

*Energy*



Physical Science

# Nature of Energy



Energy is all around you.

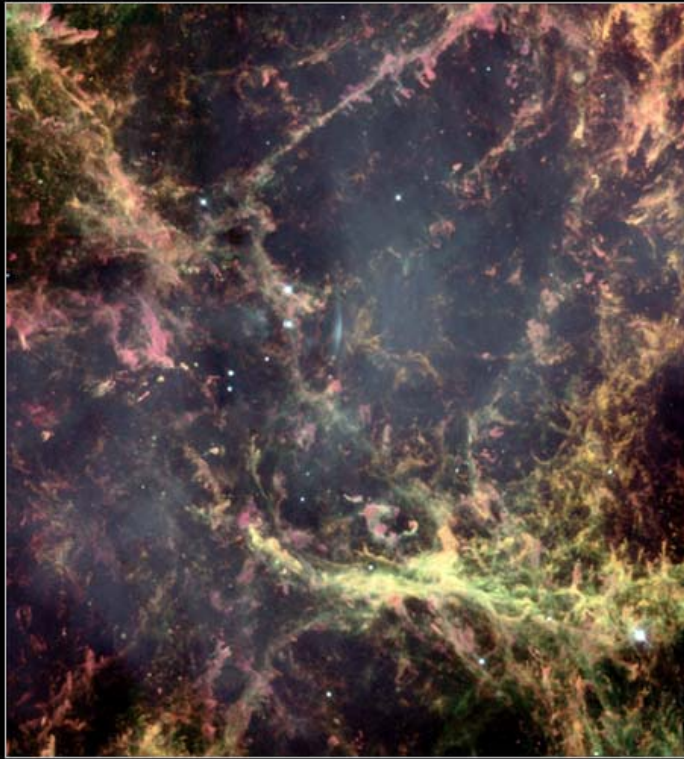
- You hear energy as sound, you see energy as light, you can feel energy in wind.
- Living organisms need energy for growth and movement.
- You use energy when you hit a tennis ball, compress a spring, or lift a grocery bag.
- Energy is the ability to do work.





# Energy

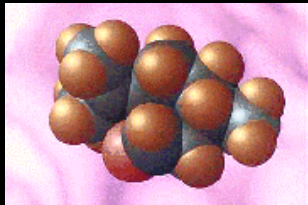
Crab Nebula



Hubble  
Heritage

- The energy released by a supernova is capable of destroying a nearby solar system in just a few hours. A supernova is one of the greatest concentrations of energy in the universe.

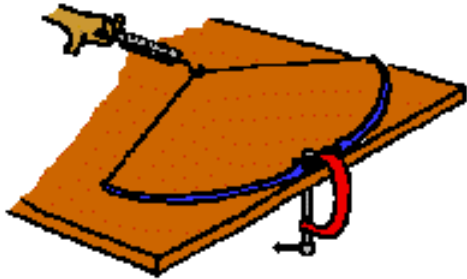
# Forms of Energy



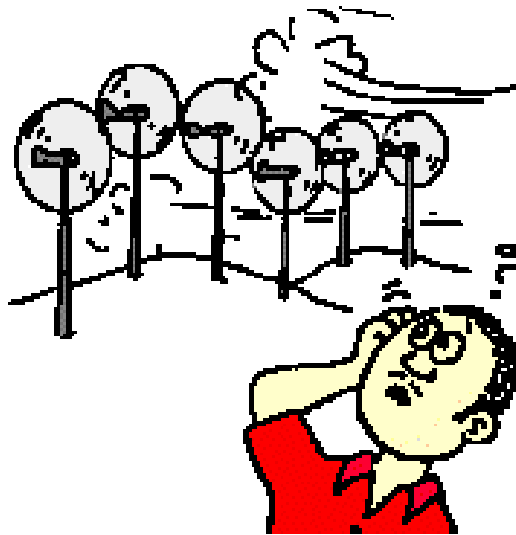
- Energy appears in many forms. There are five main forms of energy.
- Mechanical
- Heat
- Chemical
- Electromagnetic
- Nuclear



# Mechanical Energy



A drawn bow possesses mechanical energy in the form of elastic potential energy.



The kinetic energy of high speed winds contributes to its ability to do work.



