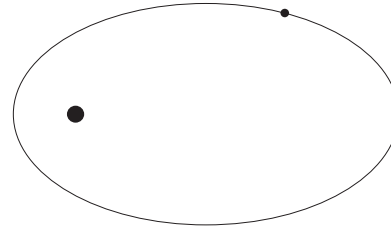


A TYPE SPECIMEN FEATURING *ADOBE JENSON PRO*

# PRINCIPIA MATHEMATICA



**ISAAC NEWTON**

**ROCKET SCIENTIST**

WINNER OF THE ROYAL SOCIETY'S BOOK-OF-THE-YEAR AWARD

“...a brilliant synthesis of mathematics and physics and how they will shape our future. By standing on the shoulders of giants, Mr. Newton has seen further than others.”

Edmond Halley

14/17 Regular	Before I begin my tale, let me extend my heartfelt thanks to the family of Nicolas Jenson. And more specifically, his type family.	<i>The recent plague that disturbed my studies at Cambridge forced all of us to return home for a semester.</i>	16/19 Italic Subhead
12/14 Regular	The olde, hand-lettered texts in our beloved Cambridge library are certainly beautiful examples of the handiwork of the most gifted monks.	<i>My friend Edmond and I passed the time playing with some of the rockets that we “acquired” from the shed behind Mr. Hooke’s abode. Our hooded cloaks</i>	14/17 Italic Display
9/11 Regular	But those laborious black letter strokes weary my eyes. Mr. Jenson has managed to capture the look of human handwork, while exploiting the capacity of Herr Gutenberg’s printing machine.	<i>obscured our faces, and though it appeared we might be caught, he was no match for younger legs. In any case, I was sure he would happily support our researches. Most remarkable devices! Free of the ground, these rockets elegantly</i>	12/14 Light Italic display
8/10 Regular	Nicolas paid exquisite attention to detail, even creating punctuation that delights the eye. The conclusion of this work employs punctuation to illustrate the motion of the rockets used in our investigations.	<i>demonstrate the principles of physicks, which I have reduced to three inviolable principles, explained on the following pages. I’ve long felt that Aristotle, no doubt because he lacked access to a large supply of rockets, gave us a flawed explanation of motion. What follows is, I feel most certainly, a superior explanation of nature. I’d like to thank Edmond for inspiring and encouraging me to publish this book.</i>	9/11 Light Italic

# The First Law

Semibold 87

Objects in motion continue in that motion, and objects at rest remain at rest—unless they are acted upon by an external force.

Semibold Subhead 24/29

These rockets are of a technology so advanced they may appear to be magic.

Light Subhead 16/19

Yet of course, they must not have such a mystical explanation. Are not all objects governed by the same principles?

Light Subhead 12/14

Set upon the ground, the rocket is motionless. Indeed, it will remain so, until

our fearless rocketeer ignites the

powder. Now, the burning powder

These rockets are of a technology so advanced they appear to be magic to the common man. Yet of course, these must not have such a mystical explanation. Are not all objects governed by the same principles? These rockets are of a technology so advanced they appear to be magic. Light 6 point

applies a powerful force

to the rocket, and it is no longer

at rest. It surges forward. And once the propellant is gone, the rocket continues gracefully on. And why not? Just as the powder created a force that changed the rocket's motion, it will take other forces to

pushing on the rocket. And like all things, it begins to fall. If we insist that changes in motion require an external force, then this phenomenon of "falling" must be due to a force. It would appear that all objects are subject to this invisible force.

Light Subhead 10/12

further change the motion. We note that the rocket slows slightly, suggesting an external force of the surrounding air

# Second Law:

*When an external force is applied to an object,  
it will accelerate with the size of the force.*

We eventually secured  
the forgiveness of Mr.  
Hooke, by agreeing to con-  
duct a series of experiments.

Display 8/10

FF

In particular, we were interested in the effects of changing the degree of the force being exerted upon the rocket by the burning powder, and in varying the mass of the rocket. A rocket with twice the mass gained speed half as fast as the lighter rocket. And of course, this means that a rocket exerting twice the force as a rocket of identical mass will gain speed twice as fast. To this measurement of the amount of speed change in a given unit time we ascribed the name *acceleration*.

