# CLIMATE CHANGE, GREEN NEW DEAL & OUR DOMESTIC ENERGY FUTURE

Ken Morgan, Ph.D
Texas Natural Gas Foundation, Inc
WWW.TXNG.ORG
k.morgan21@outlook.com
817-845-5451

# Let's Look At Climate Change



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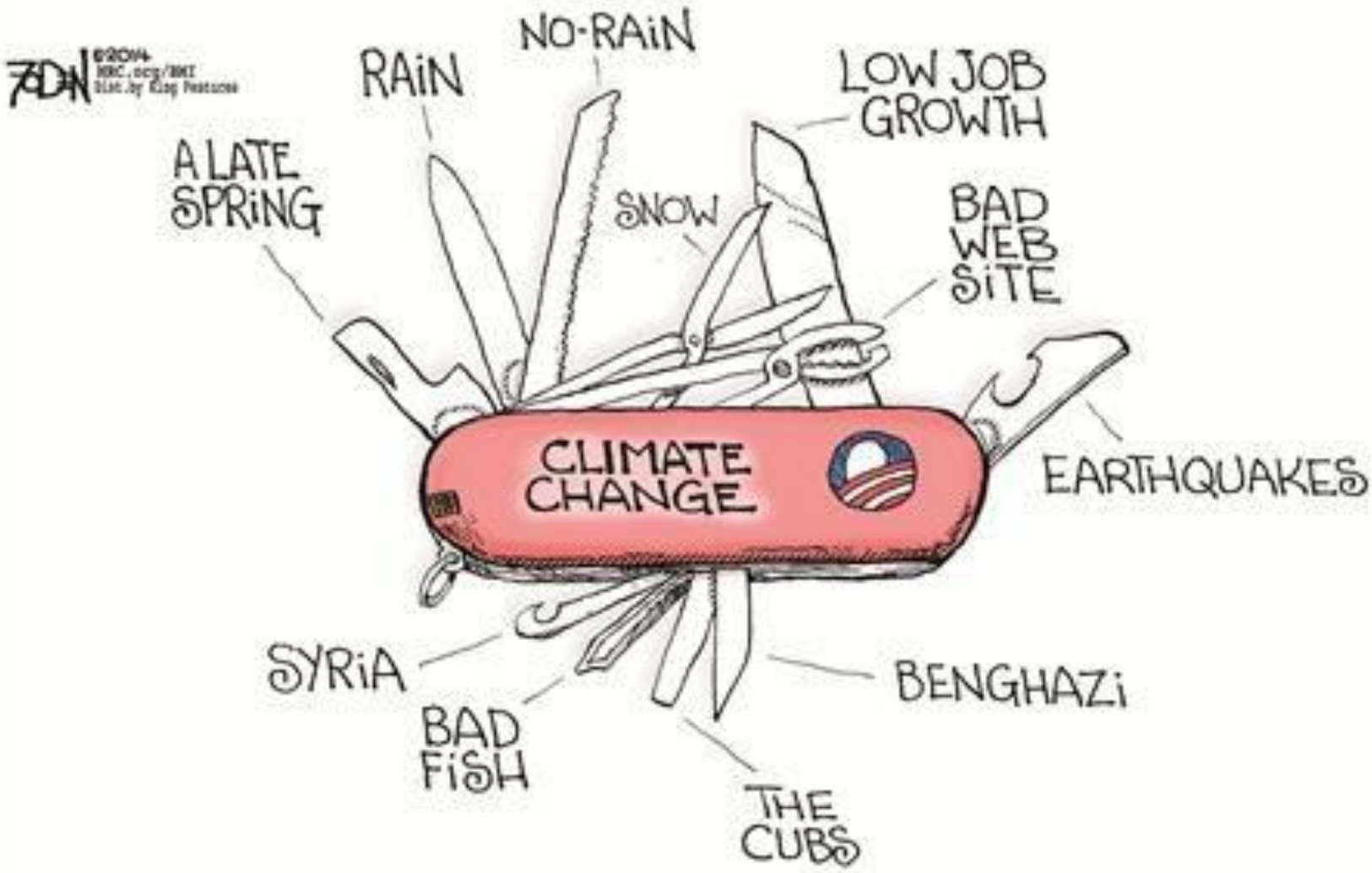
We Have Been Warming…There Is No Denying!




THE EXCUSE FOR EVERYTHING

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# Don’t Want To pick On Anyone…But!


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What do we know??

Most Agree:

1. Global temps up almost 2 degrees F since 1900
2. CO2 up since 1900

Causes??

Mostly Due to Humans and Fossil Fuels
VS
Largely due to Natural Causes

Climatechange.ProCon.org

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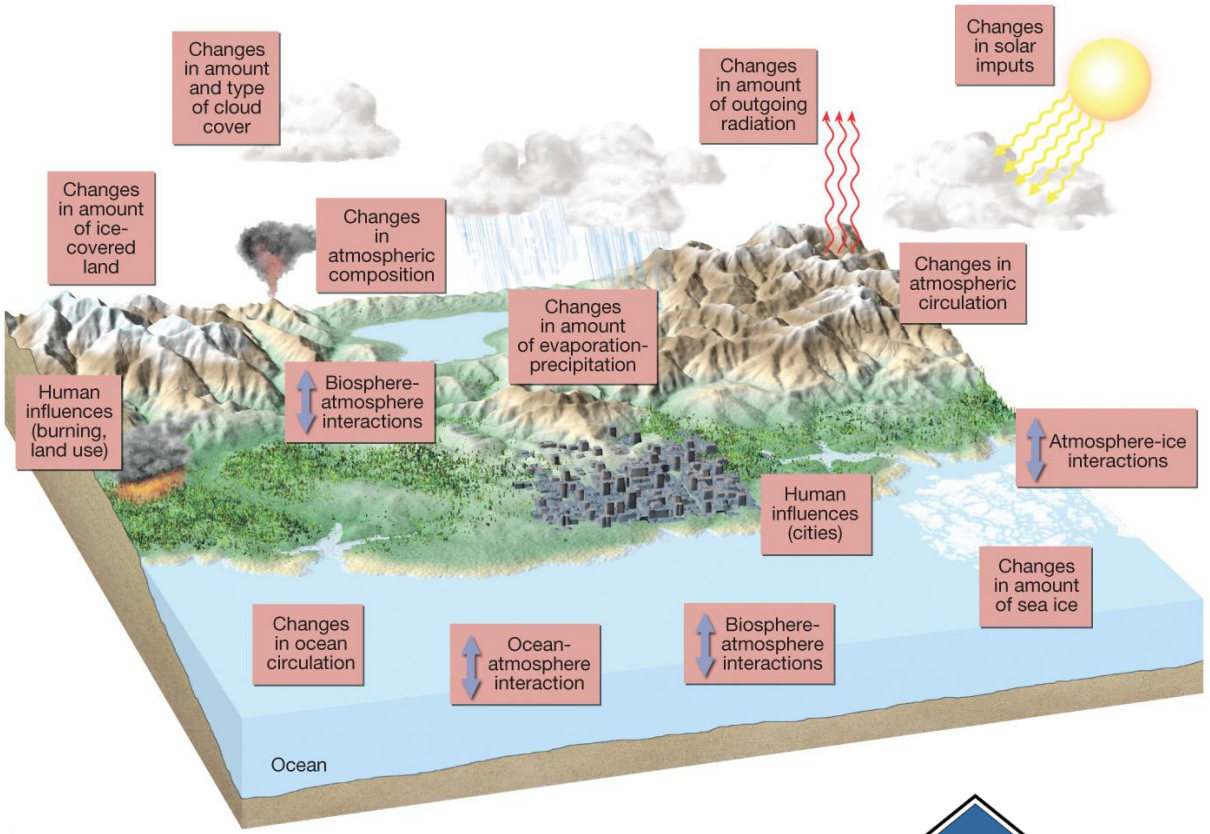
# *The Climate System Is Complex*

