Science Camp #2021.12
Theme: Gravity

27-30 June 2021 at Warner Cabin
Panguitch, and surrounding area

Advisors

H. Roice Nelson, Jr., Andrea S. Nelson,
Paul & Kate Nelson, Jared & Melanie Wright, & Sara Beckmann

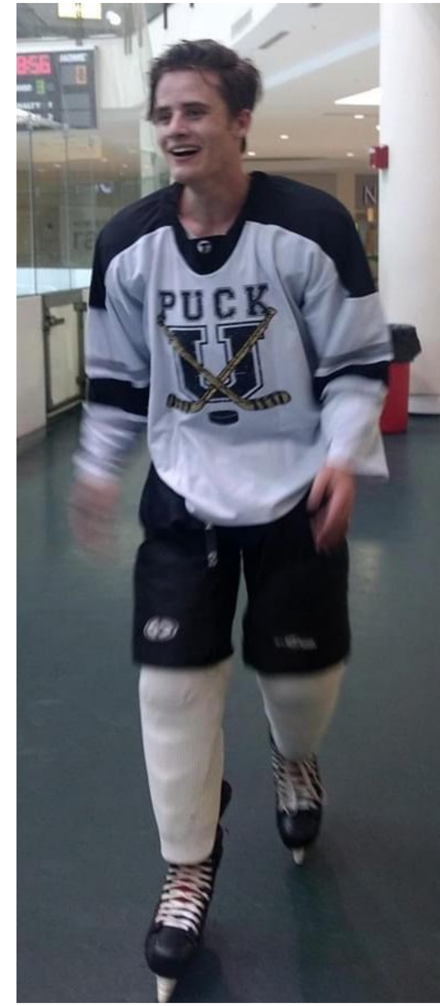
Attendees

Taylor Robbyn Wright, Ella Dawn Nelson, Halle Nalise Wright,
Bobbi Sophia Waldron, Dallin Spencer Nelson, Avalyn Ashby Wright,
Isabella Malani Waldron, Quinton Miles Nelson, Kendall Joyce Wright, &
Lauren Rachel Waldron

Guests: Gwendolyn Ivy Olson, Chloe Grace Nelson, & Sage Beckmann

Past Science Camp Themes & Sites Visited

1. Nelson Cabin, Fishing, Condensation, Water Coloring, and Music
    1. Nelson Cabin
    2. Panquich Lake
    3. Swimming at Cedar City Aquatics Center
2. Mining Range, Frisco, Silver Reef, Iron Town, Astronomy at Frisco Peak, Archery
    1. Nelson Cabin, Kolob Reservoir, Silver Reef, Snow Canyon, Volcano
    2. Parowan Gap, Rack Range Mines, Frisco, Frisco UU Telescope
    3. Iron Mine, Iron Town
3. Geocaching, Mammoth Cave, Cascade Falls, and Cedar City Cemetery
    1. Nelson Farm, Fiddler's Canyon,
    2. Boys to Mammoth Cave, Cascade Falls and Girls to St. George and Pottery Making
    3. Cedar City Cemetery
4. Volcanoes, Classy Closets, Maps, Surveying, Sand Painting, and Genealogy
    1. Condo, Snow Canyon Volcanoes, Classy Closets, Fiddler's Canyon
    2. Nelson Farm to survey, Nelson Cabin
    3. Cedar City 24th of July Parade
5. Patterns, Horse Riding, Internet, Be-a-man-campout
    1. Dust Devil Ranch, InfoWest, Fiddler's Canyon
    2. Nelson Cabin
    3. Cedar City July 4th Parade
6. Music & Spoken Word, SilencerCo, Indian Tribes & Archaeology, Solar Astronomy
    1. Family Discovery Center, Sophie & Dallin's Baptism, SilencerCo, Music & Spoken Word, UU Science Museum
    2. Freemont Indian Museum, Boulder Anasazi Ruins, Escalante Petrified Forest, Bryce Canyon
    3. Parowan Gap, Solar Astronomy, Nelson Cabin, Uncle Des' & Aunt Sara's, Swimming
7. Rock Cutting, SUU Museum, Computer Hardware and Software, Cabin
    1. 1st Annual Fun Run / Walk, rock collection Bloody Ridge, rock cutting and polishing
    2. HTML at SUU, and Lego Robots at Nelson Cabin
    3. Astronomy at Nelson Cabin, Bottle Rockets, and having a good time
8. 8G: Geography, Genetics, Genealogy, Grandma, Grandpa, Geology, Geophysics, & Guitar
    1. Watered garden, 2nd Annual Fun Run / Walk, Iron Springs, Iron Town, Genetics, Cabin, Guitar
    2. Zion, Angels Landing & Emerald Pools, Geophysical Slides
    3. Bottle Rockets, swimming, and having a good time
9. Garden of the Gods, Drones, Intercontinental Divide, Teepee, Salida Hot Springs, University Mountains
    1. Bow & Arrows, Drone, Intercontinental Divide
    2. Guitar and Buena Vista 4th of July Parade
    3. Mount Antero, Hot Springs at Salida, Teepee
10. Eisenhower Park, Guadalupe River, i-Fly, Cave Without a Name, Alamo, San Antonio
    1. Hike to overlook San Antonio, i-Fly, swimming Guadalupe River State Park
    2. Cave without a Name, Singing, Rob Nelson on Sound and Music
    3. Alamo, Wax Museum, San Antonio Riverwalk
11. Engines, Ghost Towns and Kilns, Nelson Cabin, Al Matheson's Place, Iron Springs Resort
    1. Fisco, Kiln Springs, Nelson Cabin
    2. Teepees at Nelson Cabin, water races, Dutch Oven
    3. Matheson Engines, 4-wheelers, Iron Springs statues, Bottle Rockets, Ride in a Tesla



