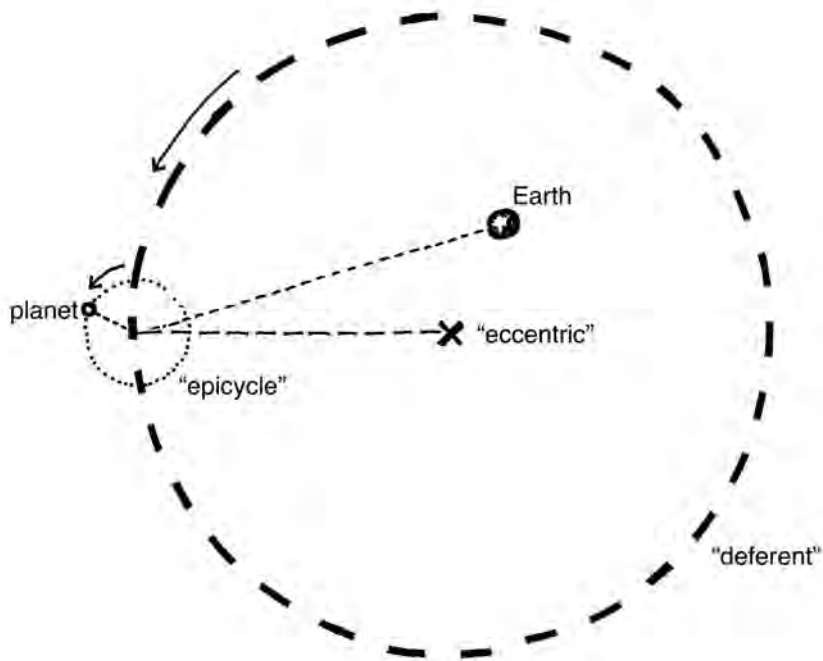
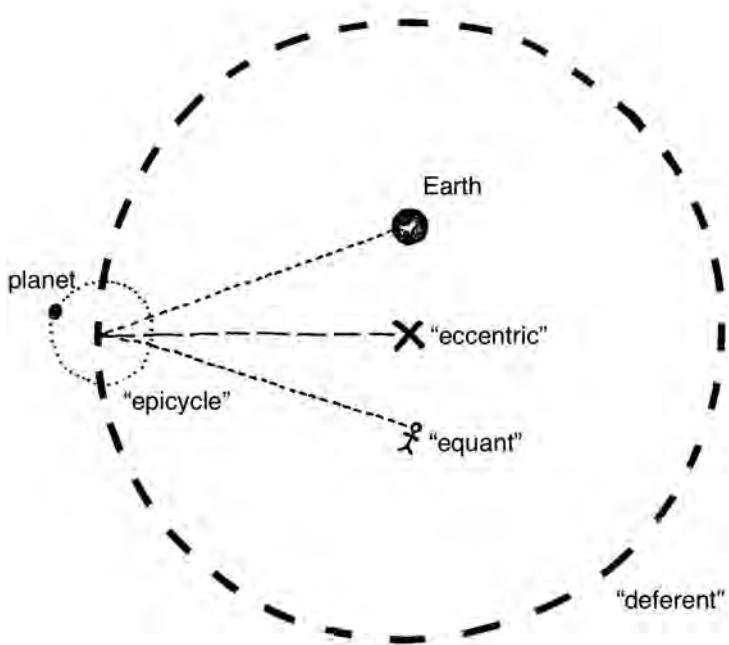


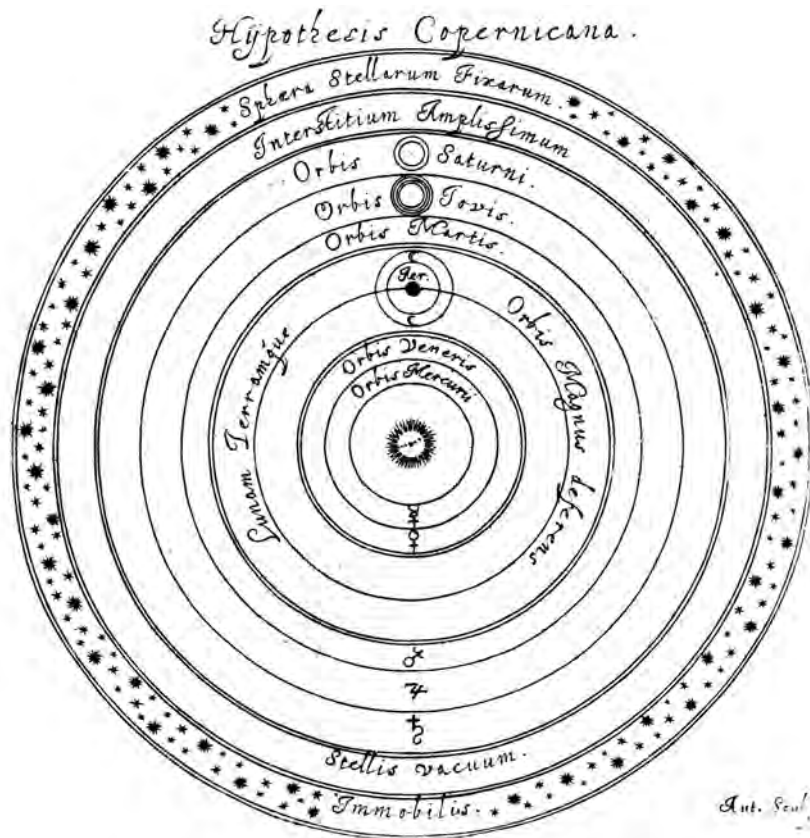
4.1 THE PYTHAGOREAN THEOREM: $a^2 + b^2 = c^2$