- **The climate system includes the:**
  - Atmosphere
  - Hydrosphere
  - Geosphere
  - Biosphere
  - Cryosphere (Ice & Snow)



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# Natural Factors Influencing Earth's Climate

## Extraterrestrial

- Solar Output
- Earth-Sun Geometry
- Interstellar Dust

## Earth's Internal

- Volcanic Eruption
- Mountain Building
- Continental Drift
- Atmospheric Chemistry
- Atmosphere-Ocean Heat Exchange

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# *How Is Climate Change Measured*

- **Some Techniques Used**

B.

**Short Term (10's to 100's of Years)**

- **Growth of tree rings**
- **Pollen contained in sediment and coral reefs**
- **Atmospheric Measurements**
- **Ocean Temps**

**Longer Terms (1,000's to Millions of Years)**

- **Drill cores in glacial ice**
- **Seafloor Sediments**
- **O-18 (warm) in ancient sea shells**

Which Tells Us The Most About Climate Change?

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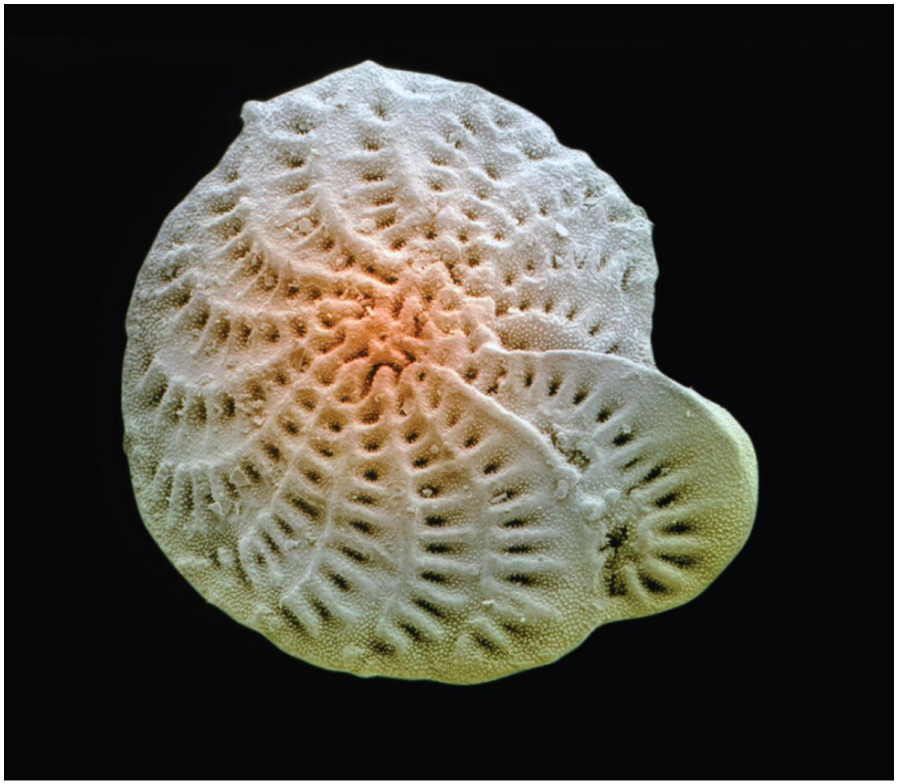
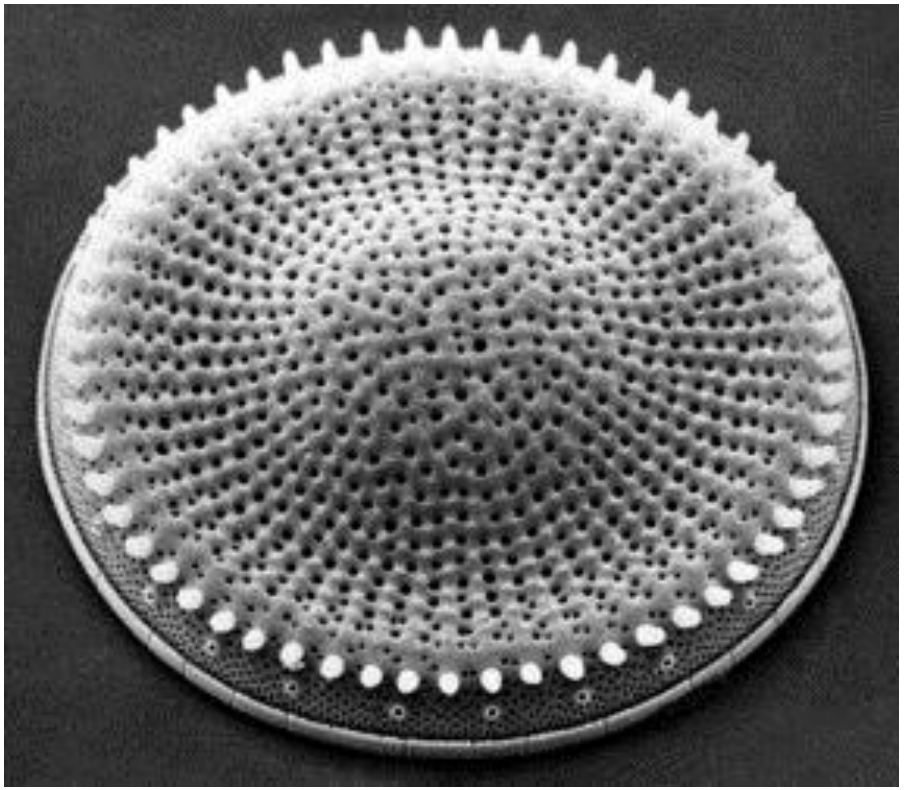
# Many Now Believe These Two Critters Are Critical To Understanding Climate Change







Foram shells

Warm Water = High $O^{18}$

Cold Water = Low $O^{18}$

Diatoms

Eats Up $CO_2$

Produces $O_2$

# *Back To Our Story..Natural Causes of Climate Change*

- **Several explanations have been formulated to explain climate change, including:**
  - **Exposed Land Surface Changes**
  - **Variations in Earth's orbit—eccentricity, obliquity, and precession**
  - **Volcanic activity**
  - **Changes in the Sun's output associated with sunspots**

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# Changing Land Surface Elevation



More Land At Higher Elevations (Mts)—Cooler Earth??  Mount Everest!