Ethan Evan Nelson

12th Annual Nelson Grandkids' Summer Science Camp; Theme: Gravity

Itinerary

Sunday:
1. Congregate, Aunt Sara's
2. Set up Camp, Warner Cabin in Panguitch

Monday:
1. Marysville Zip Line and Lazy River
2. Melanie: The Gravity of Words

Tuesday:
1. Bryce Canyon
2. Ruby's Inn Lunch
3. Gravity Experiments

Wednesday:
1. Water Rockets
2. Explore Panguitch & around Cabin
3. Stargazing

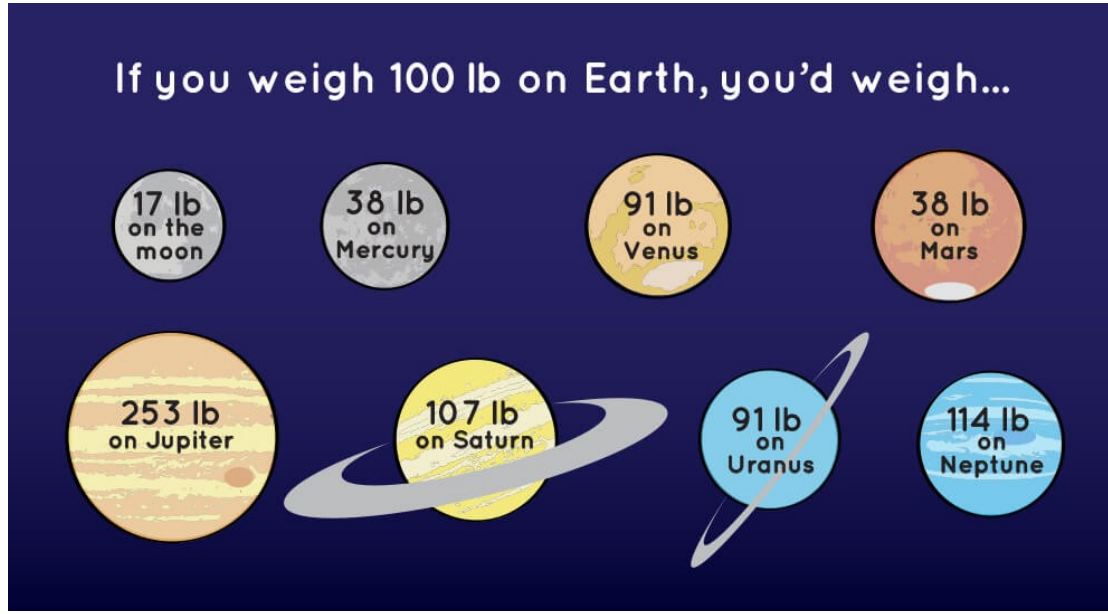
Thursday:
1. Clean Cabin, Back to Cedar, Melanie leaves
2. Check Dam, Bobby Beckmann arrives

Friday:
1. Paul's Family leaves Nelson Cabin
2. Pack Up

Saturday:
1. Nelson Cabin
2. Shakespeare

Sunday:
1. Church & Cabin

Good Times!



https://spaceplace.nasa.gov/what-is-gravity/en/

Photos + slides will be posted at: http://www.walden3d.com/photos/Grandkids_Science_Camps/210628-30_Science_Camp

You exert the same gravitational force on Earth that it does on you. But because Earth is so much more massive than you, your force doesn't really have an effect on our planet.

Schedule Saturday - Friday

- Sunday, 27 June 2021
  - Meet in Cedar then drive to / or Panguitch
  - Drive to Warner Cabin in Panguitch
  - Roast Dinner Paul and Kate
- Monday, 28 June 2021
  - Waffle Breakfast – Paul and Kate
  - Grandma picks up Sophie, Izzy, Lolo, & Gwen
  - 10:00 first Zip Line Crew, Marysville
  - 11:00 second Zip Line Crew, Marysville
  - Sandwich Lunch – Jared & Melanie
  - 12:15 call from/to Elder Colby Wright in Chile
  - 1:30 Lazy River Float
  - Cabin: Gravity discussion and Gravitation 3-D
  - Taco Dinner, Root Beer Floats – Jared & Melanie
  - The Gravity of Words - Melanie
  - Gravity Movie
- Tuesday, 29 June 2021
  - Pancake Breakfast – Grandma & Grandpa
  - Bryce Canyon
  - Lunch: Ruby's Inn Buffet
  - Gravity Experiments, Panguitch Lake, and around the Cabin
  - Hot Dog, Smores Dinner: Grandma & Grandpa
  - The Gravity of Your Turn on Earth – Grandma , Stargazing
- Wednesday, 30 June 2021:
  - Omelet Breakfast: Sara & Sage
  - Water Rockets
  - Exploring around the Warner Cabin
  - Sandwich Lunch: Sara & Sage
  - Dutch Oven, Watermelon Dinner: Grandma & Grandpa
  - Gravity Movie
- Thursday, 01 July 2021:
  - Cold Cereal Breakfast: Grandma & Grandpa
  - Clean Cabin
  - Back to Cedar
  - Gravity & Water: Check Dam – Water Guard
  - Melanie's family leaves, Bobby Beckmann arrives
  - Paul's Family to Kanarraville Falls then Nelson Cabin
  - Lunch: Pizza
  - Dinner: French Spot
- Friday, 02 July 2021:
  - Sara and Bobby to Nelson Cabin
  - Andrea to Salt Lake
- Saturday, 03 July 2021:
  - Bobby & Sara to Shakespeare
  - Grandpa and Sage watch a cowboy movie
  - Andrea back to Cedar
- Sunday, 04 July 2021:
  - Hillcrest Ward 12:00-2:00
- Monday, 05 July 2021:
  - Clean Nelson Cabin
  - Cedar City July 4th Parade

Thanks to Aunt Luana who paid the family fee so we could use the Warner Cabin.

Safety

- **<u>Never go anyplace alone, preferably 3+</u>**.
- Exception is if one of you is hurt, then:
  - One of you stay and help the person hurt.
  - The other one run and get help.
- If you get lost stay put, we will find you.
- If you hear a rattlesnake do not move quickly, just slowly move away from the sound.
- Do not run with a knife open. Use knife safety.
- If you cut yourself, apply pressure to the wound to stop bleeding, and send for help.
- Never point an arrow in a cocked bow or a gun at any person.
- Drink lots and lots and lots of water.
- Do not go swimming unless an adult is with you.
- Do not start branches on fire and swing them around where others can be hurt.
- Have fun, use common sense, and **<u>think before you act</u>**.

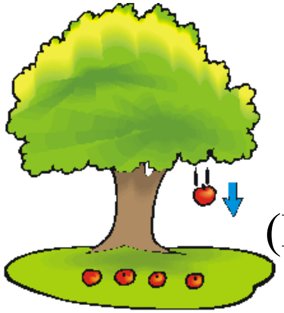
2021 Science Camp, Warner Cabin, Panguitch, UT

Everybody picks up their own dishes!

Everyone cheerfully does what they are asked to do by Grandpa, Grandma, Uncle Paul, Aunt Kate, Aunt Melanie, or other adults.

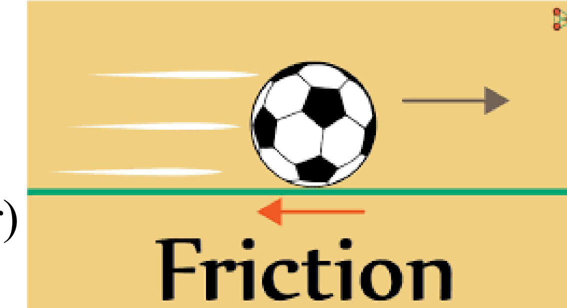
Job Chart

Sunday	Monday	Tuesday	Wednesday	Thursday
	Breakfast: - Paul & Kate - Quinton & Halle	Breakfast: - Grandma & Grandpa - Lauren & Chloe	Breakfast: - Sara & Sage - Sophie & Avalyn	Breakfast: - Grandma & Grandpa - Halle & Dallin
	Lunch: - Melanie & Jared - Taylor & Dallin - Everyone make their own	Lunch: - Ruby's Inn	Lunch: - Sara & Sage - Everyone make their own	Lunch: - Pizza
Dinner: - Paul & Kate - Ella & Avalyn	Dinner: - Melanie & Jared - Izzy & Kendall	Dinner: - Grandma & Grandpa - Gwen & Quinton	Dinner: - Grandpa & Grandma - Taylor & Ella	



