



# Feynman's Lost Lecture: The Motion of Planets Around the Sun

*David Goodstein , Judith R. Goodstein*

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**Feynman's Lost Lecture: The Motion of Planets Around the Sun** David Goodstein , Judith R. Goodstein Richard Feynman, the rock star of theoretical physics, has left an image that belies his nerdy side. Not many bongo-playing surfer beatniks would have spent hours of their spare time proving Newton's law of elliptical planetary motion using only plane geometry. But *Feynman's Lost Lecture: The Motion of Planets Around the Sun* shows that the great man did just that. Originally delivered to an introductory physics class at Caltech in 1963, this 76-minute CD and book set contains everything the math-savvy listener needs to savor the pleasures of applied math. Caltech physicist David L. Goodstein and archivist Judith R. Goodstein found the notes and tape amid another professor's papers and set to work making sense of them; unfortunately, photographs of the blackboard drawings didn't survive. The book briefly covers their find and recovery work, then presents the proof as reconstructed--crucial reading if one is to follow the lecture. There's nothing easy about it, as Feynman acknowledges in the lecture:

I am going to give what I will call an elementary demonstration. "Elementary" means that very little is required to know ahead of time in order to understand it, except to have an infinite amount of intelligence.

He means, instead, that he is strictly using geometrical methods to reach his destination, which explains why it was so difficult to reconstruct without his diagrams. His charming Brooklyn accent and good humor show through in this lecture, even if the material is quite a bit drier than his fans might expect. Still, those interested in adding a new dimension to their understanding of this brilliant scientist--and those with a deep interest in Newtonian physics--will find *The Motion of Planets Around the Sun* a rare and unexpected treat. --  
*Rob Lightner*

## Feynman's Lost Lecture: The Motion of Planets Around the Sun Details

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## From Reader Review Feynman's Lost Lecture: The Motion of Planets Around the Sun for online ebook

### Robert says

At this late stage one has to wonder if there can be any worthwhile material by or about Feynman that hasn't already been published - the answer is, in this case, yes - but this doesn't offer a tremendous amount that would be new to dedicated Feynman fans. It's really for completists and neither a great nor terrible place to start for newcomers.

For just such newbies to Feynman I will briefly disclose that he was a Nobel Prize winning theoretical physicist who worked on the Manhattan Project in his youth and became famous not only for his professional skill but his quirky and irreverent public persona and his capabilities as an educator, both of the general public and of student physicists.

This lecture was omitted from the famous three volumes of lectures based on a two year undergrad introductory course that Feynman taught at Caltech. It is a demonstration of the fact that planets orbit the sun in ellipses if Newton's Law of Gravitation is correct and perturbations from all the other planets are ignored - using only plane geometry. Since only a few diagrams and notes from the lecture remained, along with a voice recording of it, it was quite a task to reconstruct the proof, which as is pointed out by Feynman himself is, whilst elementary, not simple. That said, the explanation of the demonstration could not be clearer and anybody who can follow school level geometry will be fine. Because there are a large number of diagrams, what appears to be a lengthy (and therefore possibly intimidating) wodge of physics is in fact something you could read and understand in a couple of hours easily.

Additionally to the reconstruction and explanation of the proof, there is a mini-biography of Feynman which is best (as always) when telling anecdotes, not history, a transcript of Feynman delivering the lecture and a brief history of the relevant discoveries about the nature of the solar system, gravity and the way things move.

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### Kev says

This is a magnificent book.

The collaboration between husband & wife team David & Judith Goodstein is generative, illuminating & ultimately profound.

The math is beautiful. The reason for understanding the principles is farreaching & pragmatic at once. Truths live regardless of fashion or time. Feynman was a genius. I'm honored not only to understand this work but to celebrate it.