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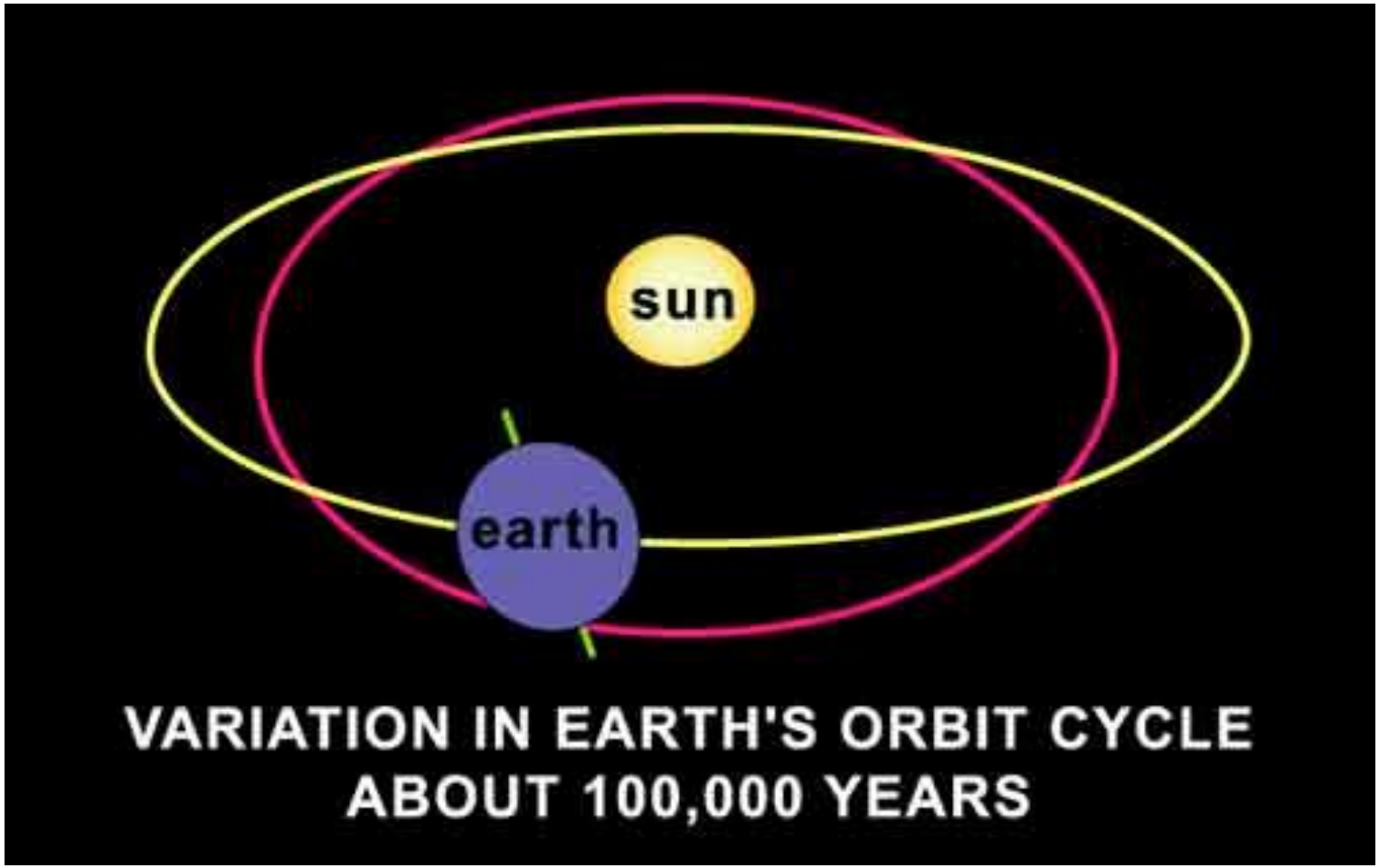
# Orbit & Tilt Changes

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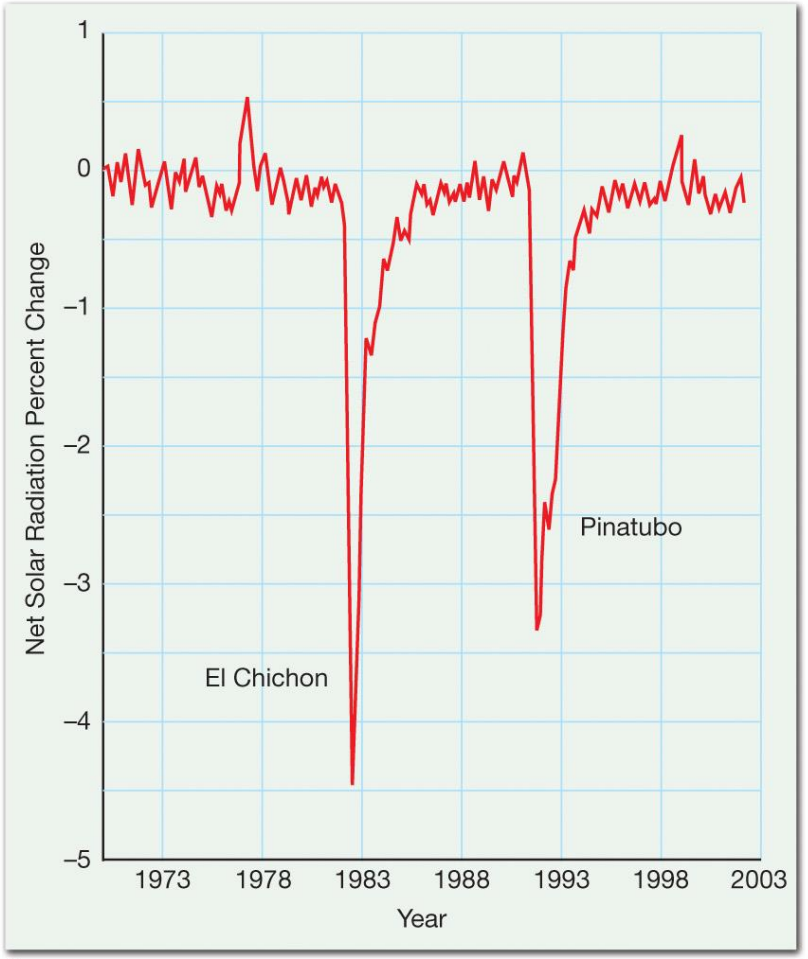
# *Effect of Volcanic Activity on Solar Radiation*

A.






B.