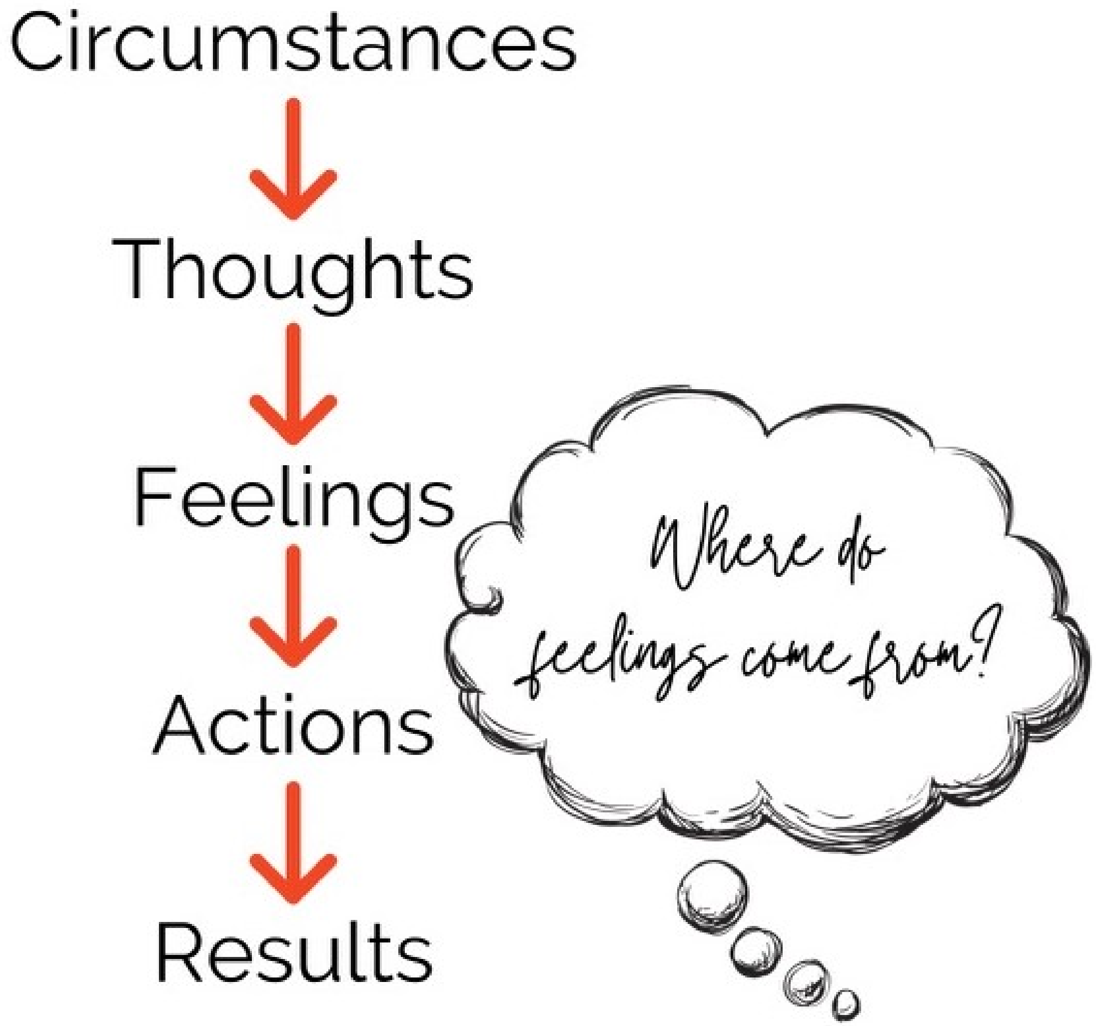
Presentations

(Discussions of Science Activities over the last year)



- Taylor R. Wright ______________________________.
- Ella D. Nelson ______________________________.
- Halle N. Wright ______________________________.
- B. Sophia Waldron ______________________________.
- Dallin S. Nelson ______________________________.
- Avalyn A. Wright ______________________________.
- Isabella M. Waldron ______________________________.
- Quinton M. Nelson ______________________________.
- Kendall J. Wright ______________________________.
- Lauren R. Waldron ______________________________.

The Gravity of Our Thoughts



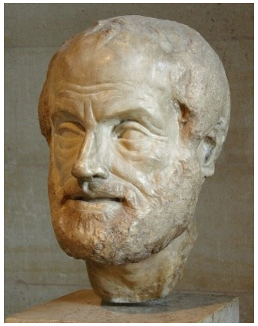
3 Components of Relationships

1. What the other person thinks about you
2. What you think about the other person (mirroring emotions)
3. What you think about you (in terms of the relationship)

Notes

Sophia, Izzy, Lauren, Uncle Roice, & Gravity

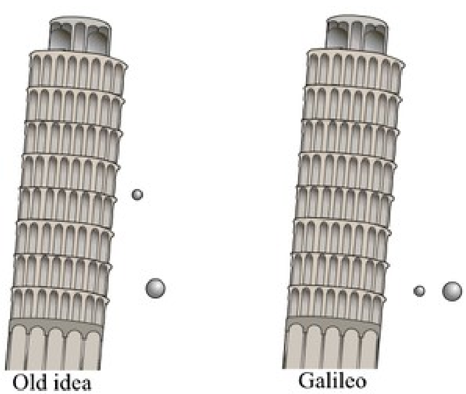
Aristotle, Galileo, and Scientific Revolution



Aristotle believed that objects moved to the center of the geocentric universe because it was their nature. One common understanding regarding his ideas about gravity was that heavier objects would accelerate faster than light objects. Thus, the weight of an object determined how fast it would fall.

Galileo Galilei [15 Feb 1564 – 08 Jan 1642] In an experiment commonly attributed to Galileo (but may be apocryphal), he demonstrated that the acceleration of objects was not dependent on the mass of the objects.

Galileo made careful measurements of balls rolling down inclines to prove that the acceleration of an object was independent of its mass.



Galileo observed that lighter objects may fall more slowly but postulated that was due to air resistance (and not to the nature of gravity).

https://teachearthscience.org/gravity.html PowerPoint: gravityprint.ppptx

Sir Isaac Newton & Gravity

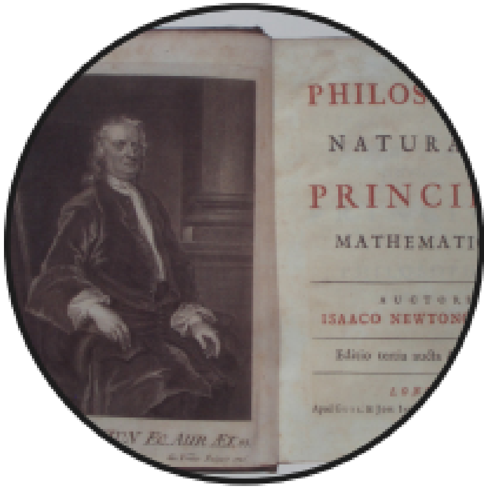
Isaac Newton was an English scientist and mathematician. He made many discoveries in his lifetime. One of the most important and influential discoveries that he made was the law of gravity.

Newton was born in 1643 at Woolsthorpe Manor in Lincolnshire. He worked hard at school, and was accepted to study at Cambridge University. He worked there for many years, but in 1666 Plague broke out and he was forced to move back to Woolsthorpe Manor.