You will embark upon a timejourney that reaches from Plato & Aristotle in 4th century BCE, to Ptolemy of the 2nd century CE, to Copernicus in the 16th, Tycho, Kepler, Galileo, Newton in the 17th, Maxwell in the 19th, Rutherford in the 19th/20th, Feynman, then Goodstein. It's a journey worth taking. You don't need to know any advanced math at all. All you have to recall is high school geometry.

But as Feynman says: "Elementary doesn't mean 'easy.' It may be elementary but it's difficult as hell." HA!

Exhilarating ride.

Oh yeah! I forgot. The 4th chapter you get to follow along Feynman's original recorded lecture & listen as you read the transcript.

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### **Animesh says**

Looking to refresh your high school geometry love without embarrassing yourself getting caught reading high school books... READ THIS!

2, maybe 3 pee breaks and boom. Such ingenuity. I did not even know how to prove Kepler or Newton.. but Mr. Feynman has taught me now. And the bonus lesson of applying concepts to Rutherford experiment s. It was really fun to try it myself on paper.

Only if someone could gift me the entire volume of Feynman lectures.

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### **Michael says**

This lecture represents Feynman at his best! Play the audio CD & follow along in the book to see just how much enthusiasm & love he brings to his subject. The concepts he presents are fairly basic, but require some knowledge of high school geometry & physics.

Feynman gave this lecture "for fun" - as a guest lecturer in the 1964 freshman physics course. He started out to explain Newton's proof of why planets have elliptical orbits around the sun - but departed from Newton's proof to use his own, much simpler (using basic geometry) proof, that he had "cooked up" at the last minute. The sheer joy with which he delivers this lecture is apparent on the recording.

Along with his lecture on Algebra (The Feynman Lectures on Physics, Vol.1, Ch 22) - in which he starts with addition & proceeds logically through imaginary numbers (using only algebra & trigonometric functions) to derive Euler's formula - this book & CD combo show why Richard Philips Feynman was one of the most original thinkers in 20th Century physics.

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### **Jerry says**

I have the version with the CD. I think it helps, at least for the transcription portion of the book, to have Feynman's cadence orally. The rest of the book stands up perfectly fine on its own. It begins with a history of Kepler, Brahe, Copernicus, and Galileo, how their discoveries led to the Newtonian revolution in how we think about the world.

Then the authors write an expanded version of Feynman's lecture. This is necessary if, like me—and unlike Feynman's freshman class—you are decades past your high school geometry. The proofs really are elementary and basic—that is, at the high school level—and very visual, in the geometric sense. It is a fascinating glimpse into how Newton and his contemporaries thought, and how they—after Newton, at least—saw the universe.

## Mobil76 says

The title is irresistible. But, like most of my "reading Feynman" projects, it's more work than I thought it would be. He is, after all, a physicist.

But, it's not a bad lecture and it comes with a story about how it was reconstructed. So, it's another labor of love for a man who makes us proud to be human.

It's approximately the same level of material that's in Six Easy Pieces. I think I would've liked it better if I'd heard it before SEP. As it is, it was a lot of money for "just one more lecture".

I'd say, "Get it if you're considering getting SEP". It's a taste of what you're getting yourself into.

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## Danil says

"I tried to find the simplest [demonstration:] that I could. It's still too hard for an ordinary human being" -- Feynman's own comment on his demonstration.

After his introduction, Feynman's demonstration proceeds in three parts: a review of some basic geometric properties of the ellipse; the geometric demonstration that elliptical orbits follow from the inverse square law, and then the application of the same ideas to atomic scattering and the discovery of the atomic nucleus.

The intention is that the demonstration be "elementary", in the sense that it does not assume that the audience is already familiar with the antecedent material. It is, however, very quick: "elementary does not mean easy to understand". The lecture itself is a live recording in a lecture hall of freshman physics students who had already covered Newton's laws. The recording itself is good, but suffers a bit from the lack of visuals.

The text is a supplement to the lecture, and includes background on the laws of gravitation, on Feynman, on the material within the lecture (Feynman "Newton's demonstration is insufficiently elementary; I cooked up another one". Goldstein "maybe we should add a chapter connecting the dots"), and then a transcript of the lecture itself.