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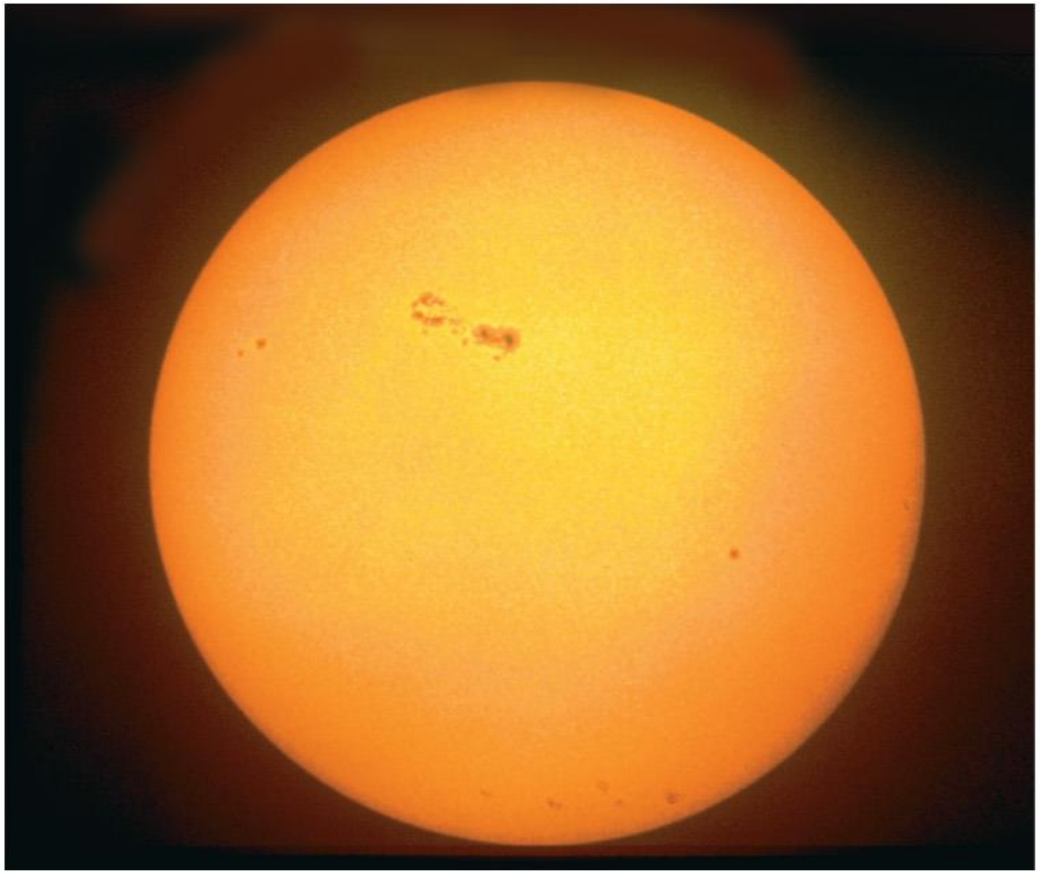
# Sun Spots??



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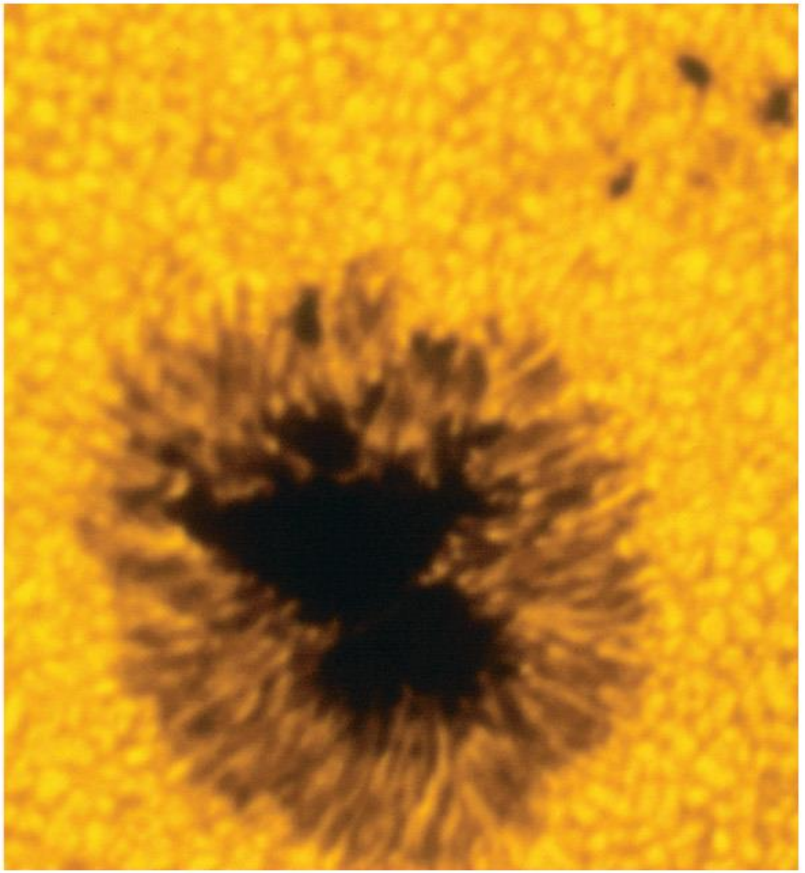

B.

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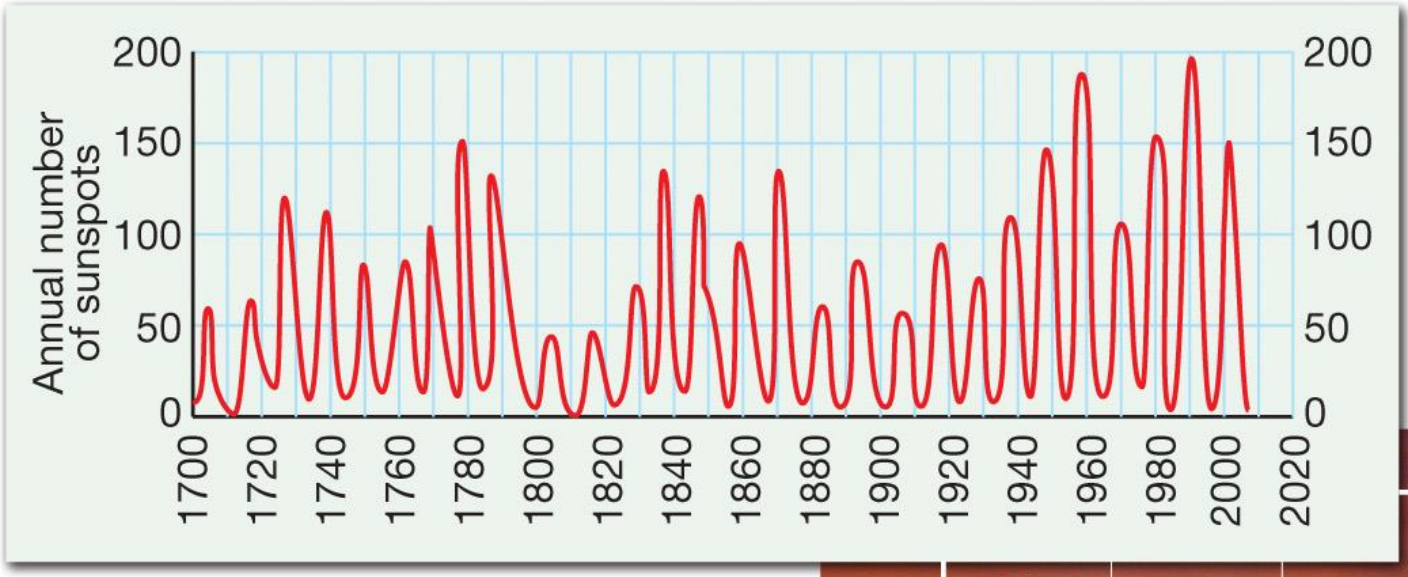