While Newton was in the garden at Woolsthorpe Manor one day, he saw an apple fall from a tree. Some say it fell on his head but there is no evidence that this definitely happened. The sight of the apple falling down from the branch to the ground inspired Newton to think about the way it fell. Years later, he told his friend William Stukeley that he wondered why the apple fell down rather than sideways or upwards. He concluded there must be a 'drawing power' in the Earth and that 'the sum of the drawing power must be in the Earth's centre, not in any side of the Earth.' (Stukeley's manuscript can be found at royalsociety.org/library/turning-pages).

https://www.redland.wilts.sch.uk/wp-content/uploads/2016/10/Newton-and-Gravity-Fact-Sheet.pdf

Sir Isaac Newton & Gravity continued



Newton spent a lot of time thinking hard about the force of gravity, and how it pulls objects down towards the centre of the Earth. He was particularly interested in the way the Moon orbits the Earth, and he reasoned that gravity must extend over vast distances, pulling the Moon towards the Earth and keeping it in orbit.

In 1687, Newton published his discoveries about gravity in his famous book, The Principia. His findings are known today as Newton's Law of Universal Attraction.

Newton died in 1727, but his legacy lives on. All forces are measured in newtons (N), using a newton metre – both of which are named after Isaac Newton. Even Albert Einstein, writing in 1927, 200 years after Newton's death, described Newton as a 'shining spirit', and claimed he had one of the most brilliant minds of anybody who had ever lived.

Today the apple tree that inspired Newton's ideas still grows in the gardens at Woolsthorpe Manor, now owned by the National Trust. It can be seen from the window of the room that was Isaac Newton's bedroom.

Photos courtesy of Philip Sheldrake, David Ireland and Duncan Hull (@flickr.com) - granted under creative commons licence - attribution

https://www.redland.wilts.sch.uk/wp-content/uploads/2016/10/Newton-and-Gravity-Fact-Sheet.pdf

Sir Isaac Newton & Gravity continued

1. When was Isaac Newton born?

2. Why did Newton move from Cambridge to Woolsthorpe Manor?

3. What fruit did Newton see falling from a tree?

4. In which direction does gravity pull objects?

5. Why does the Moon stay in orbit around the Earth?

6. What are forces measured in?

7. What did Albert Einstein think of Isaac Newton?

8. What can still be seen from Isaac Newton's old bedroom window?

Sir Isaac Newton & Gravity continued

Newton's Laws of Motion

Isaac Newton unified Johannes Kepler's laws of planetary motion with Galileo Galilei's theory of falling bodies. Newton published his laws of motion and universal gravitation in *The Mathematical Principles of Natural Philosophy*, commonly known as the *Principia*, in 1687.

Newton's first law

Newton's first law of motion states that **objects continue to move in a state of constant velocity, which can be zero, unless acted upon by an external force**. The tendency of an object to resist a change in motion is known as inertia, and objects that are moving at a constant velocity are said to be in an inertial reference frame.

Galileo had first suggested this law, but it had not been universally accepted because it contradicted Aristotle's laws of physics.

http://www.thestargarden.co.uk/Newtons-theory-of-gravity.html

Sir Isaac Newton & Gravity continued

Newton's second law

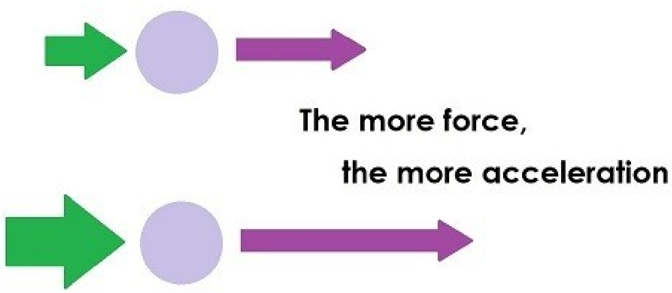
Newton's second law shows how an object will be affected if an external force does act upon it. This law states that **the rate of change of momentum of a body is proportional to the resultant force acting on it, and will be in the same direction**. This means,

$$F = \frac{\Delta p}{\Delta t} \qquad (5.1)$$

$\Delta p = m\Delta v$, and $a = \frac{\Delta v}{\Delta t}$, and so Newton's second law can be re-written as

$$F = ma \qquad (5.2)$$

Here, F is force, Δ can be read as 'change in', p is momentum, t is time, m is mass, v is velocity, and a is acceleration. This shows that less force is needed to push something lighter, which means that less massive objects have less inertia. More force is needed to push something heavier, and so more massive objects have more inertia.



Combining Newton's laws

$$F = G\left(\frac{Mm}{r^2}\right) = ma$$

Note that m occurs on both sides of the equation and can be cancelled. Rearranging

$$a = \frac{GM}{r^2}$$

where M is the mass of the Earth. At the Earth's surface, r is the Earth's radius.

$$a = \frac{(6.674 \cdot 10^{-11}\ \mathrm{N \cdot m^2/kg^2})(5.98 \cdot 10^{24}\ \mathrm{kg})}{(6.38 \cdot 10^{6}\mathrm{m})^2} = 9.8\ \mathrm{m/sec^2}$$

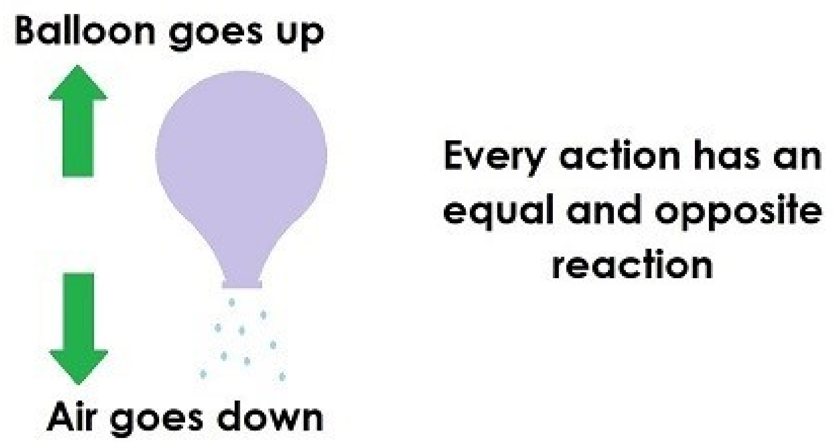
See 5.4 below

http://www.thestargarden.co.uk/Newtons-theory-of-gravity.html

Sir Isaac Newton & Gravity continued

Newton's third law

Newton's third law states that the force on an object is always due to another object; **all forces act in pairs that are equal in magnitude and opposite in direction**. This is why you feel recoil when you strike an object, and why you do not fall through the Earth due to the pull of gravity.



The combination of Newton's second and third laws shows that momentum must be conserved. This means that the total momentum of two objects remains the same before and after a collision.