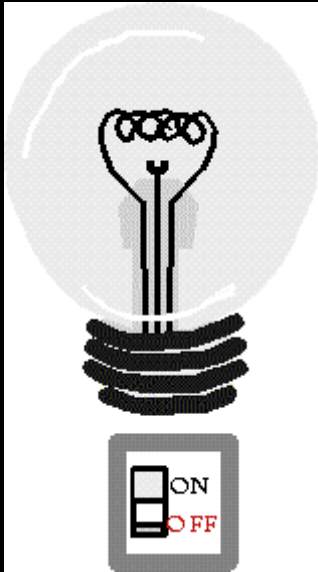
A weightlifter applies a force to cause a barbell to be displaced. The barbell then possesses mechanical energy - all in the form of potential energy.

Energy of motion.

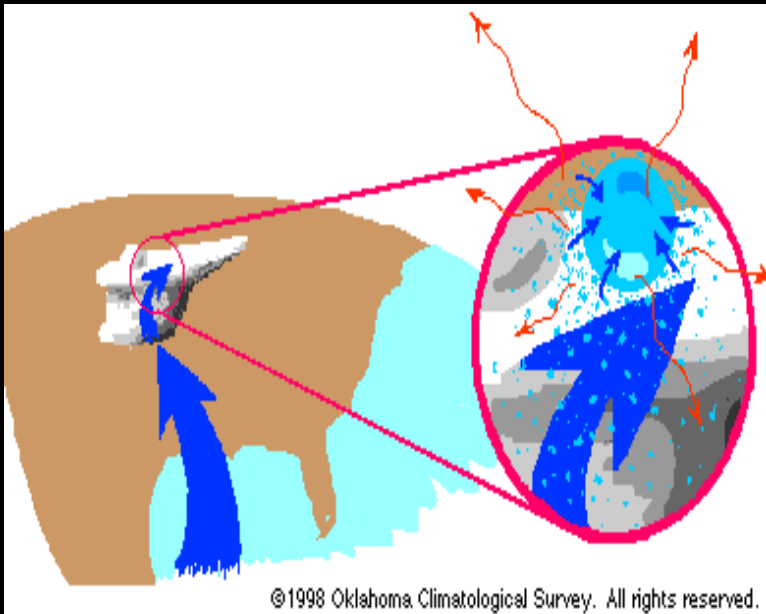
Examples:

- Water in a waterfall
- Wind
- Moving vehicles
- Sound
- Blood traveling through your body

# Heat Energy



- The internal motion of atoms.
- The faster the molecules move, the more heat energy is produced.



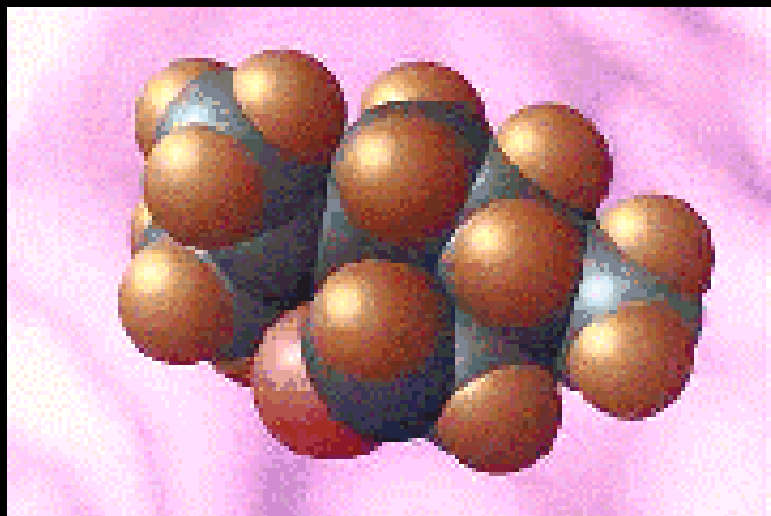
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Examples:

Friction

Changes in state of matter

# Chemical Energy



- Energy that exists in the bonds that hold atoms together.
- When bonds are broken, chemical energy is released.

## Examples:

- Digesting food...bonds are broken to release energy for your body to store and use.
- Sports... your body uses energy stored in your muscles obtained from food.
- Fire-a chemical change.



