



dr. skateboard's

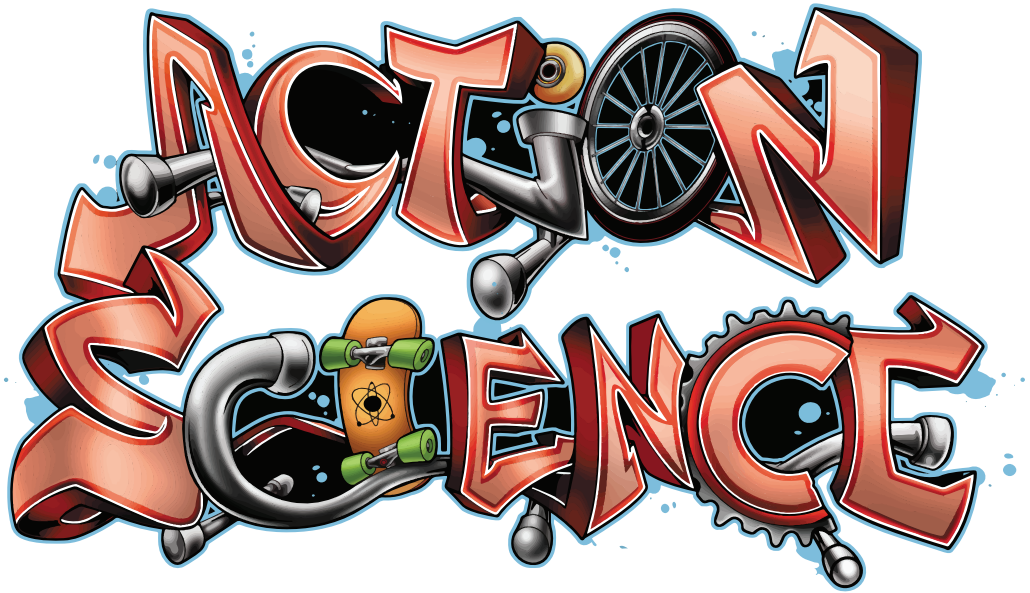
ACTION

SCIENCE



Newton's Laws of Motion

Written by Bill Robertson, Ph.D.
Illustrated by Tania Sanchez

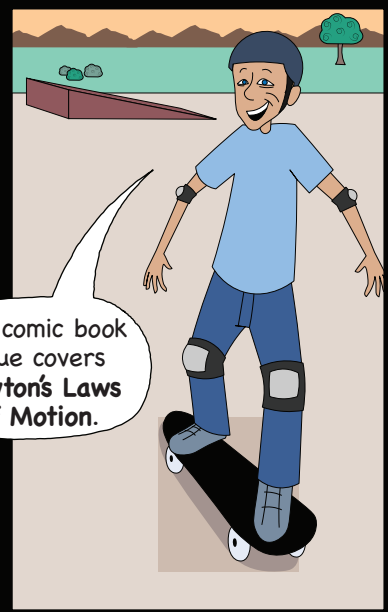
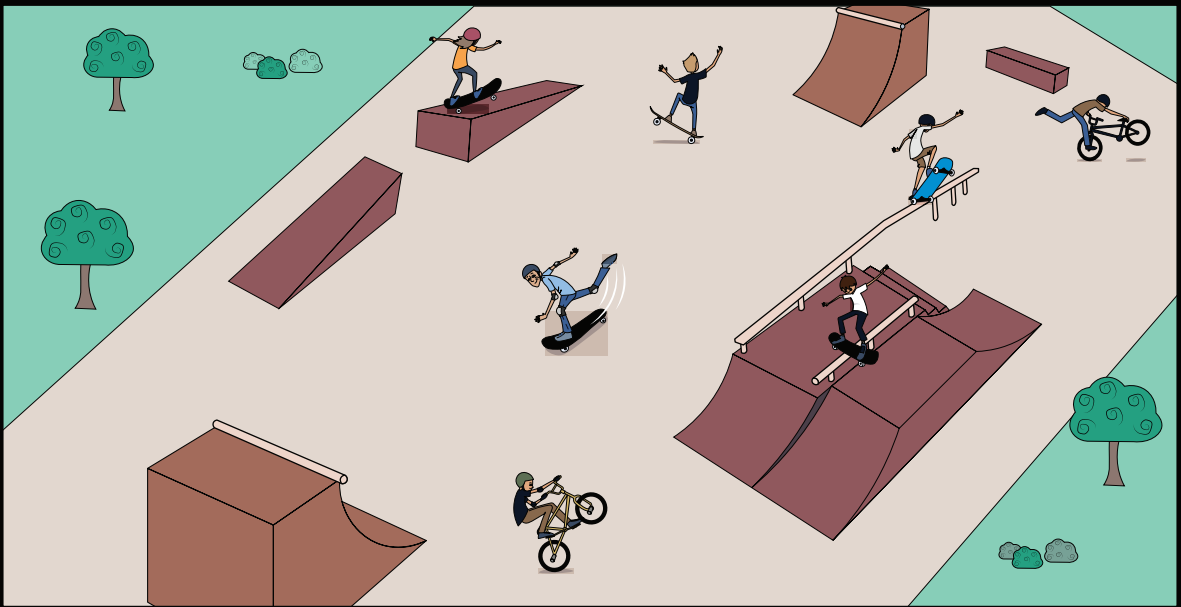


