A Teacher's Guide to Prepare Students for the Performance of

GARRY KRINSKY

Toying with Science!

Garry Krinsky: *Toying with Science*

INTRODUCTION

It has been said that GARRY KRINSKY resembles a living cartoon with his animated characters and non-stop energy. Garry was an original member of the Boston Buffoons, co-founder of the Patchwork Players, and a member of The Wright Bros., a New England vaudeville troupe. Since 1978, Garry has brought his high energy and experience to thousands of schools, theaters and festivals and has also been seen on the NBC Today Show. *Toying with Science* is a fast-paced, varied and dynamic performance. Commissioned and developed with the Museum of Science in Boston, this performance explores, among other things, the scientific principles of gravity, leverage, simple machines, and the human property of imagination. Combining circus skills, mime, original music, and audience involvement, Garry and his audience investigate basic scientific information and delve into the imaginations of scientists who explore our world.

Within this guide you will find a glossary, information about levers, simple machines, fulcrums, questions to pose to your students regarding leverage and fulcrums, a worksheet on fulcrums, and information to make your students think more about these scientific principles and prepare for Garry's performance. We hope that the guide will also give you ideas to develop follow-up activities after Garry's performance.

Garry would love to know your ideas as well as those of your students on activities that you have developed in conjunction with this program. Occasionally he will selectively add projects to the guide that are sent to us, with credit to the students, teacher and school, to give future teachers innovative ideas to use with their students.

For a complete study guide with classroom expanded activities, vocabulary and bibliography, Garry's complete guide can be found in the _____. Teachers are encouraged to make a copy of the guide for their classroom use and copies of the worksheet on *Find the Fulcrum* for every student in their class.

Garry would love to hear from your students. If you have any questions or comments about the performance, or if you would like to mail student packets to Garry, you can address mail to:

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GLOSSARY

CENTER OF GRAVITY: The point in any solid where a single applied force could support it; the point where the mass of the object is equally balanced. The center of gravity is also called the center of mass. (When a man on a ladder leans sideways so far that his center of gravity is no longer over his feet, he begins to fall.)

GRAVITATION (GRAVITY): The force, first described mathematically by Isaac Newton, whereby any two objects in the Universe are attracted toward each other. (Gravitation holds the moon in orbit around the earth, the planets in orbit around the sun, and the sun in the Milky Way. It also accounts for the fall of objects released near the surface of the earth. Objects near the surface of the earth fall at a rate of 32 feet per second.)

FREE FALL: In physics, the motion of a body being acted on only by gravity.

FRICTION: The force of one surface sliding, rubbing, or rolling against another. Friction slows down the motion of objects, and can create heat. Friction can also stabilize motion.

FULCRUM: The fixed point about which the lever moves. The point at which energy is transferred.

INERTIA: The tendency for objects at rest to remain at rest, and objects in uniform motion to continue in motion in a straight line, unless acted on by an outside force.

LEVER: A rigid rod or bar to which a force may be applied to overcome a resistance. A lever (or a combination of levers) is a simple machine used to gain force, gain speed, or change directions.

LEVERAGE: To wield power with levers. Understanding where the fulcrum is located allows us to position ourselves to gain our greatest leverage.

MACHINE: A device (or system of devices) made of moving parts that transmits, send or changes a force. Machines are often modeled on how the human body works.

SCIENCE: An organized body of information or HOW THINGS WORK!

SIMPLE MACHINE: Machines powered by human force (as opposed to batteries, electricity or burning fuel)

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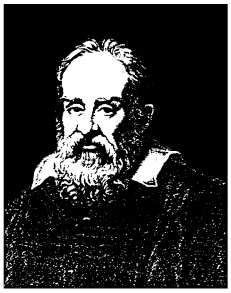
SOME FAMOUS NAMES IN SCIENCE

GALILEO
An Italian scientist of the late 16th Century and early 17th Century. His full name was Galileo Galilei. He proved that objects with different masses fall at the same velocity. Galileo also invented one of the first telescopes. Disputing the popular opinion of the time, Galileo proclaimed that the planets revolved around the sun and not around the earth.



