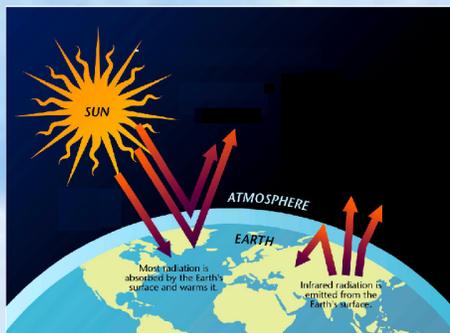
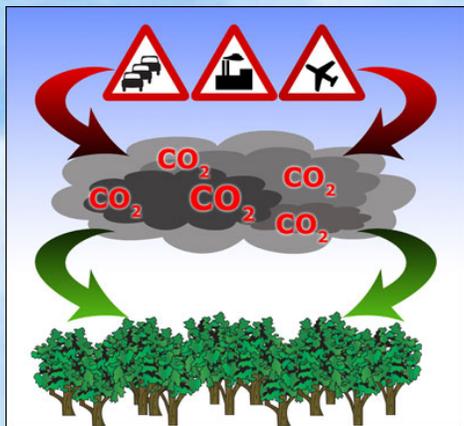




Energy, CO₂,

Climate, and YOU!

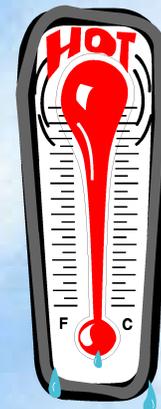
Stephen E. Schwartz



BROOKHAVEN
NATIONAL LABORATORY

summer  sundays

www.ecd.bnl.gov/steve

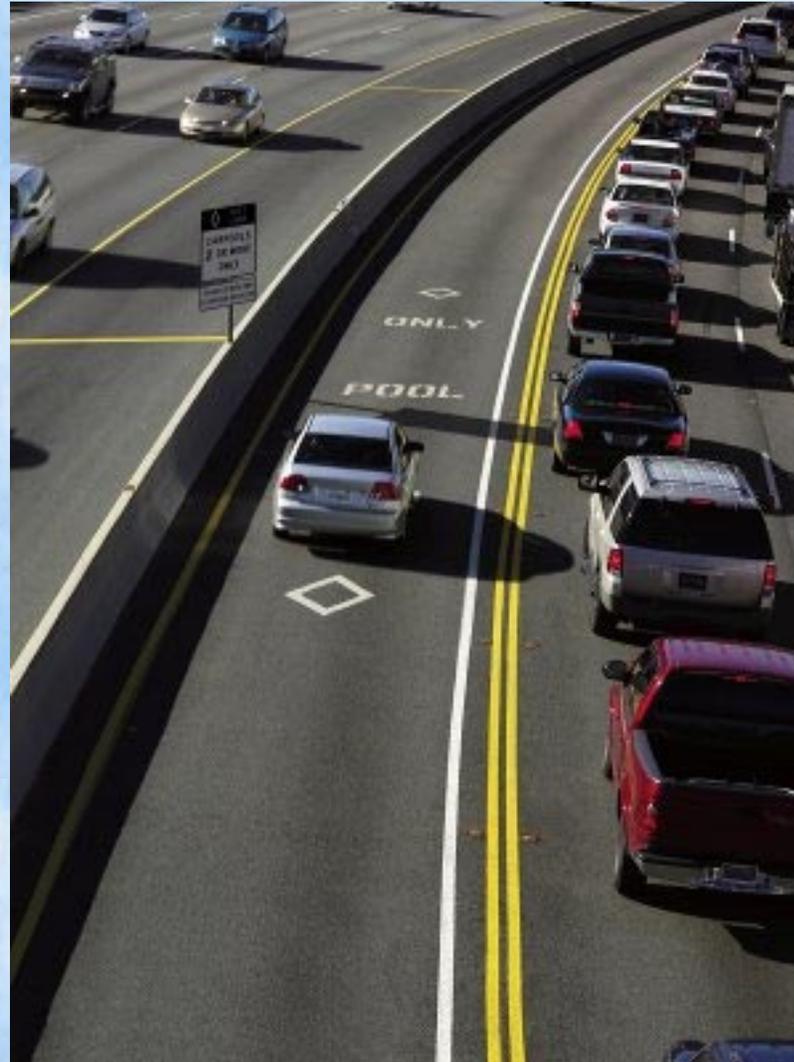


THE MOST EFFECTIVE WAY TO
DOUBLE THE FUEL ECONOMY
OF A CAR . . .