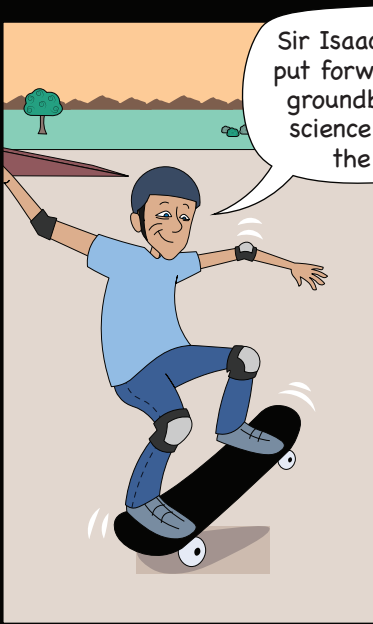
About Action Science

How can you get young people interested in science and mathematics? What efforts are there to integrate the experiences of middle school students into the things they need to do and learn in school? How can action sports, like skateboarding and bicycle motocross (BMX), be used to teach physics, algebra, data collection, and help students to grow in their engagement and motivation in science and mathematics? The answer lies in part to an approach I have termed as Action Science.

Action science is an example of the use of transformative educational strategies to enhance the study of science for K-16 students. The term “action science” can be defined as the use of familiar objects, circumstances and situations within the lives of students in order to explain specific concepts in science built around student interests, including action sports like skateboarding and BMX.

In schools, the approach to these topics is also done in very traditional manners that employ content delivery mechanisms that are often not put in relevant terms for the K-16 learner.





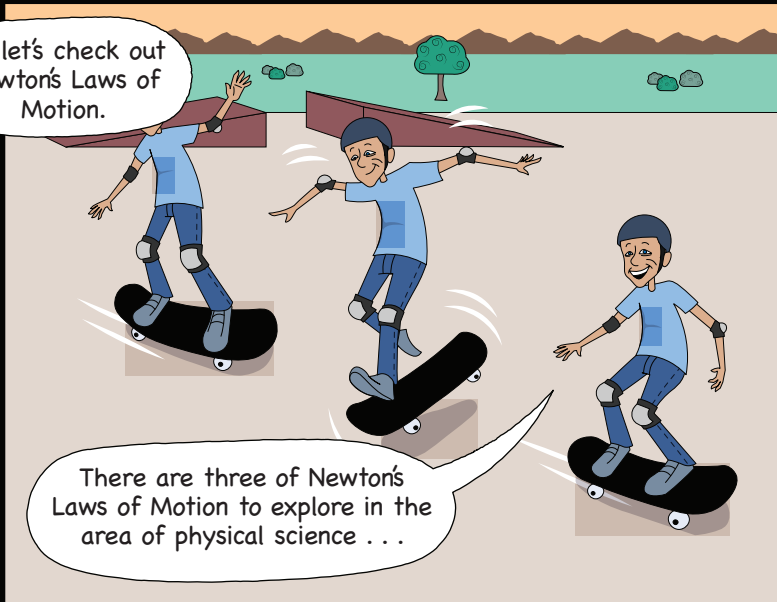
Sir Isaac Newton put forward some groundbreaking science back in the day