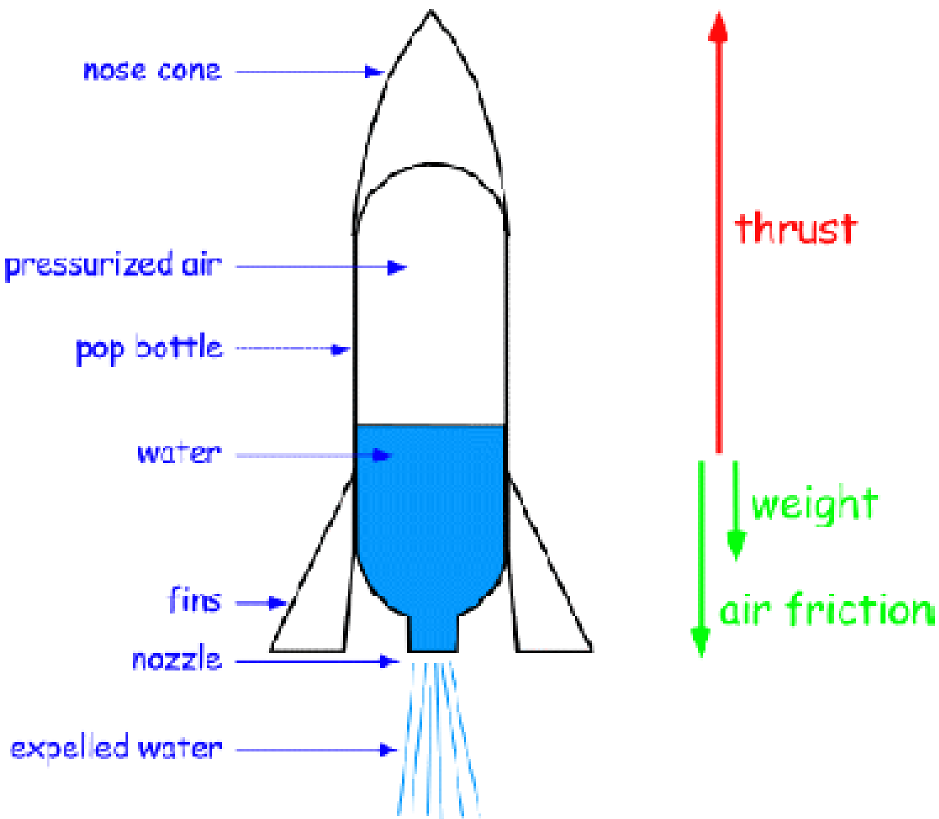
$$\text{If} \quad F = \frac{\Delta p}{\Delta t} \quad \text{and} \quad F = -F, \quad \text{then} \quad \Delta p = -\Delta p. \qquad (5.3)$$

http://www.thestargarden.co.uk/Newtons-theory-of-gravity.html

Water Bottle Rockets

2-Liter Water Bottle Rockets Overview

Great detailed website: http://www.et.byu.edu/~wheeler/benchtop/flight.php



The equation for thrust, caused by water exiting the nozzle, is:

$$T = (P_{in} - P_{out}) \cdot A_n$$

where P_{in}-P_{out} is the difference between pressure within the rocket and atmospheric pressure, and A_n is the cross-sectional area of the nozzle opening. Thrust is dependent on pressure, nozzle diameter. The amount of water dictates how long the thrust force will be applied, and therefore contribute to the rocket's total kinetic energy.

Water Bottle Rockets continued

The following values are the optimal values for maximum height at 90 psi:

- Air/Water ratio = 0.5 liters
- Dry Weight = 220 grams
- Stabilizer Length = 3.5 inches
- Maximum Height = 350 ft (impact pressure = 120 mph baseball pitch)

Water Bottles with thicker plastic (cord strength) can be pressurized greater; many European bottles have much stronger cord strengths than U.S. plastic bottles.

The following mathematical expression yields ~apogee height for a given total flight time:

$$h_{ap} = (g/8)(t_{end})2 - 3.5 \text{ meters}$$

Water rockets, requiring a largish capacity for air and water, are usually large in diameter, this causing a large amount of drag and limiting the height achieved. However, the impulse rating for even a 2 liter water rocket is normally E - four times the impulse of a pyro motor that can be bought over the counter in a high street toy shop.

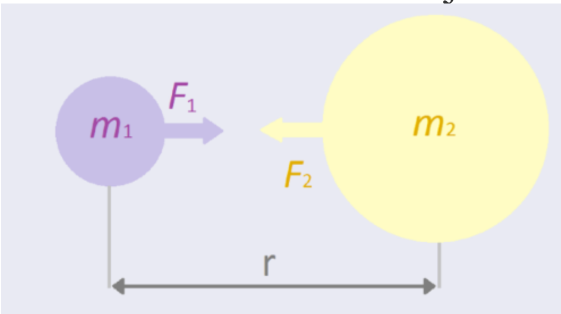
Motor Impulse Classes	
Impulse /Ns	Class
I <= 0.625	¼A
0.625 < I <= 1.25	½A
1.25 < I <= 2.5	A
2.5 < I <= 5	B
5 < I <= 10	C
10 < I <= 20	D
20 < I <= 40	E
40 < I <= 80	F
80 < I <= 160	G
160 < I <= 320	H
320 < I <= 640	I
640 < I <= 1280	J
1280 < I <= 2560	K
2560 < I <= 5120	L
5120 < I	>L

Sir Isaac Newton & Gravity continued

Newton's law of universal gravitation

Newton's law of universal gravitation states that every mass attracts every other mass in the universe, and **the gravitational force between two bodies is proportional to the product of their masses and inversely proportional to the square of the distance between them**.

Spherical objects like planets and stars act as if all of their mass is concentrated at their center, and so the distance between objects should include their radius.



$$F_1 = F_2 = \frac{Gm_1m_2}{r^2} \qquad (5.4)$$

Here, for two objects that are orbiting a common center of mass (like the Earth and the Sun), m_1 is the mass of the less massive object (like the Earth) and m_2 is the mass of the more massive object (like the Sun). F_1 is the gravitational force produced by m_1, and F_2 is the gravitational force produced by m_2. r is the distance between the two masses. Finally, G is a constant that is the same for everything in the universe.

Newton stated that the force of gravity is always attractive, works instantaneously at a distance, and has an infinite range. Most importantly, it affects everything with mass - and has nothing to do with an object's charge or chemical composition.

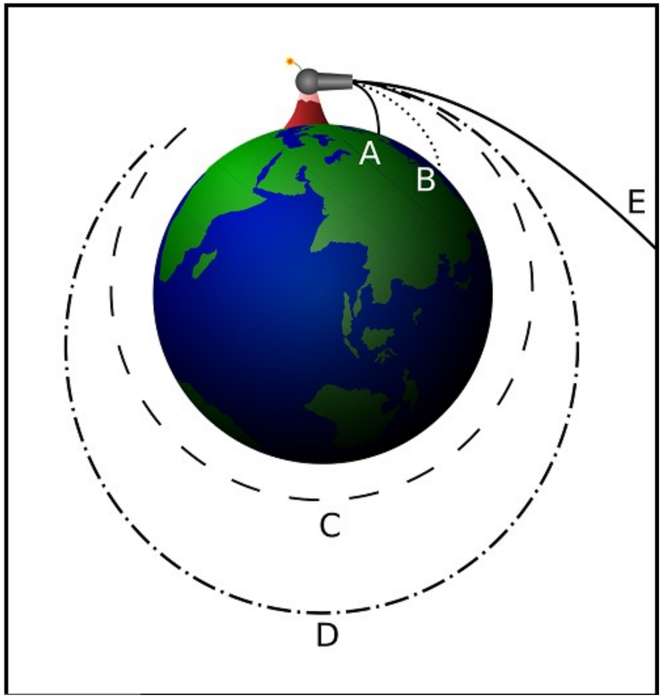
This means that it can account for both the force that causes the planets to orbit the Sun - as described by Kepler - and the downward force that causes objects to accelerate towards the Earth - as described by Galileo.