Sodium metal reacts with water.

# Electromagnetic Energy



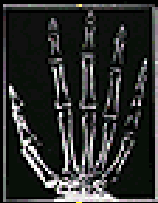
Moving electric charges.

Examples:

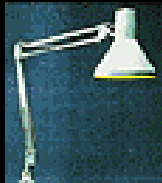
- Power lines carry electricity
- Electric motors are driven by electromagnetic energy
- Light is this form of energy (X-rays, radio waves, laser light etc.)



Gamma-ray



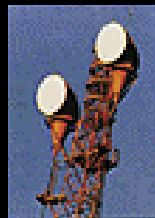
X-ray



Visible



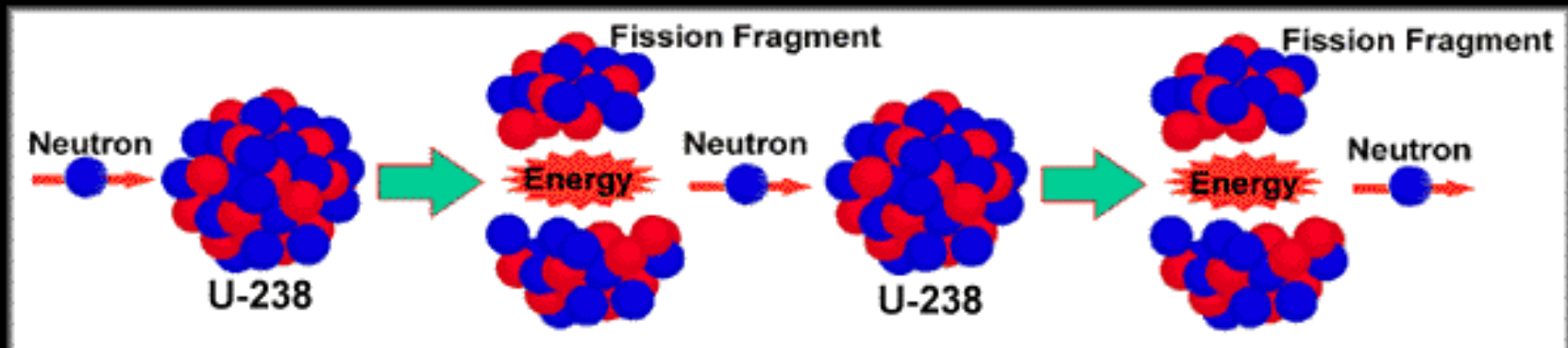
IR



Radio

# Nuclear Energy

- When the nucleus of an atom splits, nuclear energy is released.
- Nuclear energy is the most concentrated form of energy.
- Fission/fusion