The demonstration itself, while correct, is not necessarily rigorous - I found that the initial understanding I had after first listening to the lecture began to wilt under more careful examination.

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## Hrishikesh says

Incredible, incredible book.

One of the most incredible things about this entire lecture is that Feynman proves Kepler's laws using just high school geometry. There is no fancier math tool used to do so. Simplification is the real test of genius.

To be honest, I preferred the author's proof to Feynman's lecture; primarily because the lecture was verbatim and very difficult to understand without the diagrams used in the actual class. The way the authors have

broken it down to a level where anyone can understand the proof is incredible.

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### **tallulah says**

It's so fun to read about math and science. Reading this book totally makes you feel smarter than you really are.

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### **Melissa McShane says**

This is definitely a three-star book. The story of how the Goodsteins found and recreated Feynman's lost lecture on planetary movements is interesting; the image of David Goodstein holed up in a cruise ship cabin because he'd finally worked out the secret cracks me up. They're also good writers and their point-by-point explanation of Feynman's lecture is clear and easy to follow with only a basic understanding of high-school geometry.

Unfortunately, the explanation is necessary because so much of Feynman's actual material has been lost. The reconstruction is good, but Feynman's lecture (the final chapter) loses some impact without the visual aids. I'm also annoyed at my library for not including the audio of the lecture on CD, as the cover copy promises; I think hearing it in his words would have enhanced the experience considerably. The book is probably of most interest to Feynman completists and students of science history, but in general it falls short of its promise.

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### **Weyl says**

I don't have the other version of this with the CD, I have just the book. This is a fantastic little book. Basically in his unique engaging style Richard Feynman proves the motion of the planets around the sun, but with Geometry! Anyone with a piece of paper, pencil, determination and school maths could follow this with effort. I don't think any other science writer could have pulled this off. After reading it I found you get a new found respect for the audacity and cheekiness of Mr Newton, who not satisfied with just using calculus decided to prove it using geometry too!

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### **Vladimir says**

Oddly fun read. Great combination of historical and scientific context plus an insightful application of elementary math. Multiple approaches to ellipses in general, and elliptical orbits in particular, come together really well in the end. Of course, everything applies to rockets and satellites as much as planets.

I haven't read anything scientific or mathematical in a while, fortunately stumbled across this while packing.

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### **Ross says**

Amazing what Feynman does with basic geometry. Accessible and clear.

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### **Matthew says**

Another cool, clever read. Quick and interesting. Explains how Newton worked out the nature of gravity and derived the elliptical orbit of planets through his three laws of physics. The arguments are far less esoteric and far more understandable than I (a non-student of physics since 14) anticipated, though of course they are the result of years of hard thinking and decades of astrological observation. The book also gives a glimpse of how 20th century physics (relativity and quantum mechanics) evolved from the Newtonian system. Eyeopening and again I wish I'd read it before college. Why don't they give us stuff like this at O Level?

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### **Bettie? says**

Feynman's Lost Lecture: Motion of Planets Around the Sun is a book based on a lecture by Richard Feynman. Restoration of the lecture notes and conversion into book form was undertaken by Caltech physicist David L. Goodstein and archivist Judith R. Goodstein. Feynman had given the lecture on the motion of bodies at Caltech on March 13, 1964, but the notes and pictures were lost for a number of years and consequently not included in The Feynman Lectures on Physics series. The lecture notes were later found, but unfortunately without the photographs of his illustrative chalkboard drawings. One of the editors, David L. Goodstein, stated that at first without the photographs, it was very hard to figure out what diagrams he was referring to in the audiotapes, but later finding of his own private lecture notes made it possible to understand completely the logical framework with which Feynman delivered the lecture.

So I have the audio without those diagrams dot dot dot lol - so I am no further forward al la Feynman but I get the drift, if you catch my drift.

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