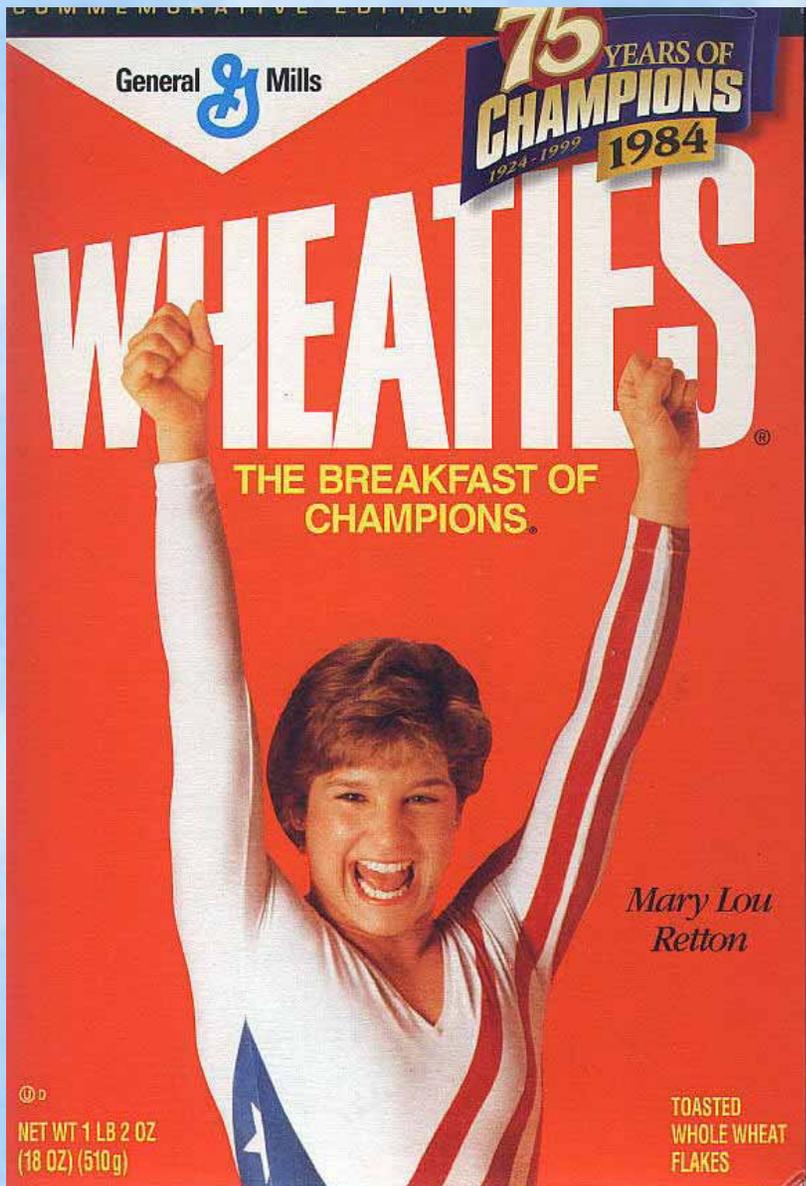
***IS TO PUT TWO
PEOPLE IN IT!***



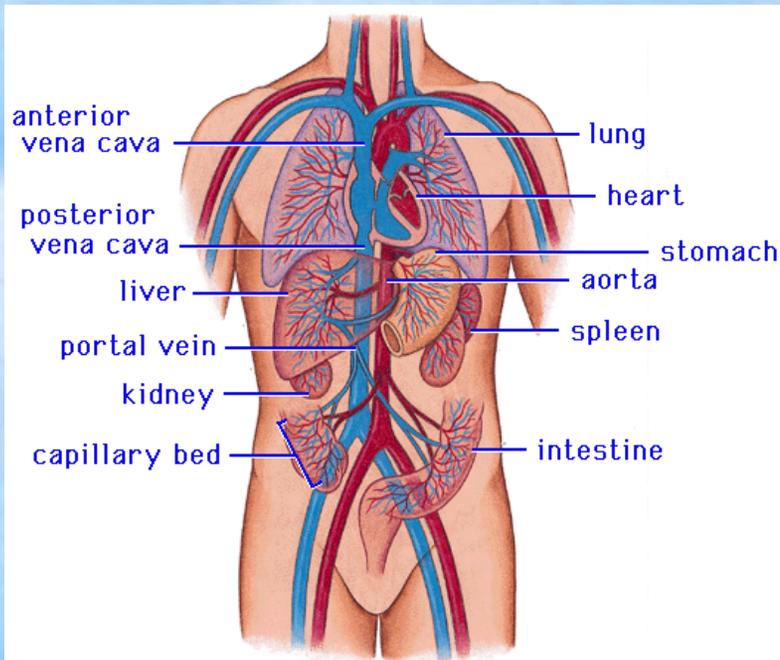
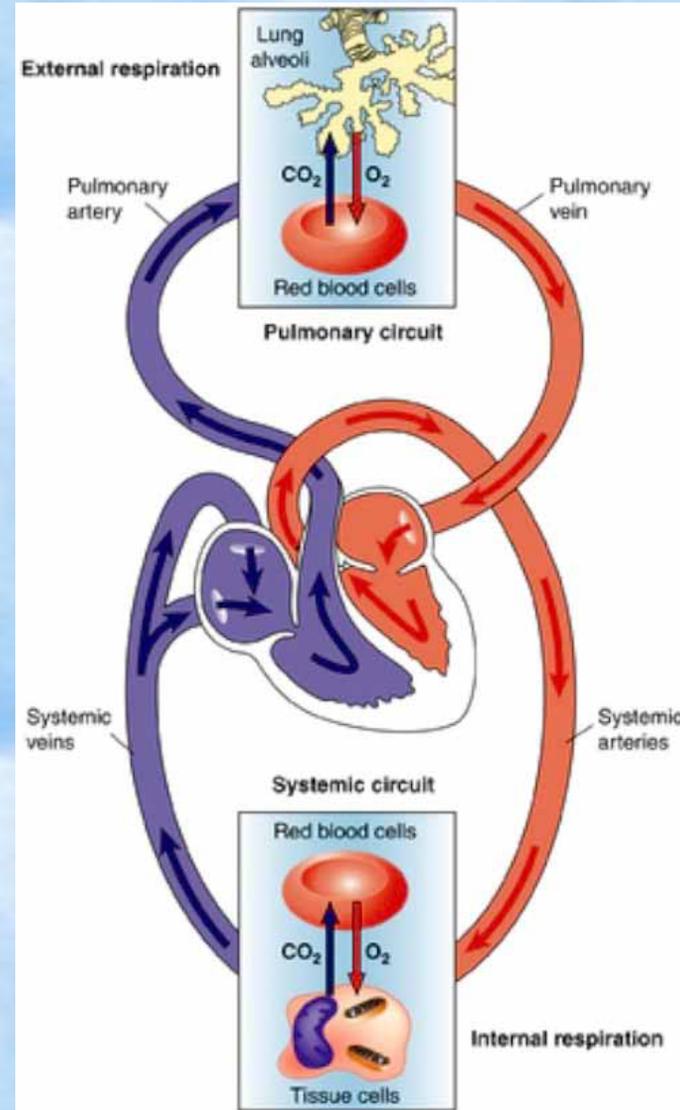
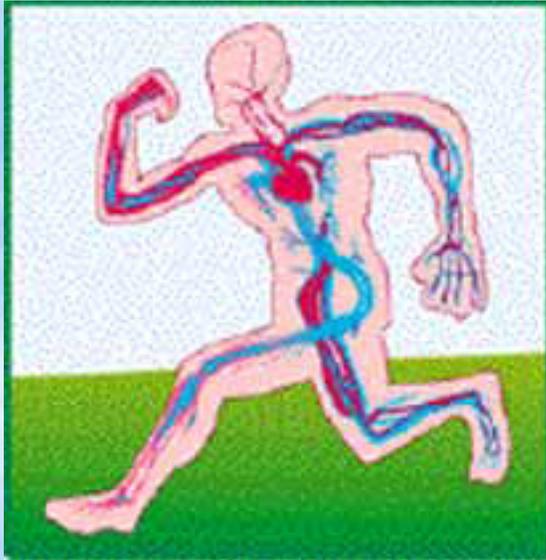
CARPOOLING CAN SAVE MORE THAN GAS