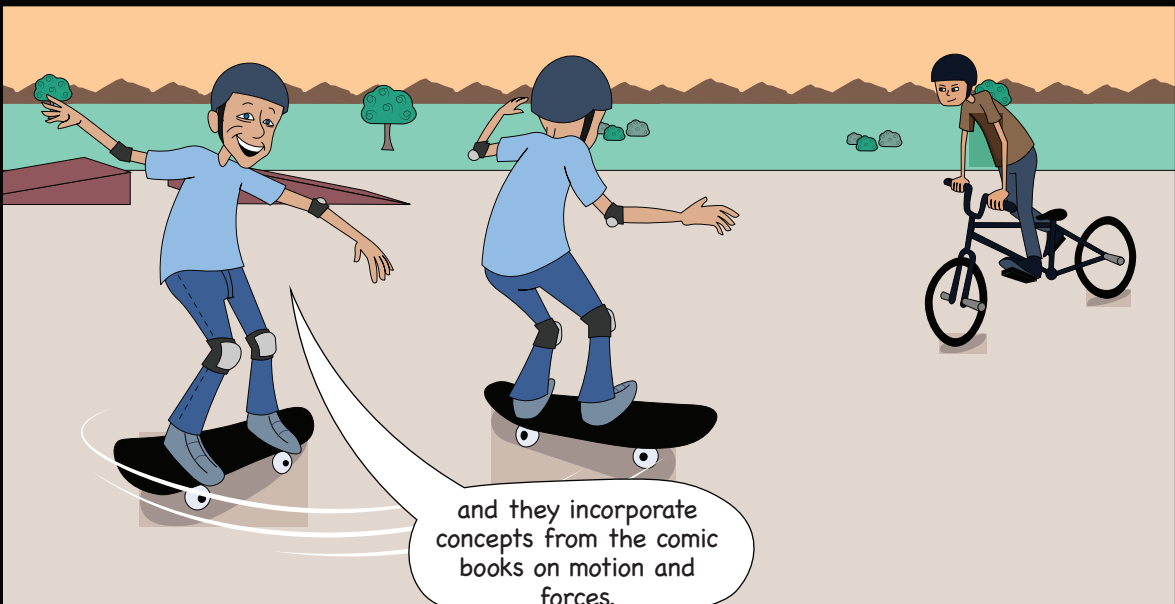
and now we can explore these laws through skateboarding and BMX.



So, let's check out Newton's Laws of Motion.



There are three of Newton's Laws of Motion to explore in the area of physical science . . .



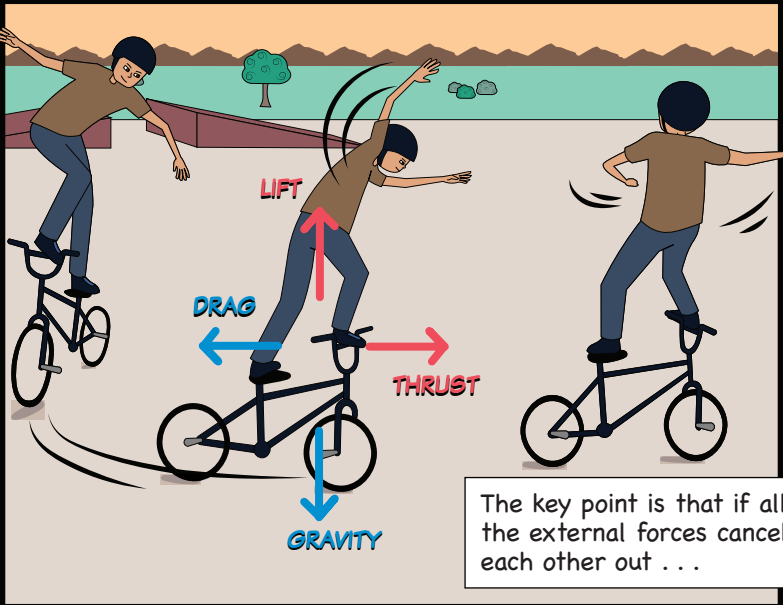
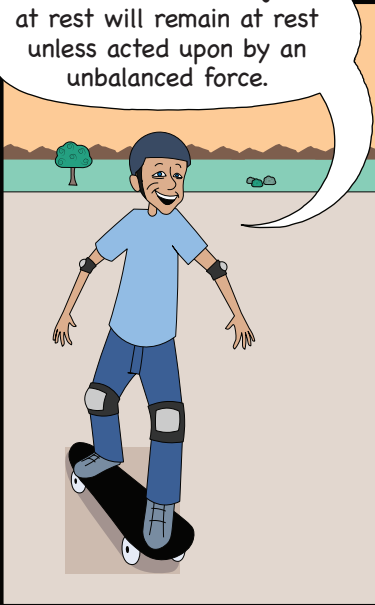
and they incorporate concepts from the comic books on motion and forces.