http://www.thestargarden.co.uk/Newtons-theory-of-gravity.html

Sir Isaac Newton & Gravity continued

Newton's cannonball thought experiment

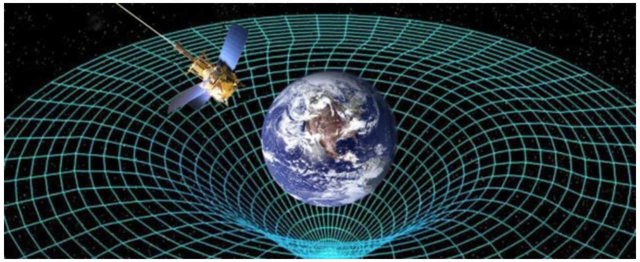
In 1728, Newton demonstrated the universality of the force of gravity with his cannonball thought-experiment. Here Newton imagined a cannon on top of a mountain. Without gravity, the cannonball should move in a straight line. If gravity is present, then its path will depend on its velocity. If it's slow, then it will fall straight down. If it reaches the orbital velocity - where the gravitational force equals the centripetal force - then it will orbit the Earth in a circle or ellipse. If it's faster than the escape velocity - when the kinetic energy is equal to the gravitational potential energy - then it will leave the Earth's orbit.



A cannonball travels further the higher its velocity. Here, a higher velocity is designated a higher letter of the alphabet. When the cannonball reaches orbital velocity (*C*), it falls continuously. It doesn't hit the ground because the surface of the Earth curves away at the same rate. At higher velocities than this (*D*), it orbits in an ellipse. When it reaches the escape velocity (*E*), it never falls and leaves the Earth's orbit.

http://www.thestargarden.co.uk/Newtons-theory-of-gravity.html

Location	Value of g (m/s^2)
Earth's surface	9.8
1000 km above surface	7.33
10,000 km above surface	1.49
50,000 km above surface	0.13



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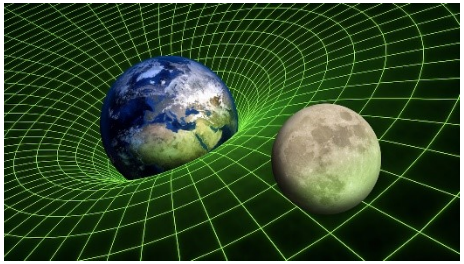
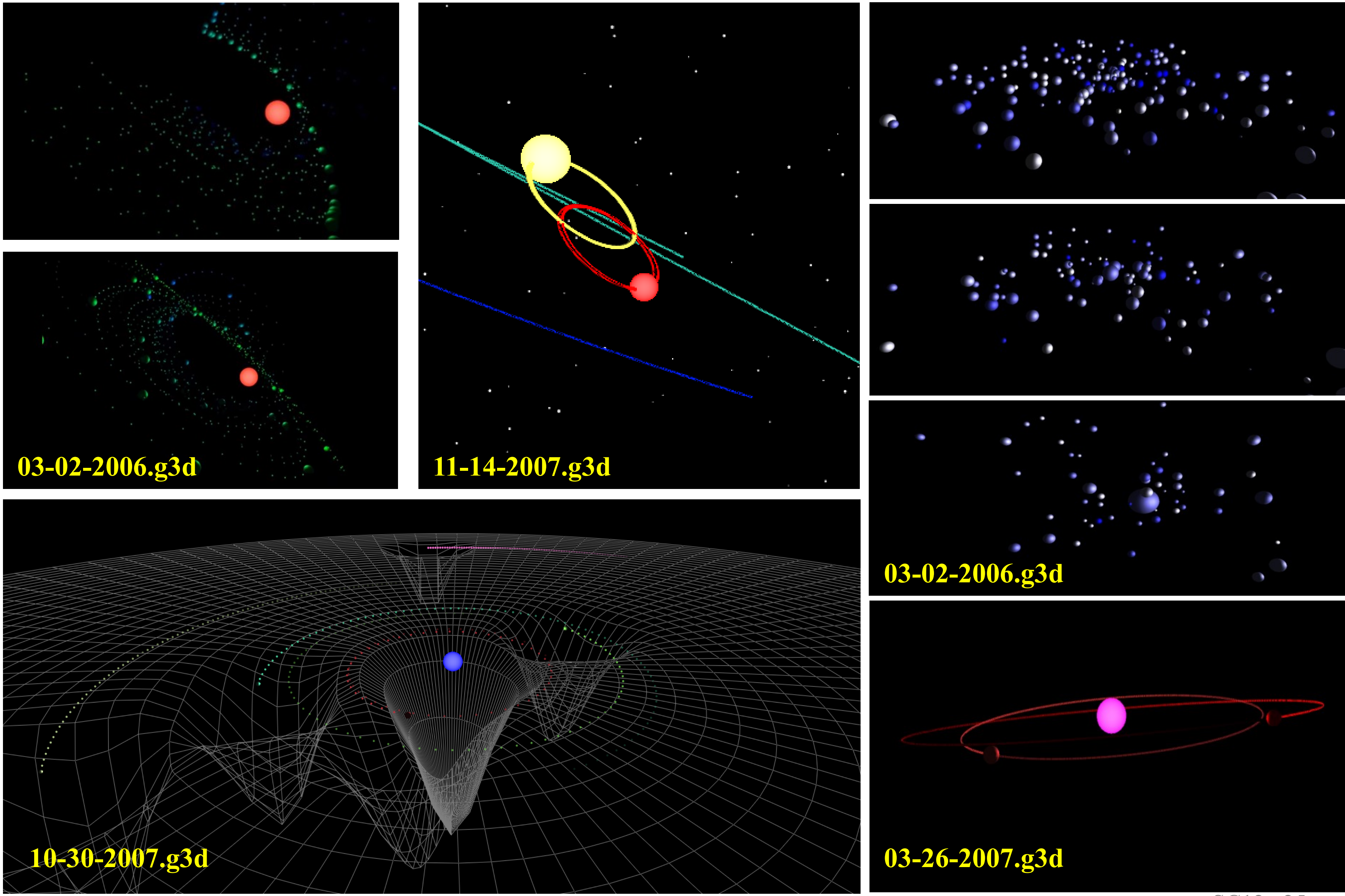
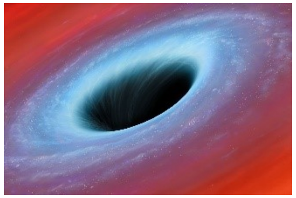


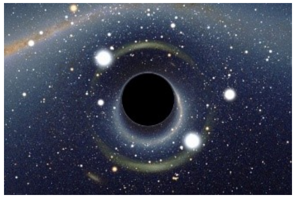
The Bigger Picture: Gravitation3D.com



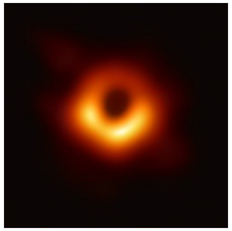
Uncle Roice’s http://www.gravitation3d.com/



Gravity in our Universe



- Why do you land on the ground when you jump up instead of floating off into space? Why do things fall down when you throw them or drop them? The answer is gravity: an invisible force that pulls objects toward each other. Earth's gravity is what keeps you on the ground and what makes things fall.
- Anything that has mass also has gravity. Objects with more mass have more gravity. Gravity also gets weaker with distance. So, the closer objects are to each other, the stronger their gravitational pull is.
- Gravity is what holds the planets in orbit around the sun and what keeps the moon in orbit around Earth. The gravitational pull of the moon pulls the seas towards it, causing the ocean tides. Gravity creates stars and planets by pulling together the material from which they are made.
- Gravity not only pulls on mass but also on light. Albert Einstein discovered this principle. If you shine a flashlight upwards, the light will grow imperceptibly redder as gravity pulls it. You can't see the change with your eyes, but scientists can measure it.
- Black Holes pack so much mass into such a small volume that their gravity is strong enough to keep anything, even light, from escaping.