WHERE DO YOU GET YOUR ENERGY?



HOW DO ENERGY AND OXYGEN GET TO YOUR MUSCLES?



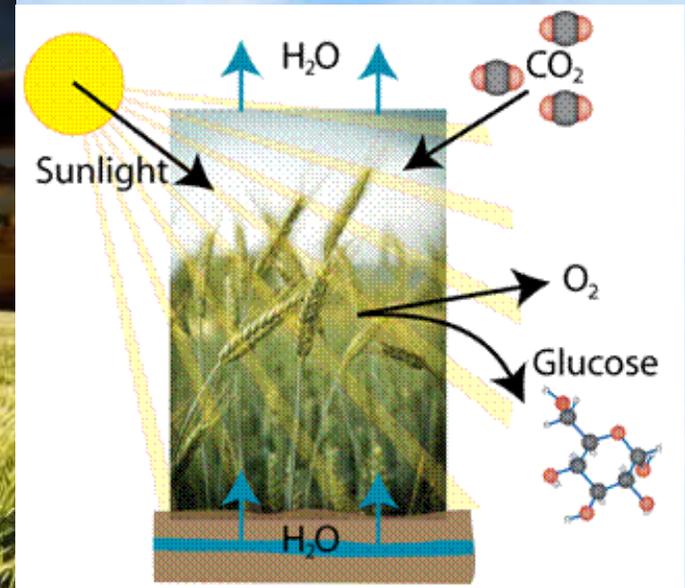
<http://www.prevent-stroke-and-heart-attack.com>

<http://library.thinkquest.org/5777/cir1.htm>

<http://newstt.com/how-is-circulatory-system-and-the-digestive-system-related/>

WHERE DOES YOUR FOOD
GET *ITS* ENERGY?

WHERE DOES YOUR FOOD GET ITS ENERGY?