Galilieo. *After a painting by Ramsey.*

NEWTON, SIR ISAAC
An English scientist and mathematician of the 17th Century. Newton made major contributions to the understanding of motion, gravity and light. He is said to have discovered the principle of gravity when he saw an apple fall to the ground at the same time that the moon was visible in the sky.

NEWTON'S LAWS OF MOTION
The three laws that govern the motion of material objects. They were first written down by Isaac newton and gave rise to a general view of nature known as the CLOCKWORK UNIVERSE. The laws are: 1. Every object moves in a straight line unless acted on by a force. 2. The acceleration of an object is directly proportional to the net force exerted and inversely proportional to the object's mass. 3. For every action, there is an equal and opposite reaction.

LEVERS

Here are examples of levers. Long levers = power; short levers = speed and mobility

LONG	vs	SHORT
	These are Levers	
shovel		trowel/toy shovel
ladle		spoon
ax		hatchet
pitchfork		fork
sledge hammer		hammer
tennis racquet		ping pong paddle

These are Simple Machines

bow	sling shot
clothing shears	paper scissors
wire cutters	cuticle (fingernail) cutters
deep sea fishing rod (for big fish)	lake fishing rod (for small fish)

Can you name other levers?

SIMPLE MACHINES

Most of the items below are simple machines. Identify those that ARE NOT simple machines.

scissors	hedge cutters	can opener	calculator	window shade	reclining chair
umbrella	wind-up clock	toilet	hot shower	hour glass	car jack
door	toaster	mouse trap	bicycle	chop sticks	telephone

Can you name other simple machines?

(ANSWERS: the are NOT simple machines: hot shower, toaster, telephone, calculator - fueled by electricity, fuel, or battery)

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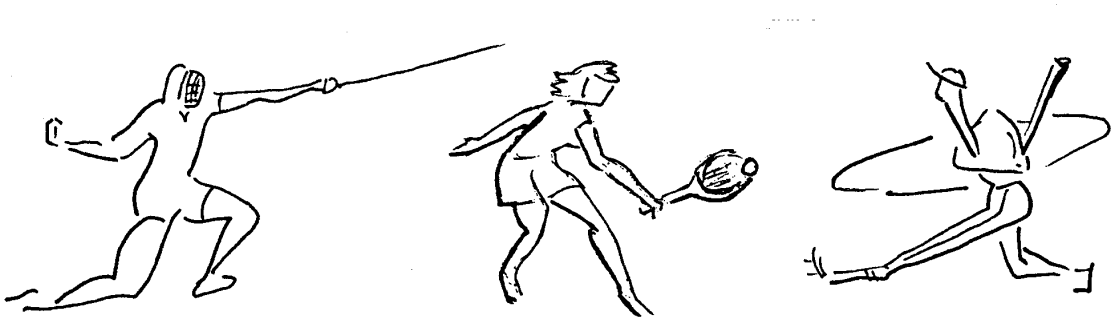
FULCRUMS

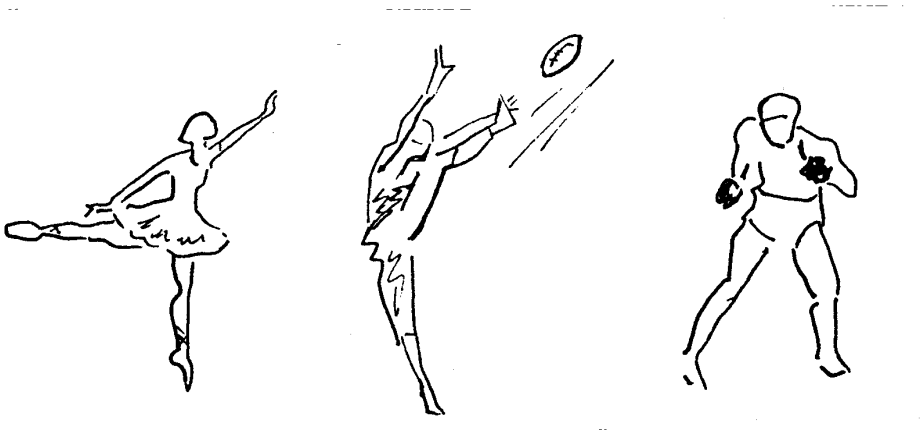
The fulcrums pictured on the next page are examples of *fixed* fulcrums, but we often use *non-fixed* or moving fulcrums. For example, in a rowboat the oars are placed into oar locks which are fixed fulcrums, but when paddling a canoe, our lower hand acts as the fulcrum but it is moving. Fixing the fulcrum (keeping its movement to a minimum) can often give us more power. We can apply more of our force in a rowboat than we can in a canoe. (However, canoes can often move faster because they have less surface in the water, and do not have as much speed-robbing friction to slow them down. Friction is also the main reason why fat-wheeled mountain bikes cannot travel as quickly as thin wheeled racing bikes.)