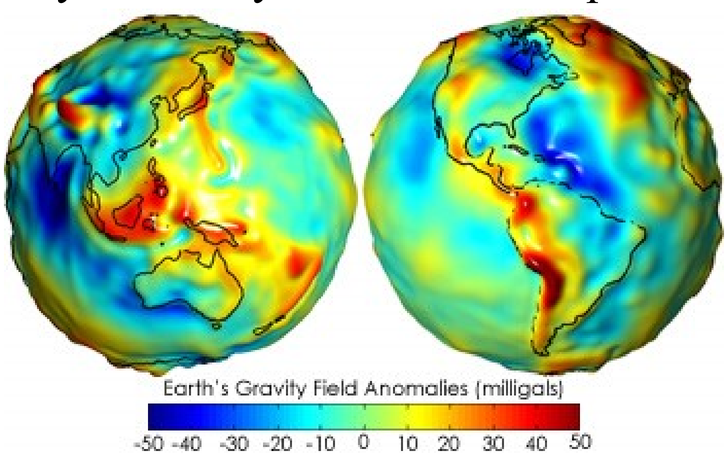


https://spaceplace.nasa.gov/what-is-gravity/en/

Gravity on Earth

Gravity is very important to us. We could not live on Earth without it. The sun's gravity keeps Earth in orbit around it, keeping us at a comfortable distance to enjoy the sun's light and warmth. It holds down our atmosphere and the air we need to breathe. Gravity is what holds our world together.

However, gravity isn't the same everywhere on Earth. Gravity is slightly stronger over places with more mass underground than over places with less mass. NASA uses two spacecraft to measure these variations in Earth's gravity. These spacecraft are part of the Gravity Recovery and Climate Experiment (GRACE) mission.



The GRACE mission helps scientists to create maps of gravity variations on Earth. Areas in blue have slightly weaker gravity and areas in red have slightly stronger gravity. Image credit: NASA/University of Texas Center for Space Research

GRACE detects tiny changes in gravity over time. These changes have revealed important details about our planet. For example, GRACE monitors changes in sea level and can detect changes in Earth's crust brought on by earthquakes.

The Big Picture: The Inca defied Gravity

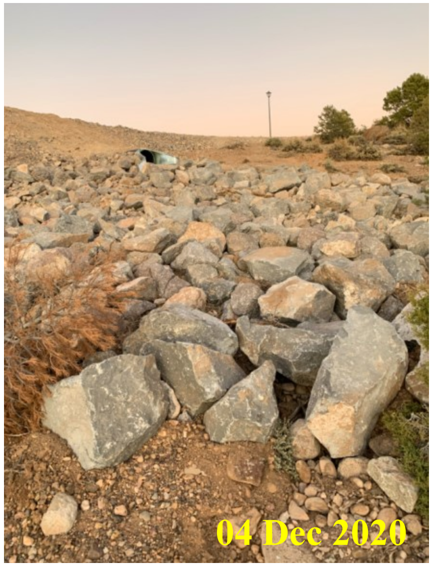
- Graham Hancock, archaeologist, regarding these Inca ruins at Cusco, Peru:
- 1 Stone is 29 feet high.
- Weighs more than 360 tons (equivalent of 500 passenger automobiles).
- The granite blocks were from a quarry 10 miles away.
- There is no known rope-and-lever system among the Inca, 500 years ago.
- One suggestion is they were built by a much older civilization than the Inca.

https://www.comeseeperutours.com/travel-information/megalithic-construction-at-sacsayhuaman-in-cusco-peru

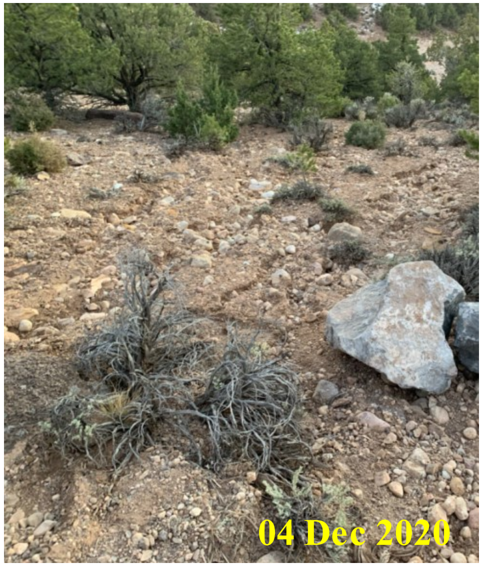
The Local Picture: Gravity Causes Erosion

Erosion is ugly.

Developers don't plan.



Initial solution poor.



Did not stop erosion.

So a Check Dam was started.

And finished.

And taken out with a scar.

The Local Picture: Gravity Causes Erosion

Erosion and the new Check Dam.

North extent new Check Dam or Water Guard.

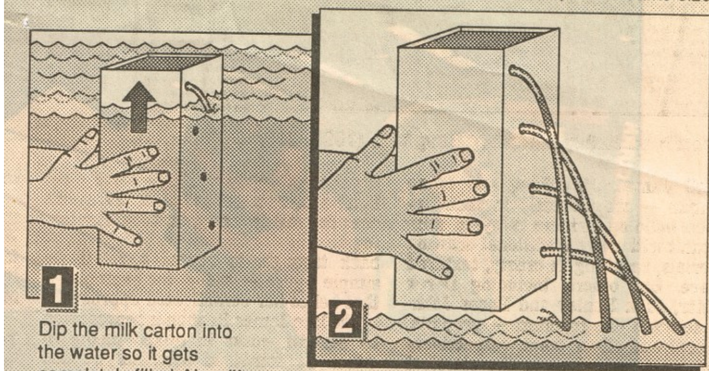
South extent new Check Dam or Water Guard, with large white rock needing to be moved.

"Give me a place to stand, and a long enough lever, and I will move the Earth." Archimedes

Try this: fountain

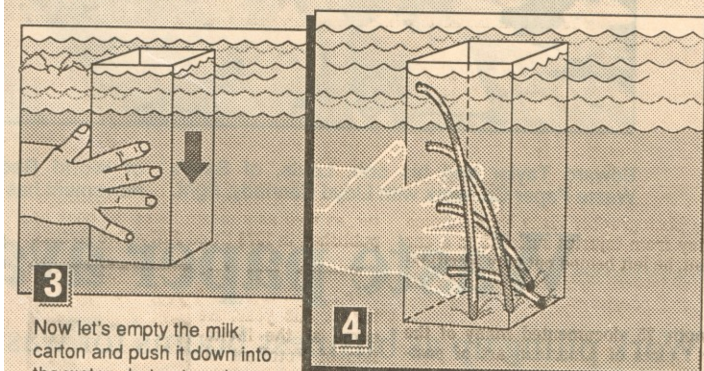
This activity clearly demonstrates water pressure and shows that the bottom of a container has more water pressure than the top, just like the base of a dam has more water pressure than the top. (That's why they make dams much thicker at the base than at the top.)