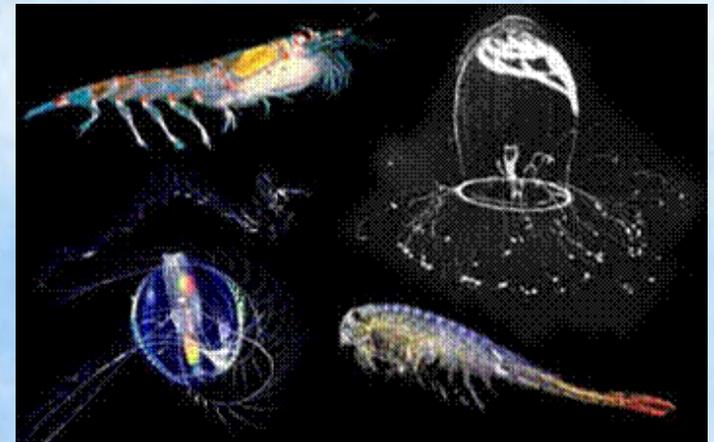
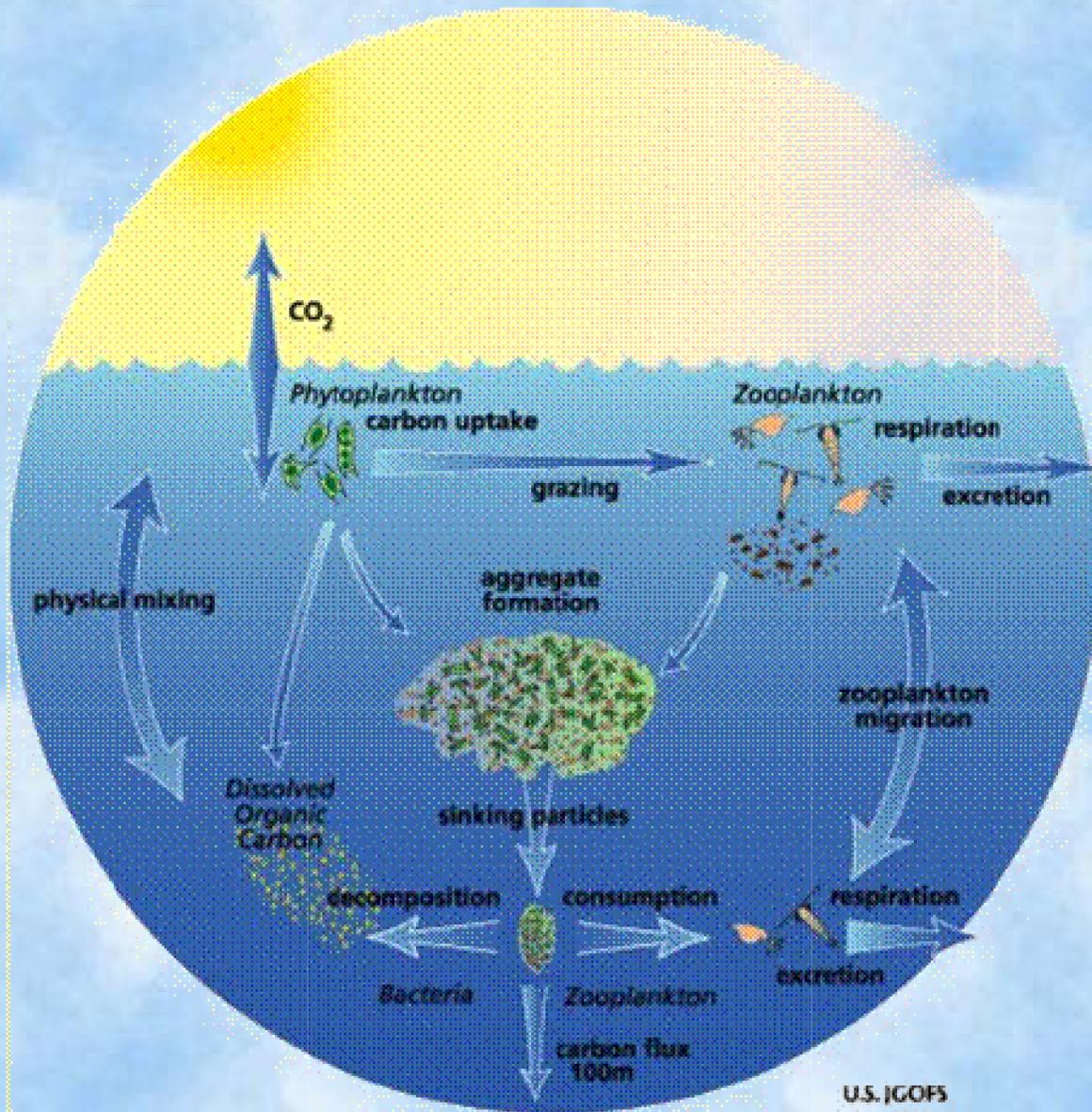
www.ems.psu.edu/~pisupati/ACSOutreach/Petroleum_1.html

www.desktopwallpaperhd.com

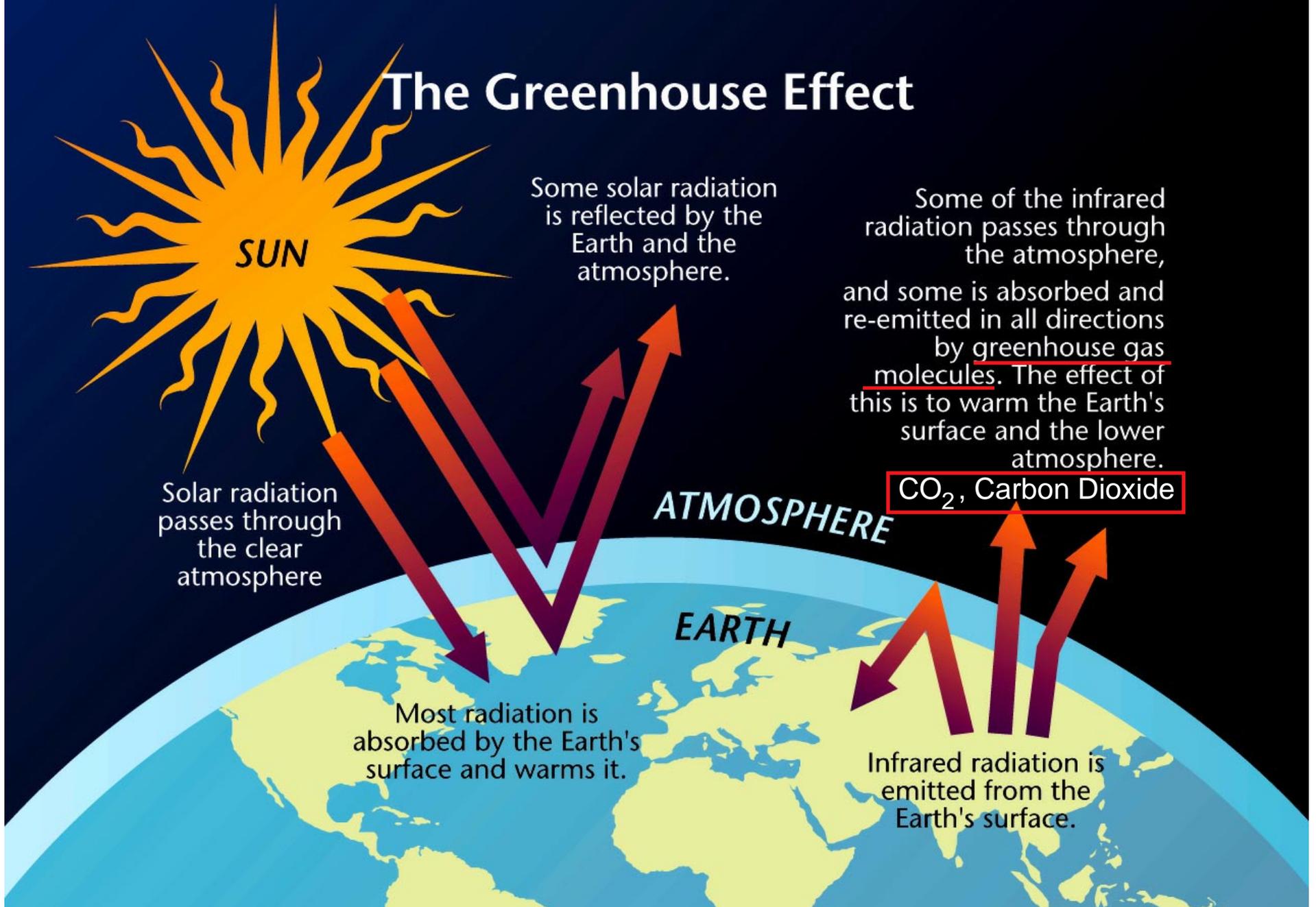
WHERE DOES YOUR CAR GET ITS ENERGY?



