

QS&BB Outline
v0.2

Raymond Brock

Part I

Front Matter

- 1 Introduction**
- 2 The Obligatory Section On What Science Is**
- 3 Mathematics, The M Word**

Part II

The Background

4 Motion

In which we follow Galileo into a modern view of physics in general and motion in particular. We'll establish our terminology for constant and accelerated motion and dip our toe into the idea of Feynman Diagrams.

5 Momentum and Force

In which we encounter the idea of Force, but more importantly, Momentum...a concept due to the very unusual Isaac Newton. He famously enunciated three "laws" but we'll lightly touch on them in preparation for:

6 Collisions

In which we bang things together and encounter the Universe's First Big Groundrule that momentum is always conserved. We up the game of Feynman Diagrams one notch.

7 Energy

In which we establish the Universe's Second Big Ground rule that energy is conserved...except it's complicated and destined to be re-thought.

8 Greek Astronomy

In which we lay out the Greeks' armchair views of astronomy and watch them get twisted into knots in the process.

9 Copernican Astronomy

In which we remove the earth's privileged position at the Center Of It All and stare hard at the picture of Copernicus' solar system, only to learn that it's not what he actually said. Following on that most famous Polish cleric's work we meet Tycho, our first international laboratory director, fake nose and all and his sidekick, the most courageous thinker since the Greeks, the unfortunate Johannes Kepler.

10 Newtonian Gravitation

In which we connect back to Mr Newton and Galileo's astronomy. Universal Gravitation is the Universe's Third Big Groundrule and of course it's all Newton. Galileo gets in trouble and we'll learn how and why and what he did...and didn't do with that telescope of his and we visit his final residence—his jail.

11 Charges and Magnets

In which we switch gears and take up the puzzling topics of electrostatics and magnetism. From Ben Franklin to August Coloumb

12 Faraday's Lines of Force

In which we follow the non-mathematician's wholly mathematical picture of the nature of the electric and magnetic field.

13 Maxwell's Fields

In which we blend Electric and Magnetic fields into a single entity at the hands of the number one thinker of 19th century physics.

14 Electromagnetism

In which we jump forward and learn to use electromagnetic fields to accelerate and bend charged particles.

15 Particle Accelerators and Detectors

In which we put it all together and use electromagnetism and simple atomism to construct particle detectors and particle accelerators.

Part III

Einstein's Relativity

- 16 Frames of Reference
- 17 Special Relativity: The Consequences
- 18 Special Relativity: Mass and Energy
- 19 The Equivalence Principle
- 20 Einstein's Cosmology
- 21 The Expanding Universe

Part IV

Quantum Mechanics: The Standard Model of Particles

- 22 Those Crazy Nineties
- 23 Quantum Theory
- 24 Quantum Mechanics
- 25 Antimatter
- 26 Relativistic Quantum Field Theory
- 27 Particle Physics: Introduction
- 28 Feynman's Diagrams and QED
- 29 The Particle Zoo
- 30 The Weak Interaction
- 31 Messenger Fields and Forces
- 32 The Strong Force and Gluons
- 33 The Higgs Field and Its Boson
- 34 Beyond the Standard Model of Particle Physics

Part V

Our Early Universe: The Standard Model of Cosmology

- 35 The Hot Big Band**
- 36 The Early Universe**
- 37 Geometry of Our Universe, Act 1**
- 38 The Cosmic Microwave Background**
- 39 Geometry of Our Universe, Act 2**
- 40 Before the Big Bang?**