Caption 8/10

We hurried back to Mr. Hooke, who we found in his shed. On the workbench that had previously been covered with the borrowed rockets, he had set up numerous springs and masses. We breathlessly announced that we had discovered that the rocket's acceleration is equal to the force exerted by

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the rocket, divided by its mass. He pondered this, staring at the arrangements of springs and weights on his workbench. I casually mentioned that this was the second law of Physics that I had discovered through my investigations of his rockets. At mention of the word "law", his countenance brightened. "Isaac and Edmond," he said, "I think I may have discovered my own law relating mass and these remarkable springs."

Light 7/8.4

# For any external force, our object exerts a force equal & opposite.

Edmond was fascinated with the highest flying rockets, which nevertheless still returned to earth even after the longest trips. I, however, became fascinated with their interaction with the ground.

So now here is a curious question. Why does the rocket stop when it reaches the ground? At first, this seems the most absurd of questions. It stops, one might say, because all things stop when they strike the ground. So let us ask the broader question: why do things stop when they encounter the ground,

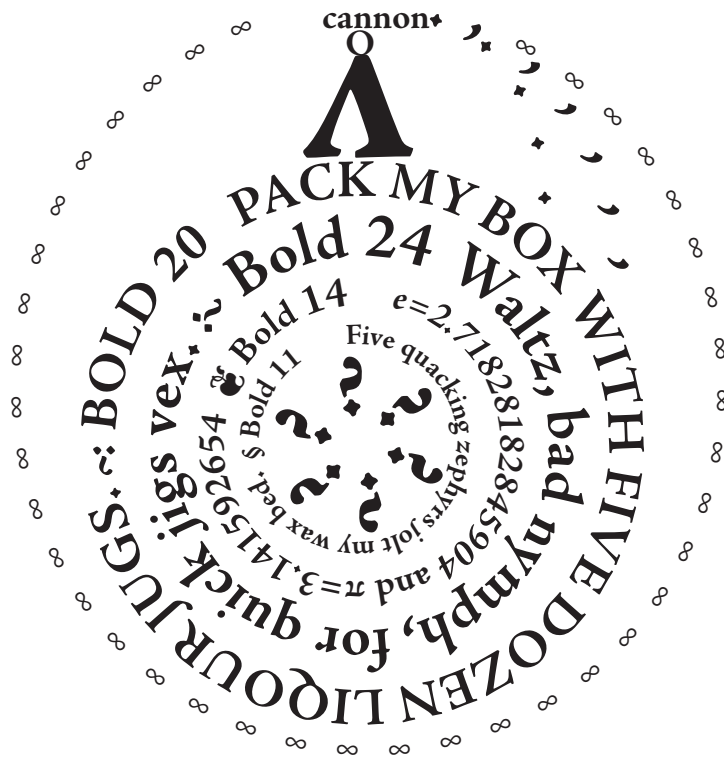
or any other obstruction for that matter?

By the first law, an object remains in motion unless acted upon by an external force. So, if our rocket rapidly slows to a stop upon touching the ground, it must be that the ground is exerting a force on our rocket. And since there is nothing special about our rocket, or the ground, we just conclude that if our object exerts a force on another, then that other object must respond simultaneously with an answering force, equal in size but opposing in direction.

All forces are matched, and the universe kept in balance.



# And so it follows...the Universal Law



Now imagine, please, a cannon launching rockets from the top of an exceptionally tall mountain. A mountain so high, that the air is so thin as to be undetectable. With a violent explosion, a period hurls outward. It does not slow to a stop, but continues, striving to fly out into the recesses of space. And once again, that invisible downward force pulls on the ball, bending its path, according to the first law. Eventually, our period impacts the ground.

Regular 10/12

*Our rocket cannon is loaded with a comma. The fuse is lit, and again, a mighty detonation, and our comma flies out, acted upon by an even greater force. By the second law, it is therefore faster even than the fallen period. The same laws of nature are applied. The comma flies further before it has dropped as the period did.*

Italic 8/10

Finally, the mighty infinity is brought forth. The rocket is packed with a carefully selected load of gunpowder. As the infinity bursts free of the cannon, it maintains a delicate balance between flying out into the unknown, and being pulled towards earth. By the 3rd law, does this not mean the infinity also pulls on the earth? For every foot it moves away, it moves a foot closer. And so, rather than falling to earth, it flies around it, passing right by its own starting point, and now repeating its path, with its speed unabated. Its flight is appropriate to its name.

Semibold 9/11

*And so again, we see the invisible force at play, creating an endless orbit. This appears to be exactly what is happening with the planets which orbit our sun. So this force is not peculiar to earth, but also the sun, and perhaps all others things. A kind of Universal Law that causes objects to gravitate toward each other.*

Italic Display 9/11