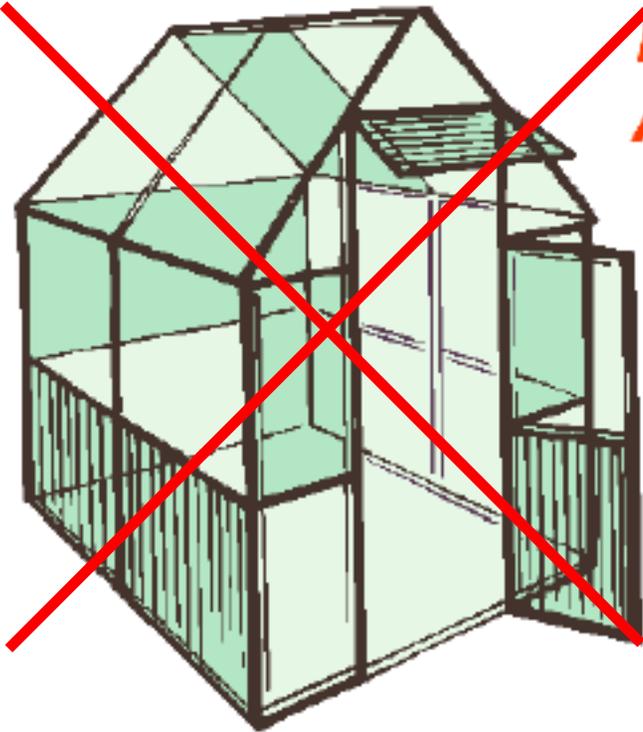
WHERE DOES GASOLINE GET ITS ENERGY?



The Greenhouse Effect



THE GREENHOUSE EFFECT



EARTH'S ENERGY BUDGET: A DELICATE BALANCE

- Sunlight heats the Earth.
- The warm Earth radiates energy (in the form of infrared radiation, or heat) back out to space.
- Some of this infrared radiation is trapped in the atmosphere, giving Earth its temperate climate.

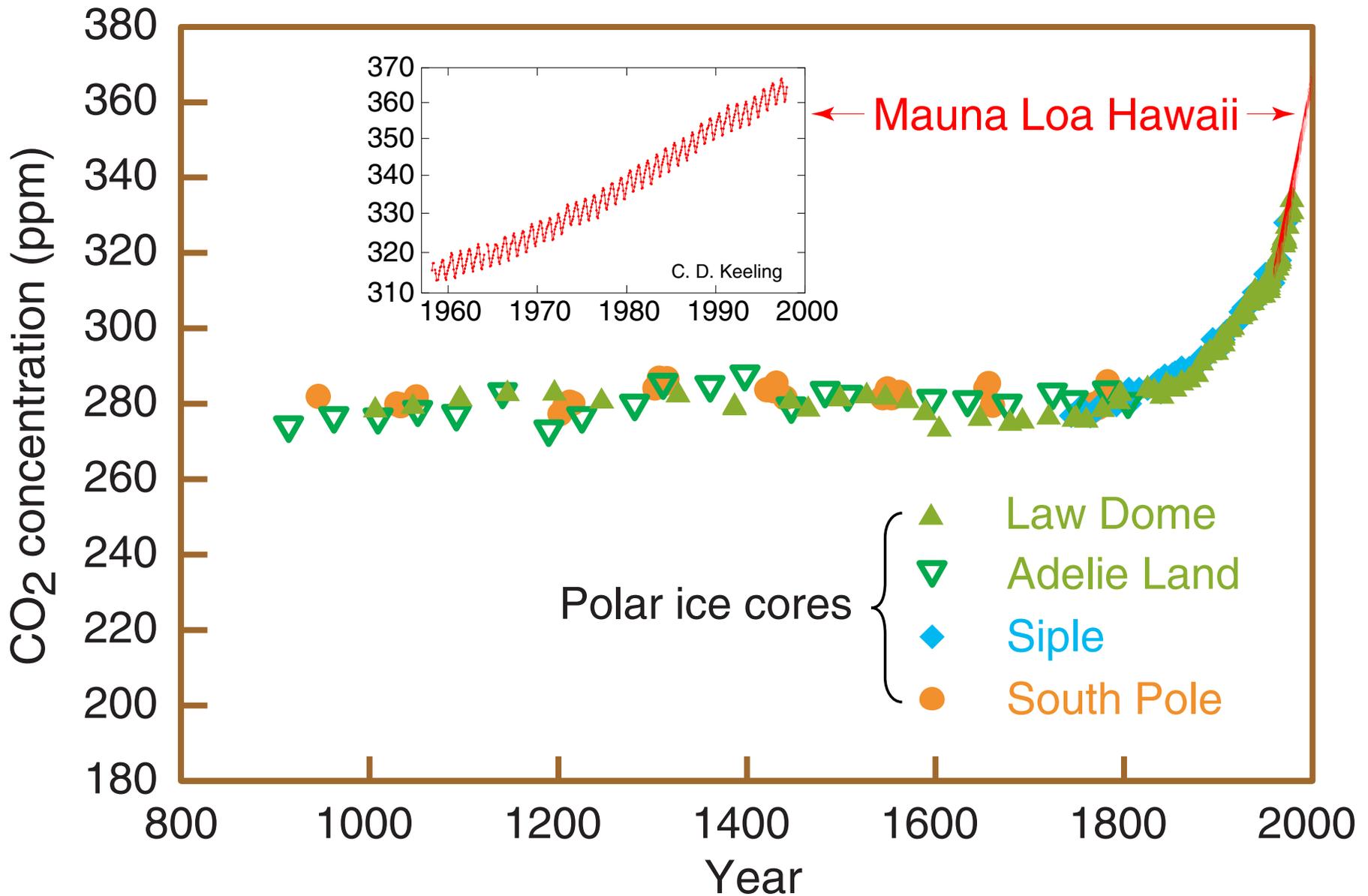
This is the greenhouse effect.