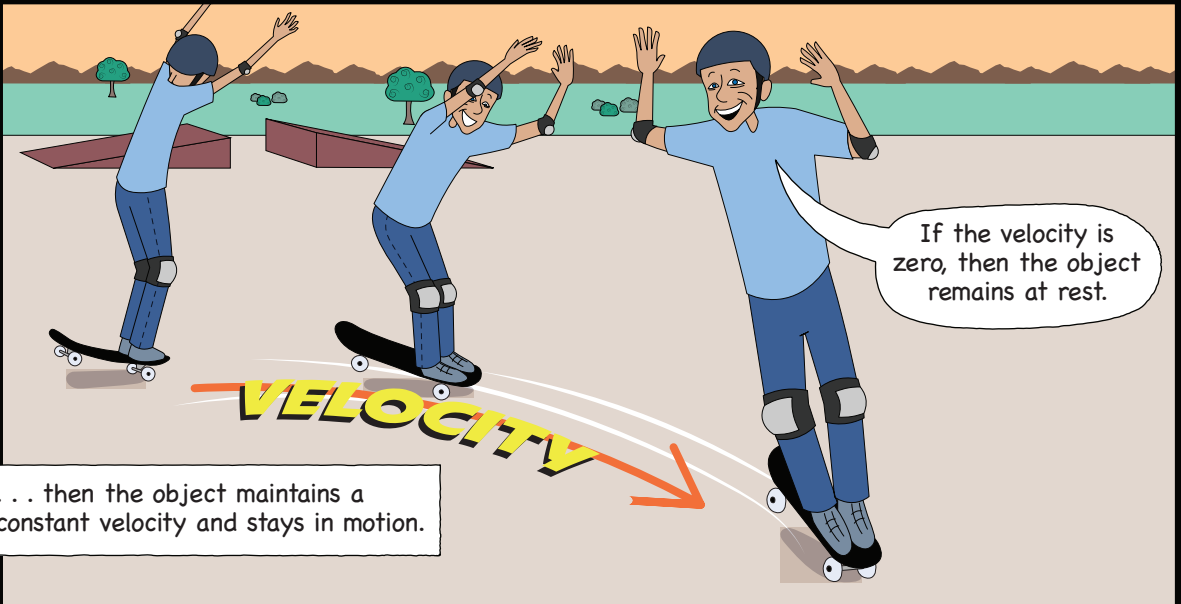
Newton's First Law of Motion states that objects in motion will remain in motion

unless acted upon by an unbalanced force.

It also states that objects at rest will remain at rest unless acted upon by an unbalanced force.



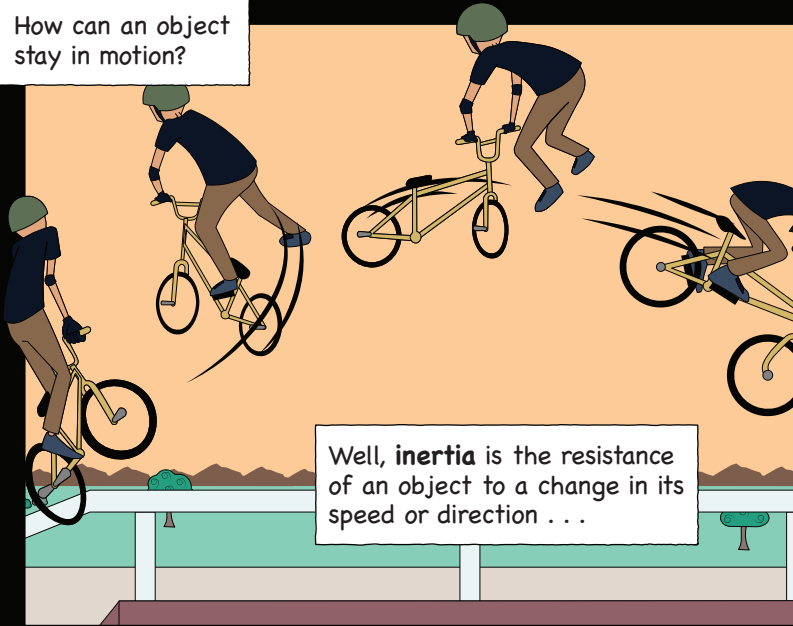
The key point is that if all the external forces cancel each other out . . .



If the velocity is zero, then the object remains at rest.

. . . then the object maintains a constant velocity and stays in motion.

How can an object stay in motion?