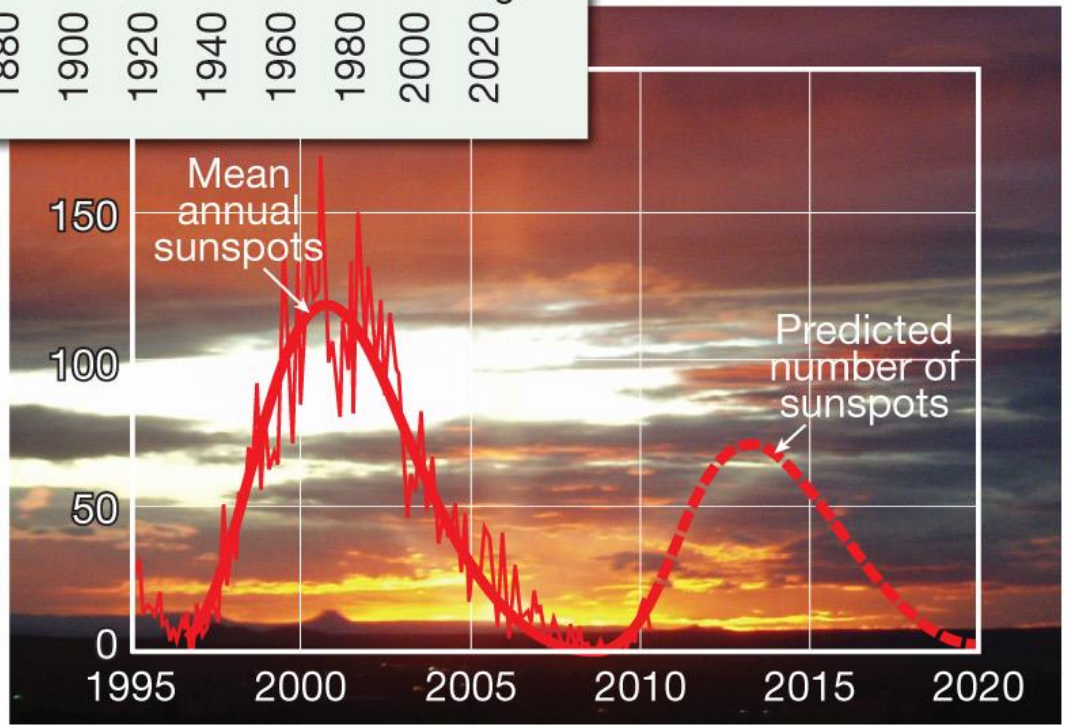




# More Sun Spots Over A Long Time = Warmer Earth??

UN Intergovernmental Panel on Climate change
IPCC Reports 2007 & 2014 & 2018

Predict Global Temps will Increase Another
Almost 2 Degrees by…..2050—30 Years!
Some say much sooner…. 12 Years!




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# Questions??

- How Long Has It Been Warming?
- How Do We Know?
- Have We Had Global Warmed Before?
- How Warm Did It Get?
- What Came After Global Warming?
- How Do We Measure Global Change?
- Causes…Humans?
- What Do We Do?

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# It has Gotten Very…Very Political



What Does Science Say??

# We All Know There Is Change..Right?

- Temps Changes Over Time
- $O_2$ Changes Over Time
- $CO_2$ changes Over Time
- Species Change Over Time
- Volcanos Change Over Time
- Glaciers Change Over Time
- Our Orbit Changes Over Time
- The Sun Changes Over Time
- The Earth Changes Over Time

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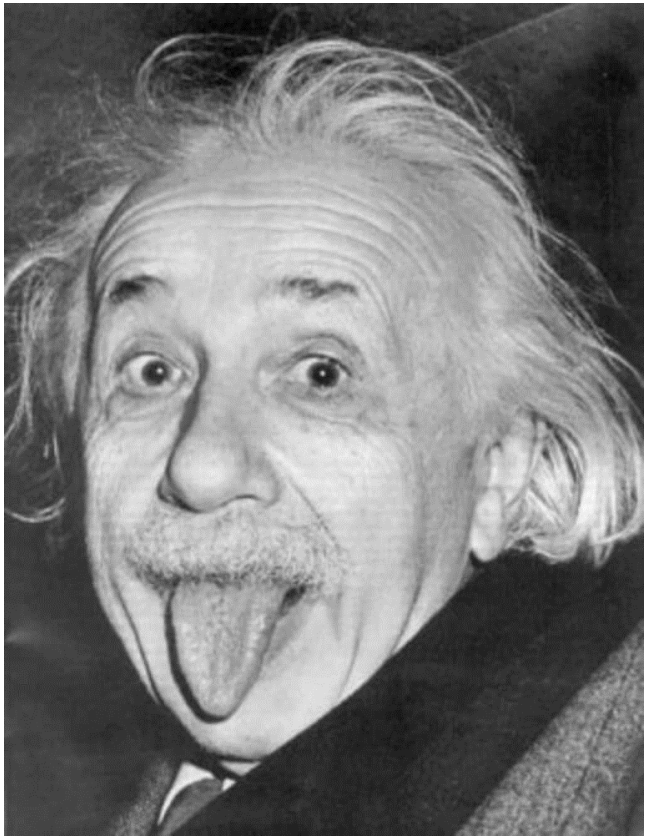
# Doesn’t Really Mind Change!



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# Not Big On Change!


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# These Places Know About Change:

New Orleans
Flooding

Fukashima
Earthquakes

Hawaii
Volcanos

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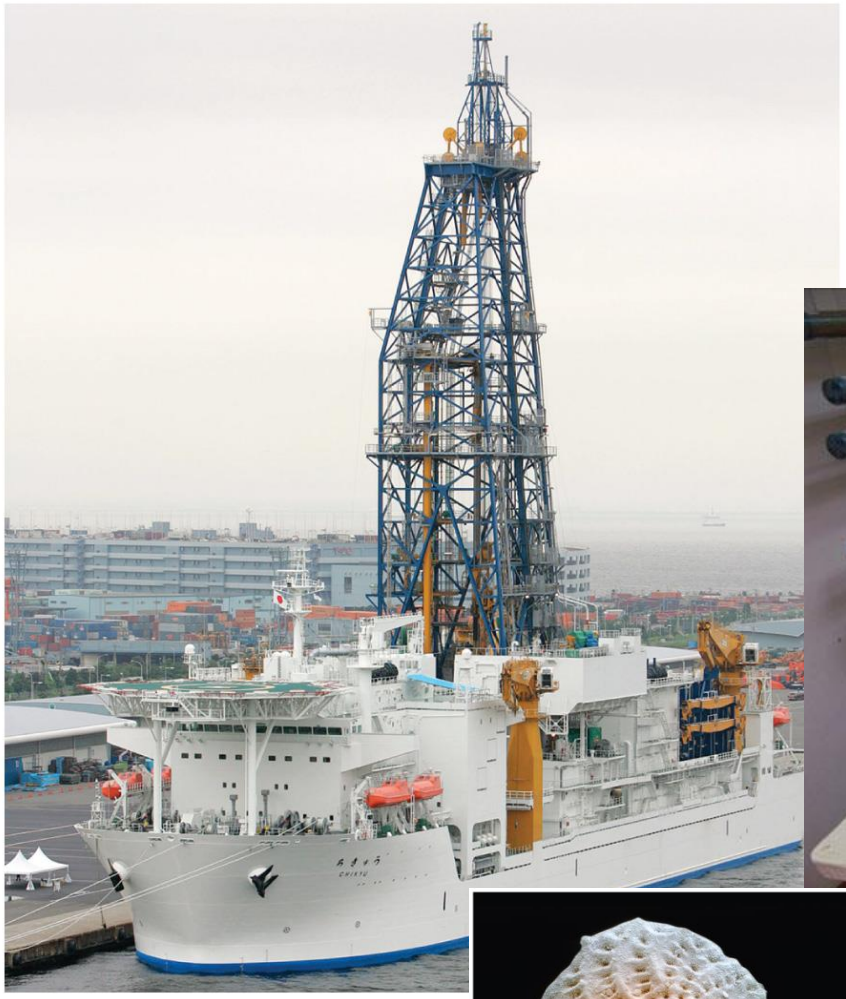
*Climate Tracking Is Often Centered Around…. GLACIERS*

"The Earth's Natural Thermometers!!"