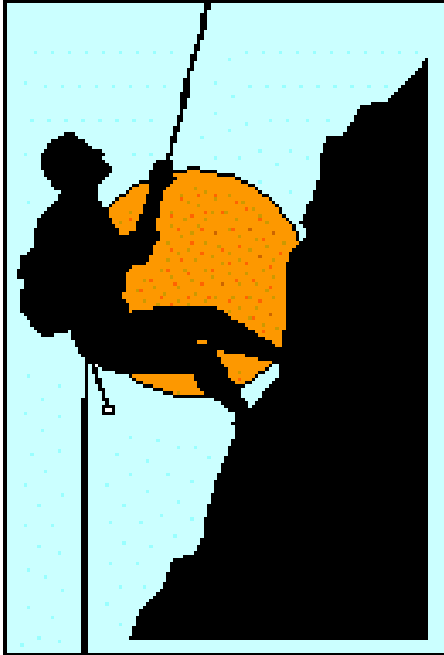


# Questions



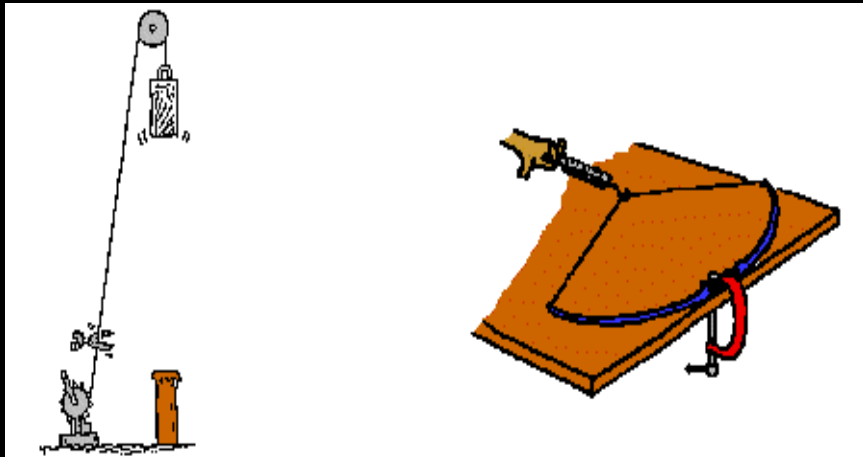
- What is energy?
- Can energy be transferred from one object to another?
- What are the different forms of energy?

# *States of Energy*



There are two states  
of energy:  
Potential and Kinetic

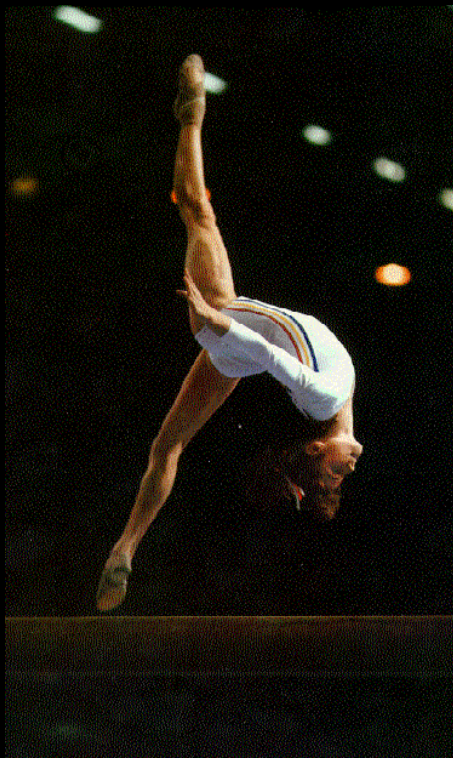
# Potential Energy



The heavy ram of a pile driver and the stretched bow possess stored energy of position - potential energy.

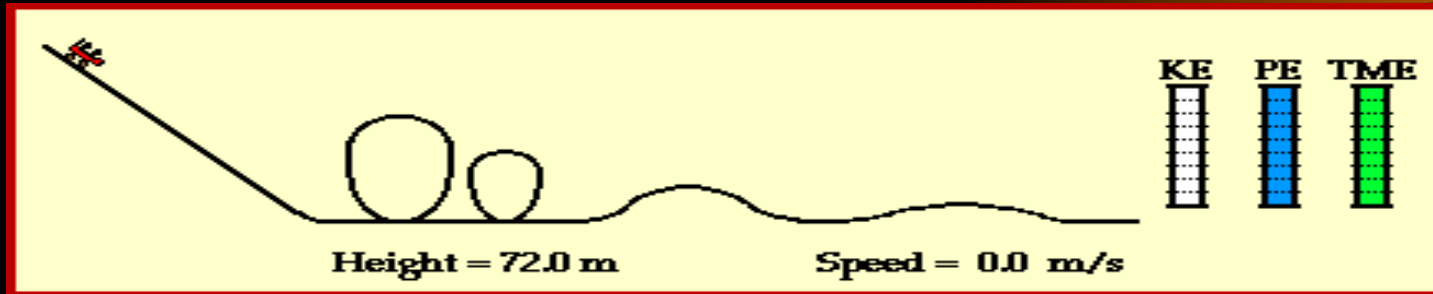
- Stored energy - energy of position.
- Not always mechanical energy - can be other forms.
- Gravitational Potential energy - dependent on height and weight.
- $GPE = Weight \times Height$
- Units - Newton\*meter

# Kinetic Energy



- The energy of motion.
- The faster the object moves - the more kinetic energy.
- Kinetic energy depends on both mass and velocity.
- $KE = \frac{1}{2}(\text{mass} \times \text{velocity}^2)$
- $\text{Kg m}^2/\text{s}^2 = \text{Newton} * \text{meter} = \text{Joules}$