As with a canoe paddle, we encounter many non-fixed fulcrums in sports. Can you name some other sports levers where we transmit our power through non-fixed fulcrums?



(ANSWERS (just a list to get everyone started): baseball bats, hockey sticks, pole vaults, pool cues, tennis racquets, golf clubs, and Lacrosse sticks.)

We do not need levers to use leverage. We often use our arms and legs as levers. Can you name activities where you or other people use your arms and legs as levers?



(ANSWERS (just a list to get everyone started): dancing, doing martial arts, directing traffic, performing mime, pitching a baseball, wrestling, bowling, playing Frisbee, throwing a football, swimming, diving.)

When compared to a long canoe oar, in swimming, our hands act as small, barely efficient levers. The canoe oar increases our power. Most of the machines and tools that we build use the human body as a model, and by adding the scientific principal of leverage, it increases our own power to make the human race move stronger, faster and more efficient.

TEACHER NOTE: On the next page are examples of fixed fulcrums. You may make copies of this page to use as worksheets for your students.

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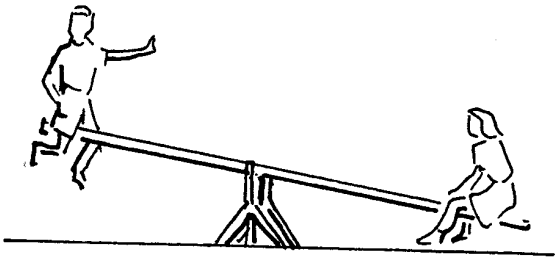
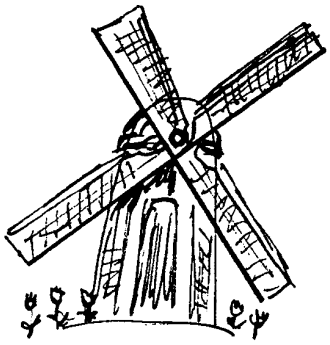
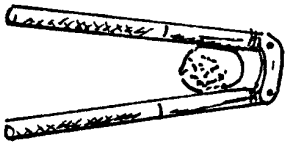
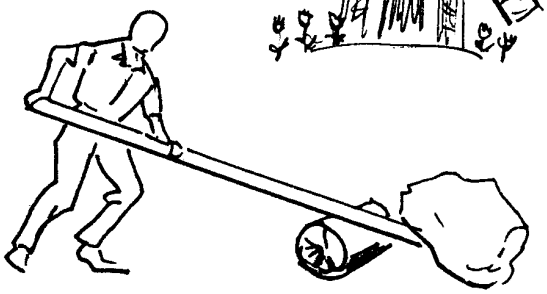
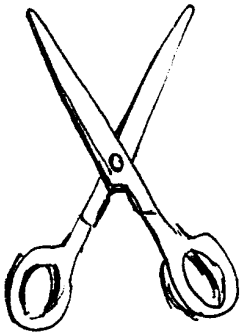
FIND THE FULCRUMS