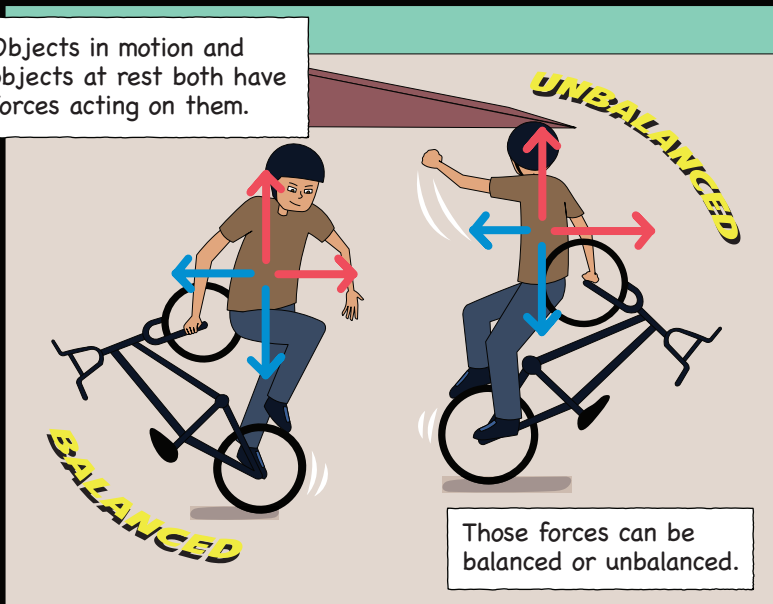


Well, **inertia** is the resistance of an object to a change in its speed or direction . . .

and with inertia, objects stay in motion.

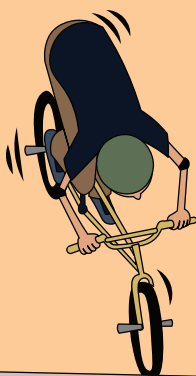


Objects in motion and objects at rest both have forces acting on them.



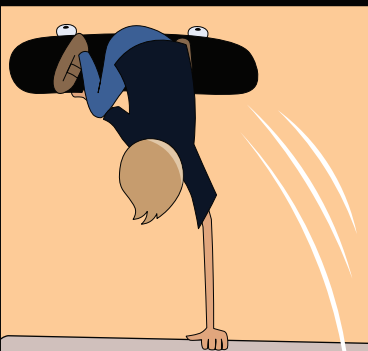
Those forces can be balanced or unbalanced.

What is a **balanced** force?



Well, it is any force that does not cause a change

in the direction or speed of an object.



For example, when a skateboarder is performing a move like a handplant

the forces are balanced when the rider stalls on the coping.





About Dr. Skateboard

Dr. Skateboard is Bill Robertson, a Ph.D. in Education and a skateboarder for over forty years. Bill has done hundreds of demonstrations nationally and internationally in festivals, events and in academic settings. He has performed for thousands of students in elementary, middle, and high school levels throughout the United States, in Canada, Mexico and into South America. Bill has been an educator for over twenty-five years. His academic areas of expertise are science education, curriculum development and technology integration. He also teaches and does research in the areas of problem-based learning and action science.



$$s = \frac{d}{t}$$

$$F = ma$$

$$v = \frac{d}{t} \text{ (direction)}$$

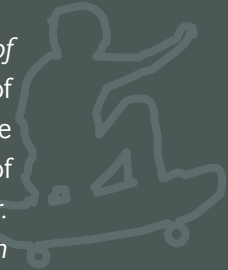


$t = 6 \text{ sec}$



Dr. Skateboard's Action Science – Newton's Laws of Motion comic book is the fourth installment of a series of graphic novels based on the fundamental physical science areas, which include forces, motion, Newton's Laws of Motion and simple machines. The overarching theme of *Dr. Skateboard's Action Science – Newton's Laws of Motion* comic book is the appeal of skateboarding and BMX as teaching and learning vehicles for young people, adults and families in a format that is well presented, easily accessible and conceptually correct.

$$v = \frac{d}{t} \text{ (direction)}$$

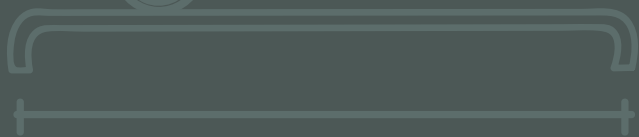





$$\Sigma F_x = ma$$

$$P - f = ma$$

$$\Sigma F_y = ma$$

$$N - mg = ma = 0$$



 @drskateboard
 @drskateboard
 @drsk8board

www.drskateboard.com