Global average temperature 15°C or 59°F

Without it, the Earth's climate would be like the moon's, harsh and severe.

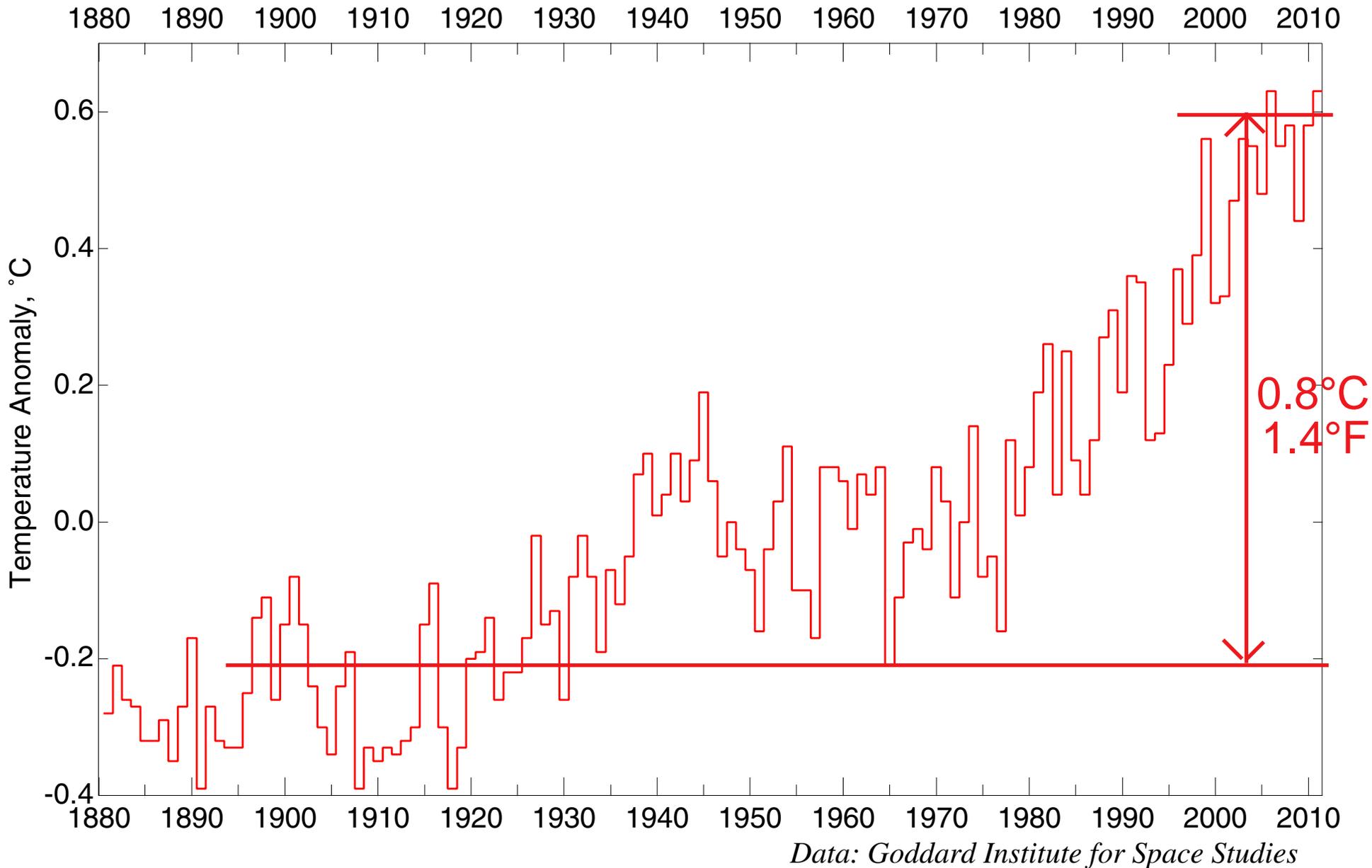
Global average temperature -19°C or -2 °F

ATMOSPHERIC CARBON DIOXIDE IS INCREASING



Global carbon dioxide concentration over the last thousand years

GLOBAL ANNUAL TEMPERATURE ANOMALY, 1880-2010



PASTERZE GLACIER, AUSTRIA 1875 - 2004



About 2 km shorter.