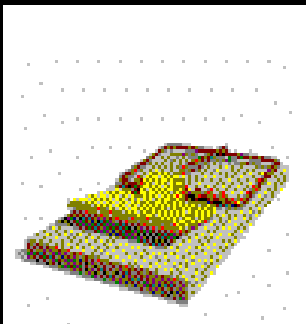
# Energy Conversions



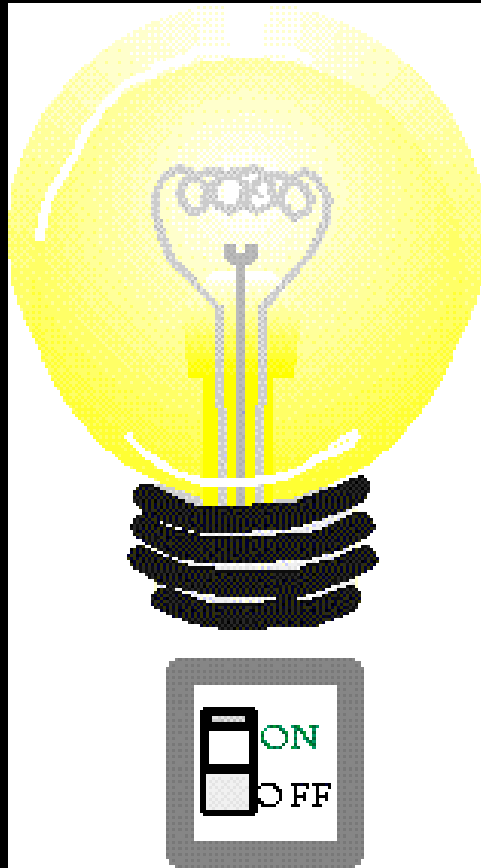
- The most common energy conversion involves the changing of potential energy into kinetic energy or vice-versa.

Examples:

Ball thrown in the air  
Roller coaster



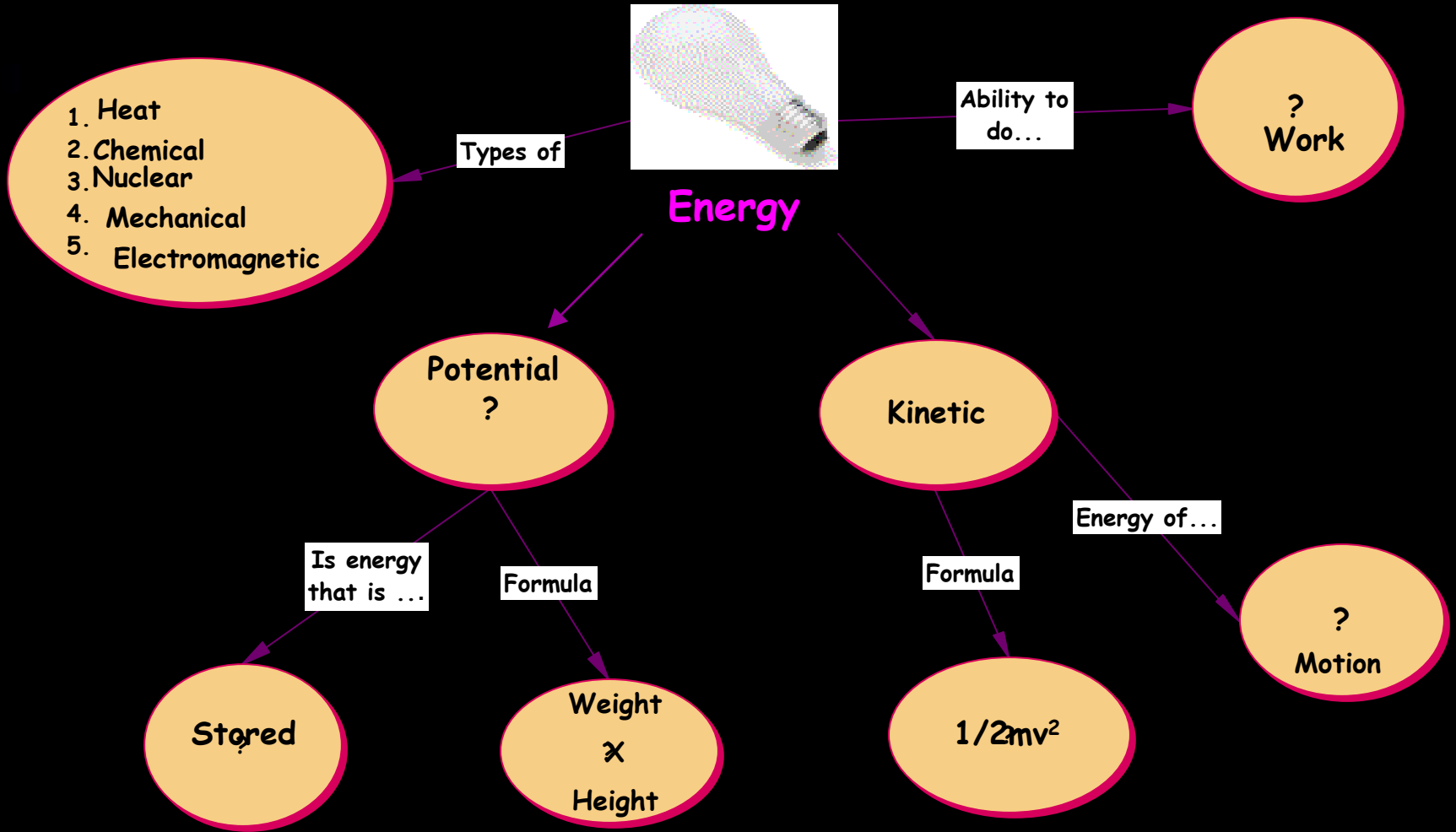
# More Conversions



- All forms of energy can be converted to other forms.
- Law of Conservation of Energy: Energy cannot be created or destroyed.
- Einstein - If matter is destroyed, energy is created, if energy is destroyed, matter is created. The total amount of mass and energy is conserved.

Electromagnetic energy comes in...produces light then, converted to heat..

# Concept Review



# Writing Assignment

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- Identify the various energy conversions involved in the following events:
- An object is raised and then allowed to fall. As it hits the ground it stops, produces a sound and becomes warmer.
- Due tomorrow at the beginning of class.

# Resources

Roller coaster Animation:

<http://www.glenbrook.k12.il.us/gbssci/phys/mmedia/energy/ce.html>

Mouse Trap animation

<http://communities.msn.com/VickisClipArtandAnimationStorage/mimichar.msnw?action=ShowPhoto&PhotoID=4571>

Chevy animation

<http://communities.msn.com/VickisClipArtandAnimationStorage/angelfirepics.msnw?action=ShowPhoto&PhotoID=4601>

Pics

<http://www.glenbrook.k12.il.us/gbssci/phys/Class/energy/u511e.html>

<http://www.glenbrook.k12.il.us/gbssci/phys/Class/energy/u511b.html>

<http://www.glenbrook.k12.il.us/gbssci/phys/Class/energy/u511d.html>

<http://library.thinkquest.org/20331/types/>

<http://library.thinkquest.org/20331/history/timeline1600.html>

<http://library.thinkquest.org/20331/history/timeline1900.html>

<http://library.thinkquest.org/2745/data/loops.htm>

[http://www.sunybroome.edu/~eet\\_dept/POWERPIX.html](http://www.sunybroome.edu/~eet_dept/POWERPIX.html)

<http://www.st-agnes.org/~lstinson/webpages/kinpot.htm>

<http://www.rz.uni-frankfurt.de/~schauder/>

<http://radar.metr.ou.edu/OK1/meteorology/HeatTransfer.html>

[http://hrast.pef.uni-lj.si/docs/en/web-based\\_education/infodist/tutorial/simulate/off.htm](http://hrast.pef.uni-lj.si/docs/en/web-based_education/infodist/tutorial/simulate/off.htm)

<http://heritage.stsci.edu/2000/15/index.html>

<http://csep10.phys.utk.edu/guidry/violence/remnants-save.html>

Text

*Exploring Physical Science*, Prentice Hall, chapter 16.