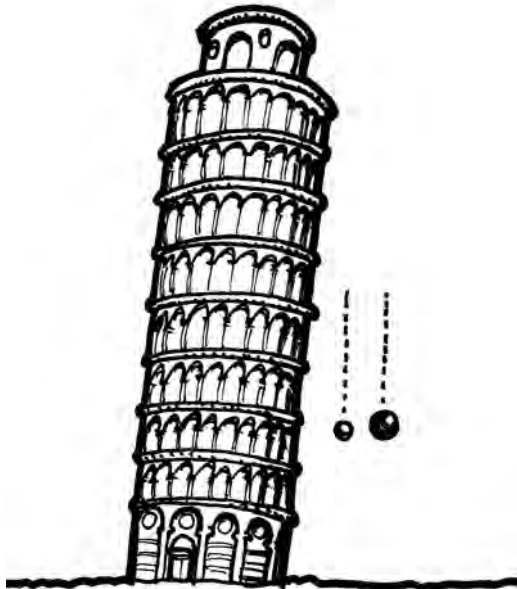
6.1 THE SCHEME OF HIPPARCHUS



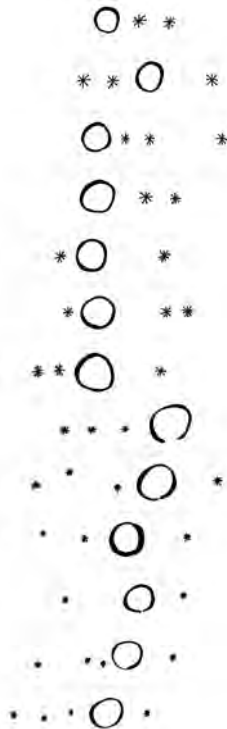
6.2 THE SCHEME OF PTOLEMY



7.1 THE COPERNICAN UNIVERSE. A SEVENTEENTH-CENTURY SKETCH BY JOHANNES HEVALIUS.



10.1 GALILEO'S EXPERIMENT



10.2 GALILEO AND JUPITER. A REPRODUCTION OF THE SKETCH GALILEO MADE OF HIS TELESCOPIC OBSERVATIONS OF JUPITER.

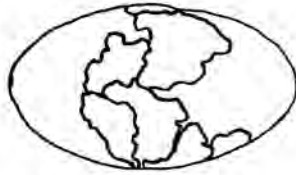
The four books of the *Principia* lay out the rules by which gravity functions. Throughout, Newton establishes and makes use of three principles (Newton’s Laws of Motion):

Law	Formula	Nonmathematical statement	Paraphrase
1. The Law of Inertia	$\sum F=0=\frac{dv}{dt}=0$	“The velocity of an object remains constant unless an unbalanced force acts on the object.”	Objects in motion remain in motion, and objects at rest remain at rest— unless an outside force is applied.
2. The Law of Acceleration	$F=m\frac{dv}{dt}=ma$	“The net force on an object is equal to its mass times its acceleration and points in the direction of the acceleration.”	When a force is applied to a mass, acceleration results. The greater the mass, the greater the force needed to produce acceleration.
3. The Law of Action and Reaction	$F_A=-F_B$	“If an object exerts a force on a second object, the second object exerts an equal force back on the first object.”	For every action, there is an equal and opposite reaction.