Let's Look At The Ice & Mud….





## Deep Sediment Drilling & Core Analysis

Ice Cores tell us the Temps!
Higher $O_{18}$ = Warmer Temps

Forams-$CaCO_3$!

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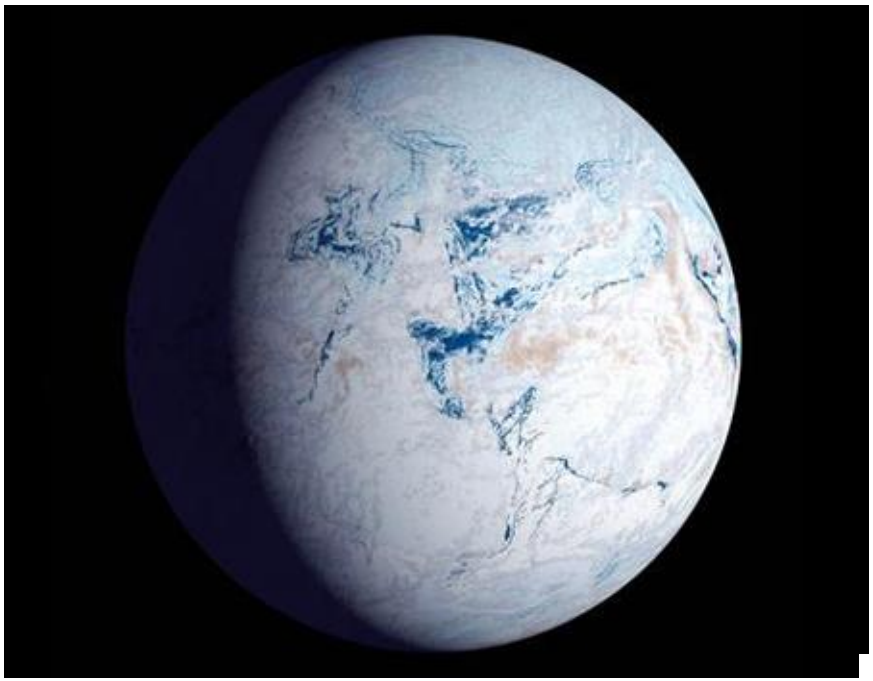
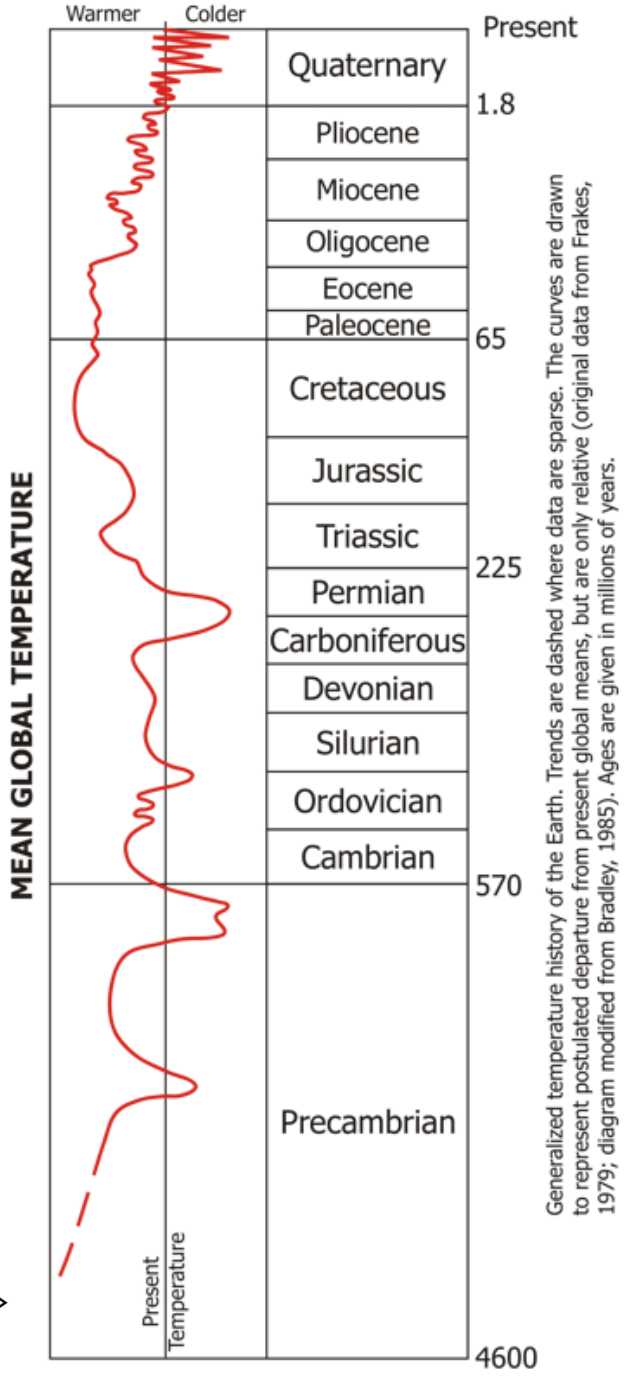
What Has Happened Over Time?

Guess What…Forams Suggest
Global Temperatures Have Actually
"Changed Throughout Time!"

# Snowball Earth-700 MYA!
# Lasted 80 Million Years!



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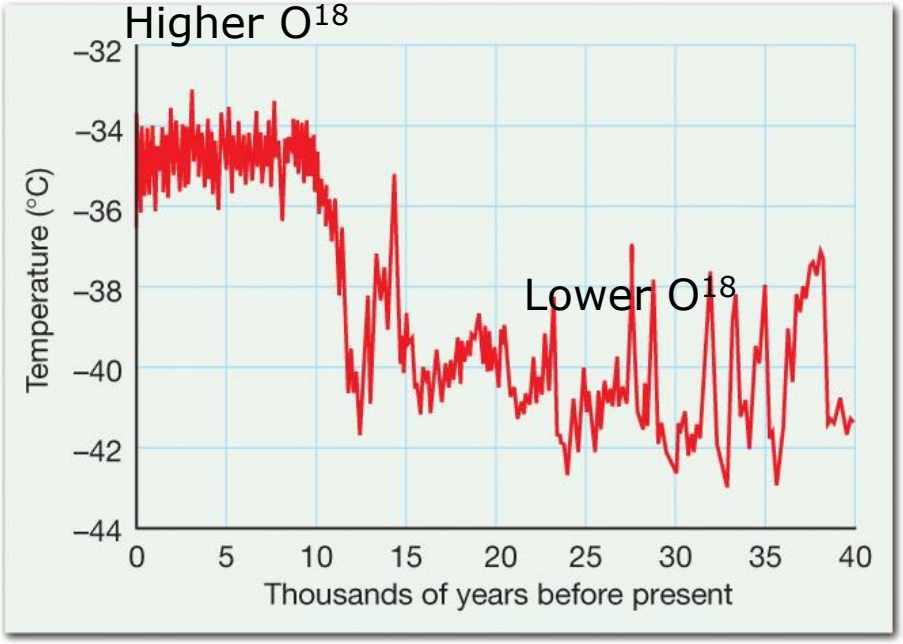
# Ice Cores tell us the Real Temps!
# Higher $O^{18}$ = Warmer Temps

A.