Terminus replaced by artificial lake.

Decrease in length about 15 meters per year.

In 2003, decrease was 30 m in length and 6.5 m in thickness.

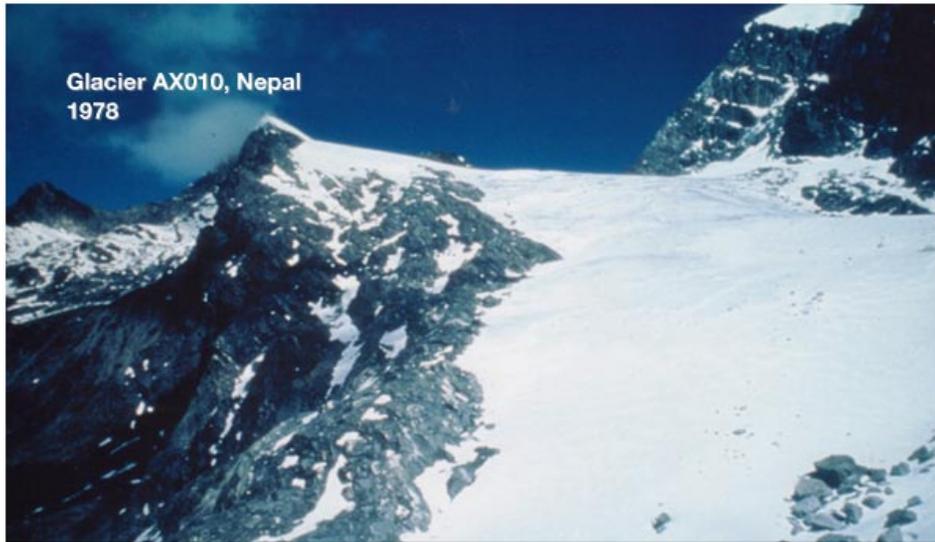
<http://www.worldviewofglobalwarming.org/pages/glaciers.html>

GRINNELL GLACIER GLACIER NATIONAL PARK 1911 - 2000



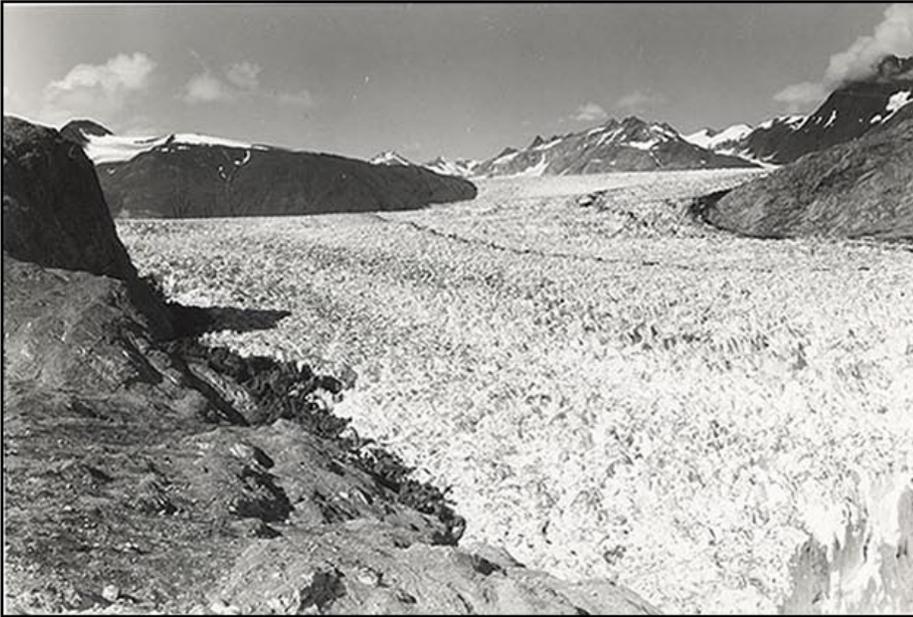
<http://www.worldviewofglobalwarming.org/pages/glaciers.html>

GLACIER AX010, NEPAL, 1978-2004



<http://snowman.ihis.nagoya-u.ac.jp/download/photo/AX010.html>

MUIR GLACIER - MUIR INLET GLACIER BAY NATIONAL PARK, ALASKA 1941 vs. 2004



Muir Glacier, William O. Field on 13 August 1941 and by Bruce F. Molnia on 31 August 2004

UPSALA GLACIER, ANDES, ARGENTINA

1928



2004



RHONE GLACIER, VALAIS, SWITZERLAND 1859 - 2001



Glacial retreat is 2.5 km.

Base is 450 meters higher.

<http://www.worldviewofglobalwarming.org/pages/glaciers.html>

ARIZONA FIRES

Sierra Vista, Arizona, June, 2011



Third largest fire in Arizona history.

ARIZONA FIRES

Monument Fire, Arizona, June, 2011



MISSISSIPPI RIVER FLOOD

Vicksburg, Mississippi, May, 2011



Second highest flood on record; highest since 1937.

MISSISSIPPI RIVER FLOOD

Morehouse, Missouri, May, 2011



FLOODS IN NORTH DAKOTA

Souris River, Minot North Dakota, June 27, 2011



The river surpassed its 1881 record level of 1,558 feet above sea level, and flooded an estimated 4,000 homes in the city.