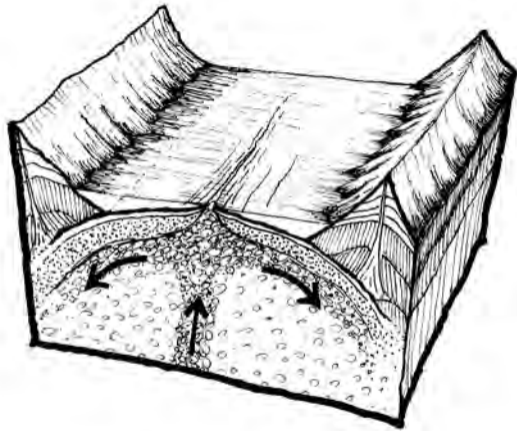
* Isaac Newton and his contemporary Gottfried Leibniz were simultaneously, and independently, working toward this new “calculus.” Afterward, they fought bitterly about who had invented which aspects of calculus, and who had copied from whom; this quarrel takes up a lot of literature about Newton, but it is irrelevant to our interests here. A useful overview is found in Chapter 15 of Niccolò Guicciardini’s *Isaac Newton on Mathematical Certainty and Method* (MIT Press, 2009).

Nonmathematical statements are all from Larry Kirkpatrick and Gregory Francis, *Physics: A World View* (Thomson, 2007), 37, 41.

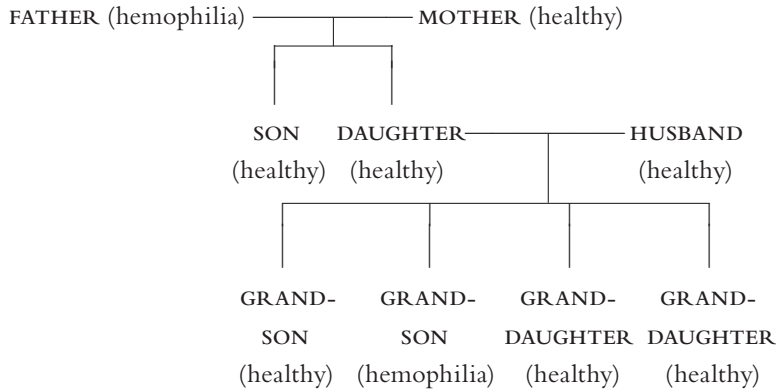
First Epoch	The earth begins to cool.
Second Epoch	The earth solidifies.
Third Epoch	Water covers the earth.
Fourth Epoch	The waters begin to recede and volcanic activity begins.
Fifth Epoch	Elephants and “southern animals” inhabit the warm north.
Sixth Epoch	Continents separate.
Seventh Epoch	Human life begins.



17.1 PANGEA AND CONTINENTAL DRIFT

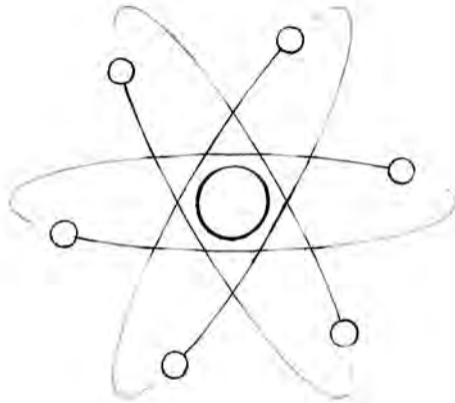


17.2 CONVECTION

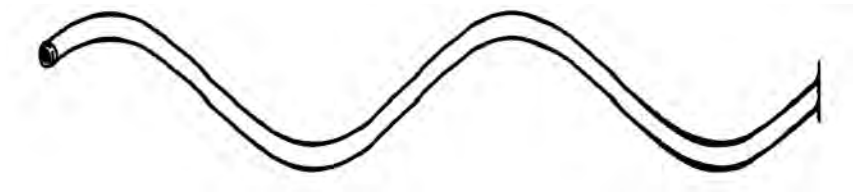




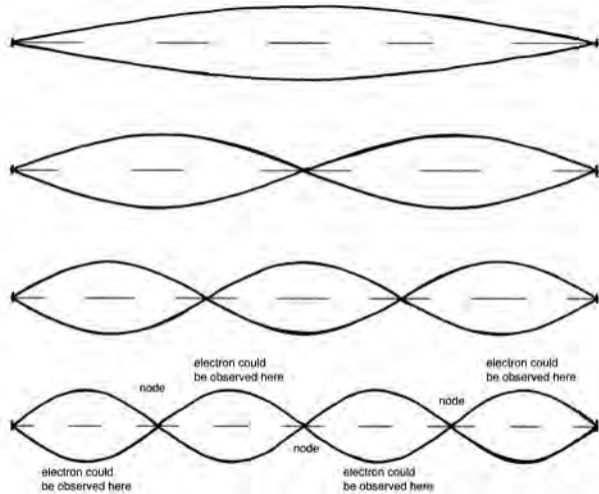
25.1 EINSTEIN'S RAILWAY



26.1 RUTHERFORD'S ATOM



26.2 EINSTEIN'S TUBE



26.3 EINSTEIN'S WAVES