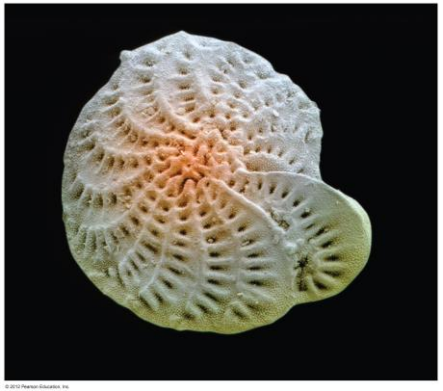




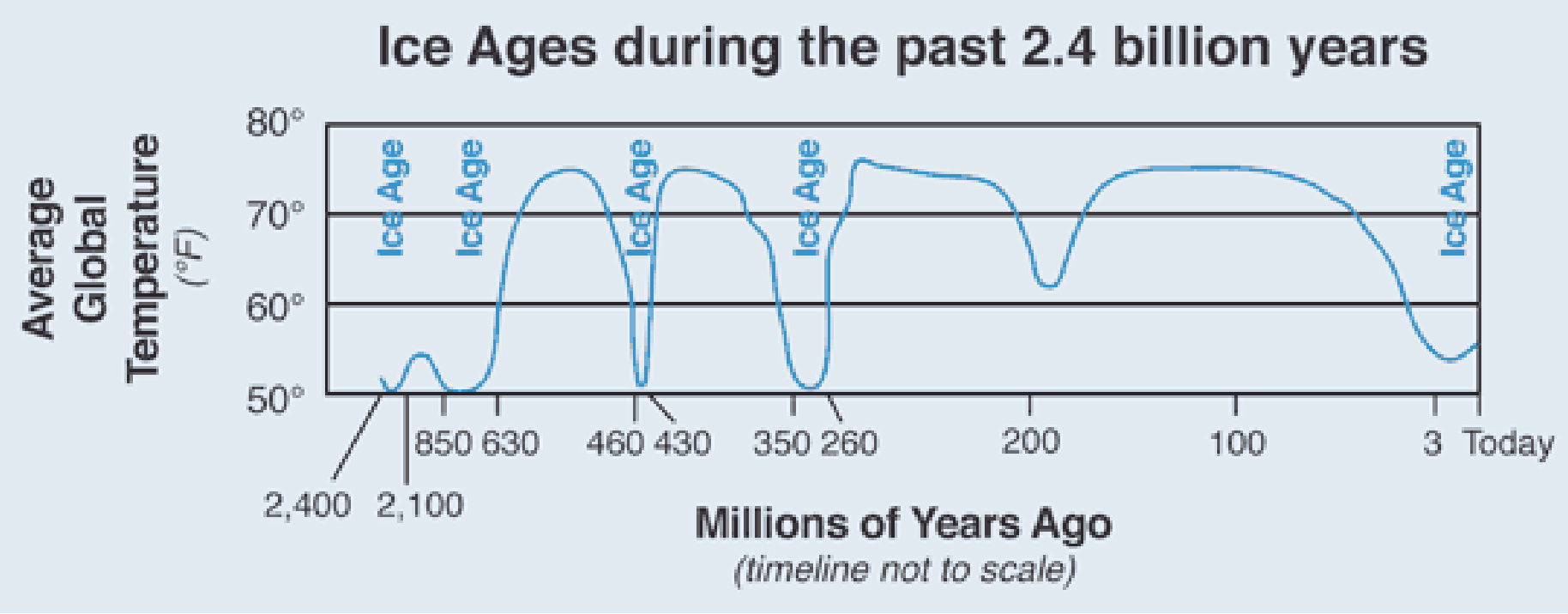

B.

$O^{18}$ From Ice and Sea Shells

So What Has Happened in 12,000 Years?



# 5-6 Giant Ice Ages!
# Followed By Major Global Warming!

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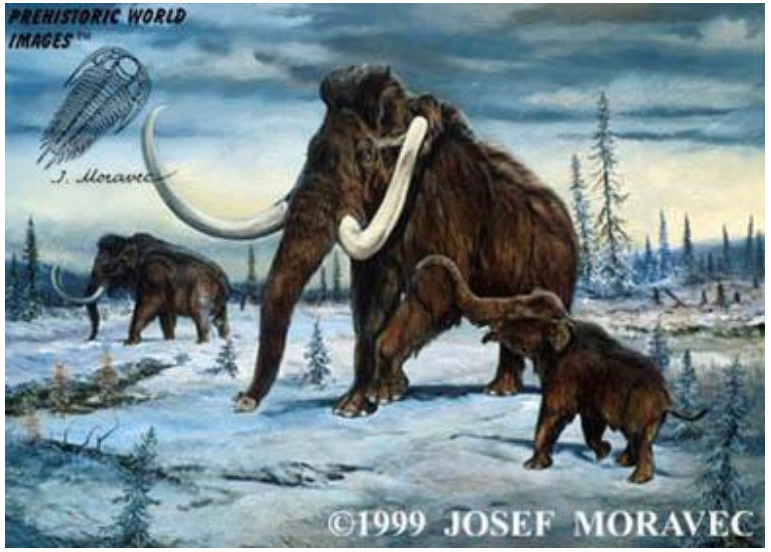
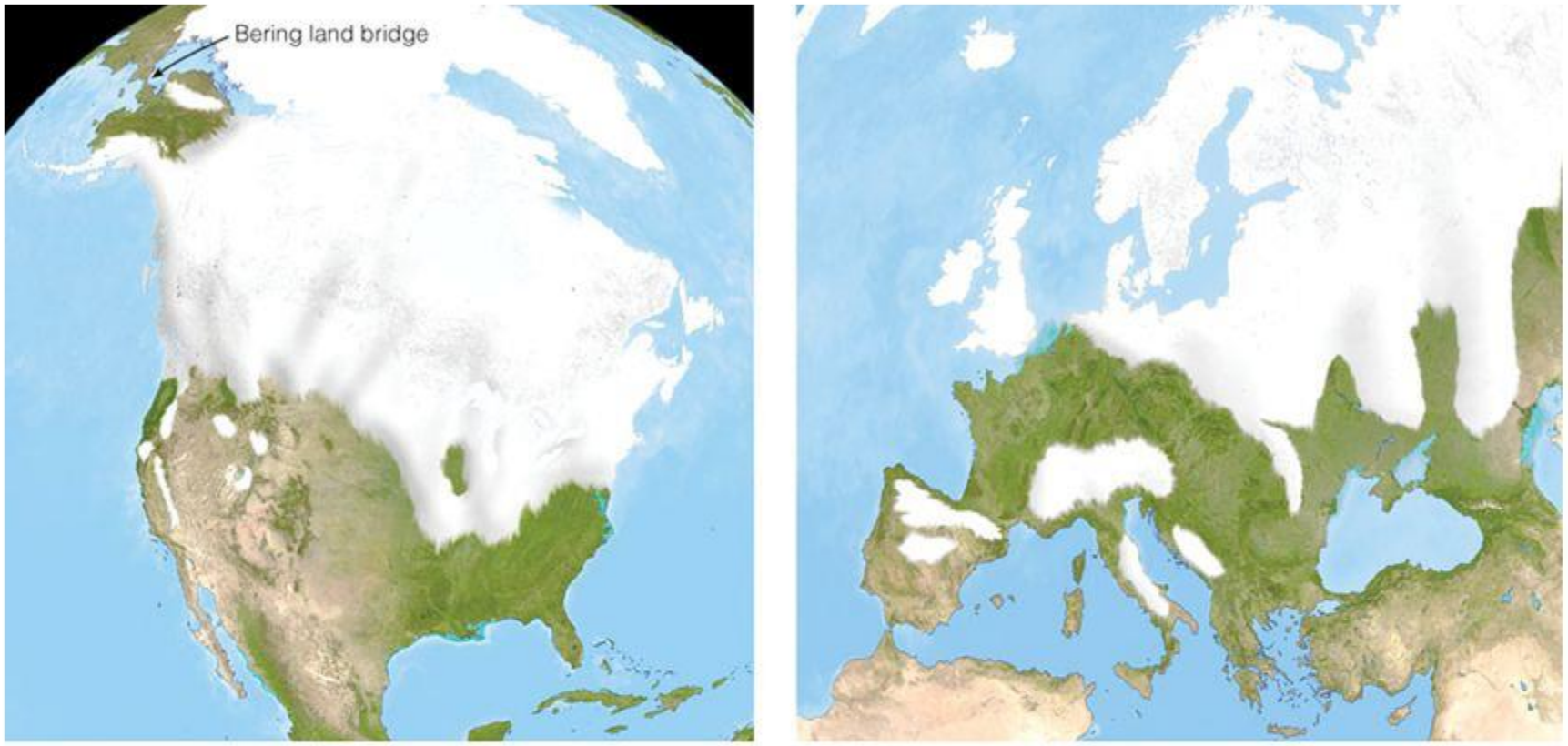
# Glaciers Come and Go…
# Global Cooling And Warming!!