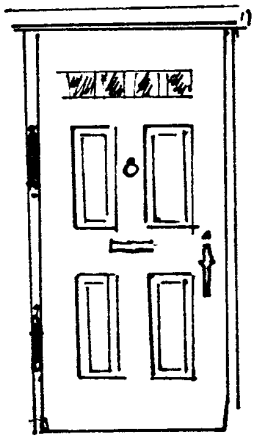


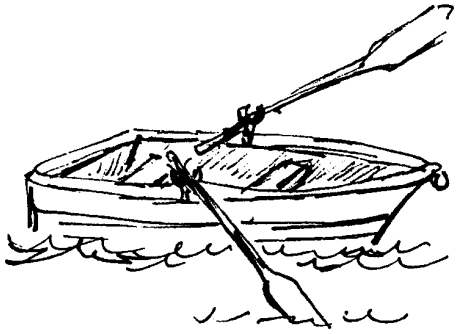


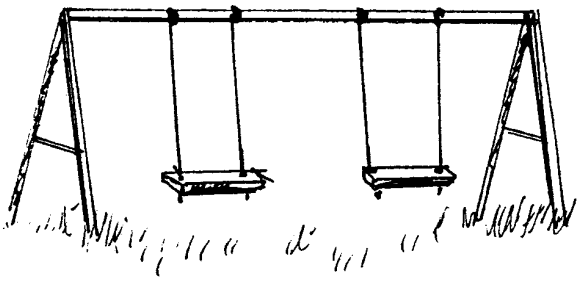












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FEATHER BALANCING

TIPS FOR SAFETY
Remove "breackables." You will need to move around, so prepare the room for your feet. Feathers break easily, so be gentle with them. Feathers have points, so be careful with your eyes.

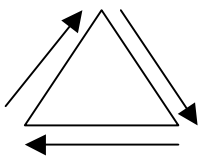
TIPS FOR SUCCESS
Look at the **top** of the feather. Balance in a non-windy space (indoor spaces work best). The more you practice, the better you will get, so don't get frustrated if success doesn't come right away.

PLACES TO BALANCE ON	**TRICKS TO TRY**
Palm of hand	- from a hand balance, throw it up and catch it
Back of hand	- keep it balanced
Shoulder	- throw it from one hand to the other
Elbow	- throw it in the air, clap and catch it (see if you can add more claps)
One finger	- carefully switch the feather from one finger to another
Top of your foot	- balance it on your foot, kick it up to your hand
Chin	- let a "balanced" feather lean, walk in that direction
Nose	- as above

EXPLORE NEW PLACES TO BALANCE ON
- Hold the feather like a dart or javelin (point up) and throw it straight up. It will turn over and return to earth facing down. Catch it in the palm of your hand. It helps to bend low to catch the feather so that it has time to straighten.
- While balancing, sit, lie down, then stand up again.
- Lying on your back, balance the feather on the bottom of your foot.
- EXPLORE NEW TRICKS!

TIPS FOR THROWING
- Throwing it high and catching it low gives you more time to see the feather.
- Higher throws allow the feather to straighten out.
- Straight throws are the easiest to catch.
- When throwing more than one feather with more than one person, one person should call out a loud and clear "cue" so that all partners throw at the same time.

MORE THAN ONE PERSON PASSING
- With a high, straight throw, pass a balanced feather from one partner to the other.
- With each partner balancing a feather, one partner gives a clear CUE ("1, 2, 3!" or "Ready…Go!") and partners switch feathers with a high, straight throw, AND, of course they balance it when they catch it.
- One partners give a "javelin" toss to the other.
- Two partners "javelin" toss at the same time (on a clear CUE) switching their feathers with a high and accurate throw.
- Three partners stand in a triangle formation, each holding a feather with the "javelin" hold. On a clear CUE, they toss their feather to one partner, then IMMEDIATELY turn to catch it from the other partner.



- Two partners stand one behind the other, both facing the same directions. The front partner balances a feather (on their hand), then throws it straight up moving forward underneath it, while the back partner steps up and catches it. This can also work with a whole line of people, with the front person moving to the back of the line each throw. A clear CUE is IMPORTANT!

HAPPY BALANCING!!!

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