TORNADO IN MISSOURI

Joplin, Missouri, May, 2011



Devastating EF5 multiple-vortex tornado that struck Joplin, Missouri, late in the afternoon of Sunday, May 22, 2011.

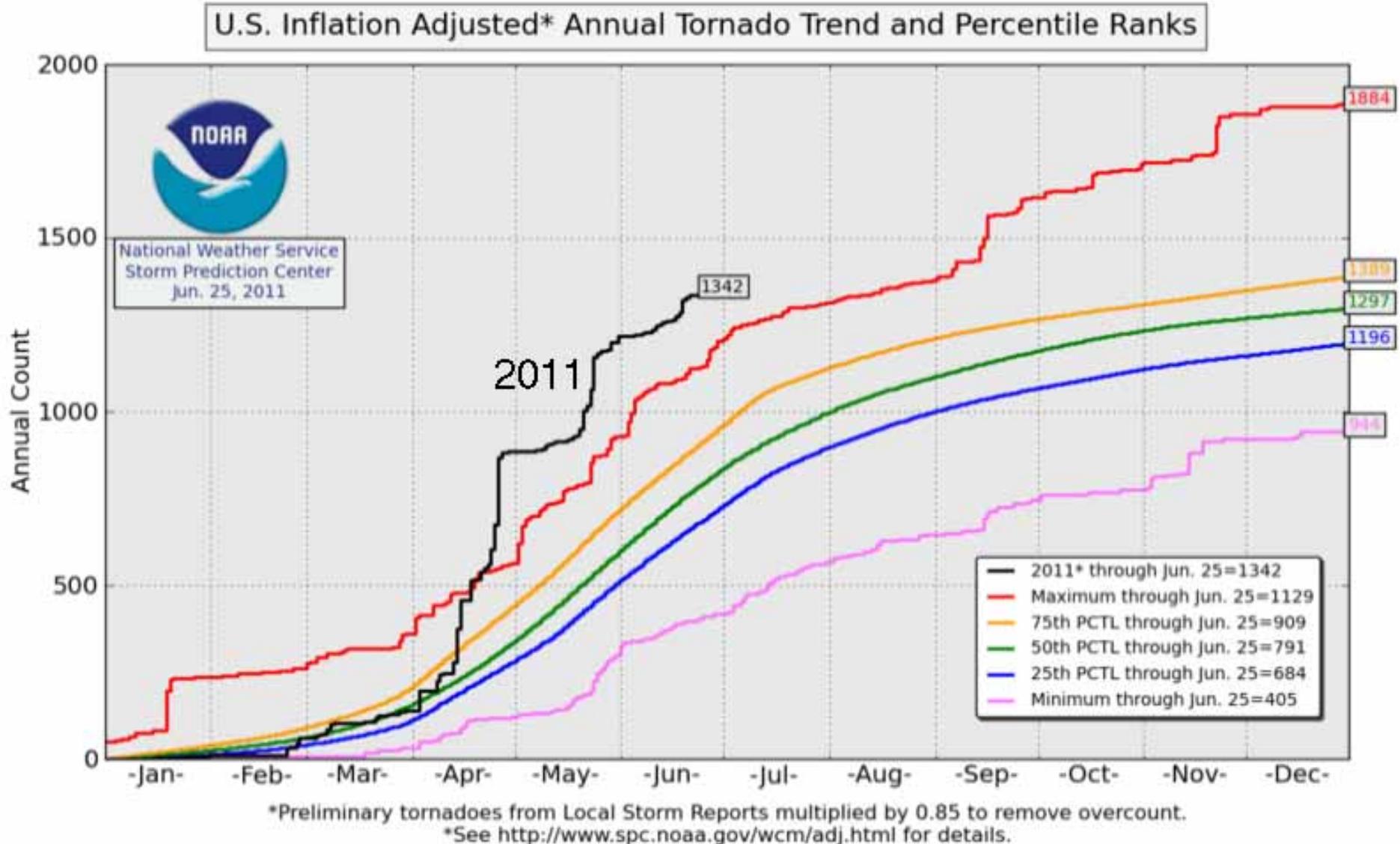
TORNADO IN MASSACHUSETTS

Springfield, Massachusetts, June, 2011



Seven tornadoes from Connecticut to Maine in rare New England outbreak.

UNITED STATES TORNADO COUNT



1,140 confirmed tornadoes reported in the US in 2011 as of June 23, 2008.
537 U. S. deaths, compared to 564 in the 10 years prior.

***WHERE IS ALL
THIS CO₂
COMING FROM?***

***WHO IS
RESPONSIBLE?***



HOW MUCH CARBON IS IN A GALLON OF GASOLINE?



1 lb?

2 lbs?

3 lbs!?



5 lbs!?!?



All of this carbon goes into the atmosphere as carbon dioxide when you burn the gasoline in your car.



***WHERE IS THIS CARBON DIOXIDE COMING FROM?
WE ARE ALL RESPONSIBLE.***



Burning a gallon of gasoline in your car puts 5 pounds of carbon in the atmosphere as carbon dioxide (CO₂), and it will stay there for decades — maybe a century!

Other sources are home heating and electric power production.



Global Atmosphere, Global Warming

QUESTIONS ABOUT GLOBAL WARMING

- IS IT REAL?
- IS IT IMPORTANT?
- WHAT IS IT DUE TO?
- HOW MUCH MORE CAN WE EXPECT?
- ARE WE SEEING JUST THE TIP OF THE ICEBERG?



***RESEARCH IS HELPING
TO ANSWER THESE QUESTIONS.***

www.ecd.bnl.gov/steve

THANK YOU

summer  sundays

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