You'll need: A cardboard milk carton with four holes in the side, all the same size.



1. Dip the milk carton into the water so it gets completely filled. Now lift it out. Watch the water come out of the holes. It's just like a FOUNTAIN!

2. Do it again, but watch carefully. Which hole squirts water out the farthest?



3. Now let's empty the milk carton and push it down into the water - but not so deep that the water goes over the top. Look inside. What do you see?

4. Do it again! Watch the streams of water from each hole. Which one squirts in the farthest?

What did you see?

The bottom hole squirted water the farthest. The top hole squirted water the shortest distance. This happened no matter whether the water squirted into or out of the container.

Why did it happen?

The water at the bottom of the container pushes harder because all the water above it is pushing down. The water at the top doesn't have as much water above it, so it doesn't push as hard. When you swim in deep water, it pushes on your eardrums more than if you swim on top of the water.

Source: Rub-a-Dub-Dub Science in the Tub, Meadowbrook Press

Knight-Ridder Tribune News

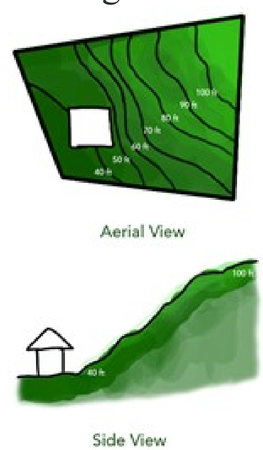
Hydrostatic Pressure, A Siphon & Gravity

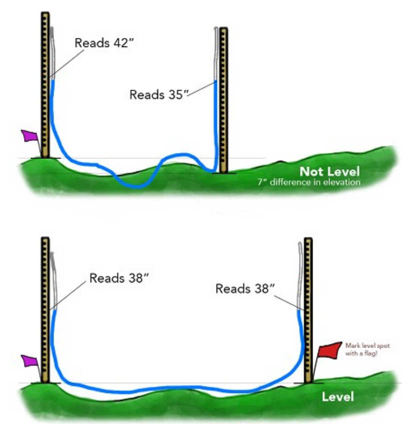
- A siphon is a way to carry water uphill without the use of pumps. It consists of a hose full of water with one end in a water source and the other end pouring out into a destination that is below the source. A combination of gravity and atmospheric pressure drives the water through the hose, even if parts of the hose take the water uphill.
- Fill one container with water and place it on the higher surface. Place the empty container on the lower surface. Put one end of the hose in the full water container.
- Fill the hose with water either by completely submerging it or by sucking water through it. Keep one end submerged and the other totally covered as you move the hose so that air doesn't get into the hose.

https://sciencing.com/siphon-water-upwards-science-experiment-8637329.html

Bunyip Water Level – to measure contours

- A contour map is a visual representation of the different drops in elevation. You can decide what increments you'd like to measure – every 3 ft, every 10 ft, etc. – as long as each line is a consistent distance apart. For example, a sloping hillside might look like this:





- A standing body of water will always work to reach a level state. With a bunyip water level, you can employ this effect on a small scale using clear plastic tubing filled with water. Each person holds onto one end of the tubing and as someone walks around the landscape, the water in the tubing will remain level. This is a quick technique for making topographical maps

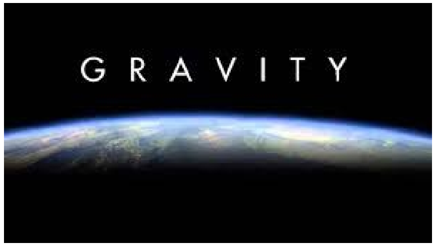
https://www.permaculturenews.org/2016/06/13/bunyip-water-level-measure-contour-lines-swales/

Whirlpools

- Liquid that spins in a circular motion forms a whirlpool. A vortex is a whirlpool with a downward draft. Whirlpools occur most frequently when water is forced through a narrow opening and then flows into a more open area. The water speed increases as it goes through the opening, creating a whirlpool downstream. Whirlpools can also occur in the ocean where water flows through narrow straits, particularly when the tide is changing. A model of a whirlpool or vortex can be created with simple items around the home.
- Remove the tops from both bottles. Fill the first bottle ¾ full of water. Add a few drops of food coloring.
- Hold the second bottle above the first with the bottle openings together. Use the duct tape to join the two bottles together securely. Tip the bottles so the water flows over the joined section to verify no water leak occurs. If water leaks out add more duct tape.

https://sciencing.com/make-whirlpool-science-project-6346142.html

Notes



Notes

2021 Science Camp

- What was best about 2021 Science Camp?
  - ______________________
  - ______________________
  - ______________________

- What would be your ideal 2022 Science Camp Theme?
  - ______________________
  - ______________________
  - ______________________

This Year's Science Camp Book is dedicated to Uncle Des, a Scientists' Scientist

IN LOVING MEMORY OF

DESMOND NOEL PENNY

Dec 4 1950 — *June 11 2021*

June 19 2021

Community Presbyterian Church
2279 North Wedgewood Lane
Cedar City, Utah 84721

REMEMBERING
DESMOND NOEL MARY DOMINICK PENNY
DECEMBER 4, 1950 – JUNE 11, 2021

Gathering Music and Service Accompaniment .... Elaine Vickers, pianist

Welcome & Opening Prayer .... Pastor Nancy Pearson

Congregational Hymn .... "How Great Thou Art"

Old Testament Reading: Psalm 23 .... Paul Nelson

Obituary Reading .... Bridget Lee

Musical Number "Wayfaring Stranger" .... Jim Howells and David Bolsover

Sharing Memories of Des .... Tyrell Wood
Brooke MacNaughtan
Carol Bolsover
Laura Cotts

Remembering Des in Pictures.."Dreaming of No(w)here" written and recorded by Brian Penny
"Never Doubt My Love" written and recorded by Des Penny

Poem Recitation: "A Summer Day" .... Paul Raftery
Written by Mary Oliver with addition by Dennis McCarty

Musical Number: "Danny Boy" .... Justin Lee, vocalist

Meditation & Prayer
The Lord's Prayer
Our Father who art in heaven, hallowed be thy name
Thy kingdom come, thy will be done,
On earth as it is in heaven.
Give us this day our daily bread,
And forgive us our debts as we forgive our debtors.
And lead us not into temptation but deliver us from evil.
For thine is the kingdom and the power and the glory forever, Amen.

Poem Recitation: "Stand Not By My Grave and Weep" .... Brian Penny

Congregational Hymn .... "Abide with Me"

Closing Remarks .... Pastor Nancy Pearson

Blessing & Benediction

Please join Des's family and friends outside following the service. Thank you to the Community Presbyterian Church for hosting this service, to Andrea Nelson and friends for hosting a family luncheon, and for all of your support and love. If you would like to make a donation in Des's honor, contributions can be made to the SUU Engineering Sciences Scholarship. Donation link can be found: www.suu.edu/advancement/giving.html.