Just 8,000 yrs ago!
Chicago, Buffalo,
New York Under Ice Sheet

Retreated 4,000 miles in 8,000 years!
Rate of 0.5 miles per year..in pulses!
Or 5 Miles Per Decade Average!



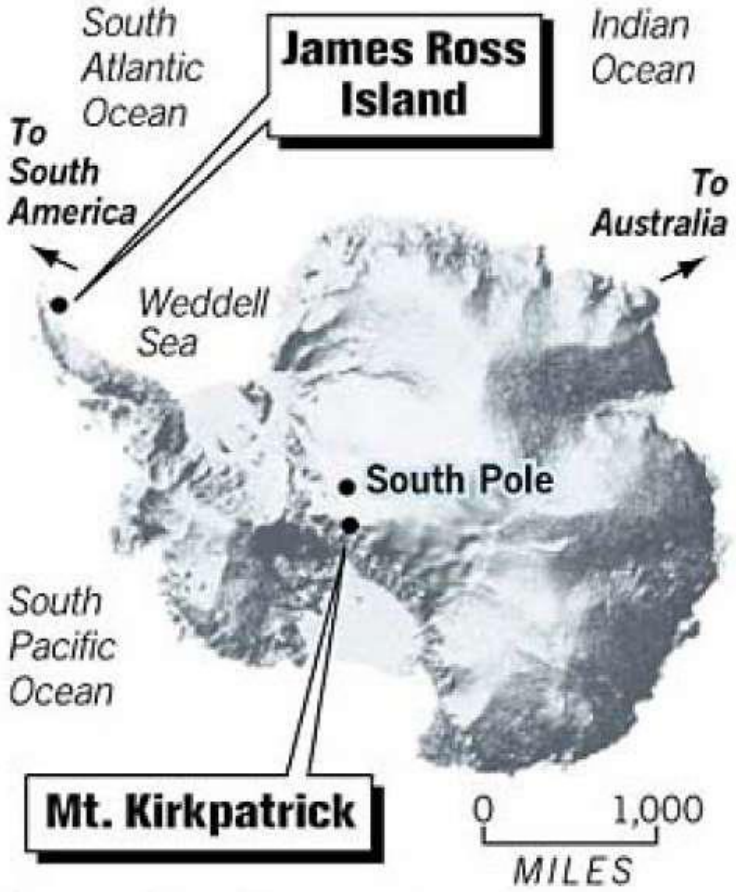

- **Just 18,000 years ago, the Earth was in an ice age where continental glaciers reached as far south as the Ohio River Valley over North America.**

- **Over Europe, the northern region and higher terrain were covered in thick sheet as well.**

- **The glacial advance/retreat occurred about 10 times over a 2 million year period.**

# Antarctic dinosaurs

Researchers working at separate sites found remains of two distinct dinosaurs more than a thousand miles apart on Antarctica.




Source: Chronicle research

Chronicle Graphic

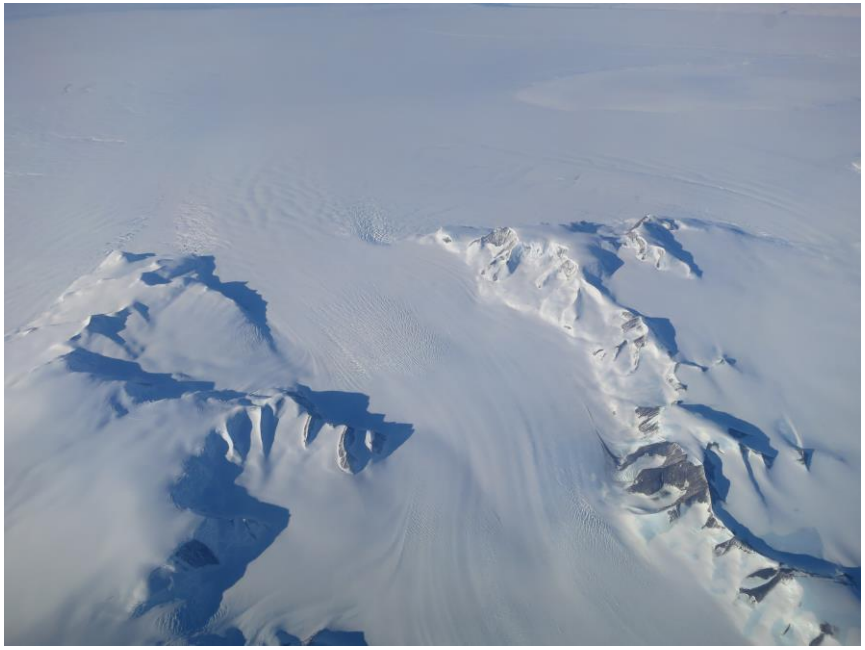
## Antarctica Has Changed Throughout Time!

# Today….Antarctica—Melting??

**“NASA – Antarctic Ice Sheet Is Growing”**

A new NASA study says that an increase in Antarctic snow accumulation that began 10,000 years ago is currently adding enough ice to the continent to outweigh the increased losses from its thinning glaciers.

The research challenges the conclusions of other studies, including the Intergovernmental Panel on Climate Change’s (IPCC) 2013 report, which says that Antarctica is overall losing land ice.



https://www.nasa.gov/feature/goddard/nasa-study-mass-gains-of-antarctic-ice-sheet-greater-than-losses

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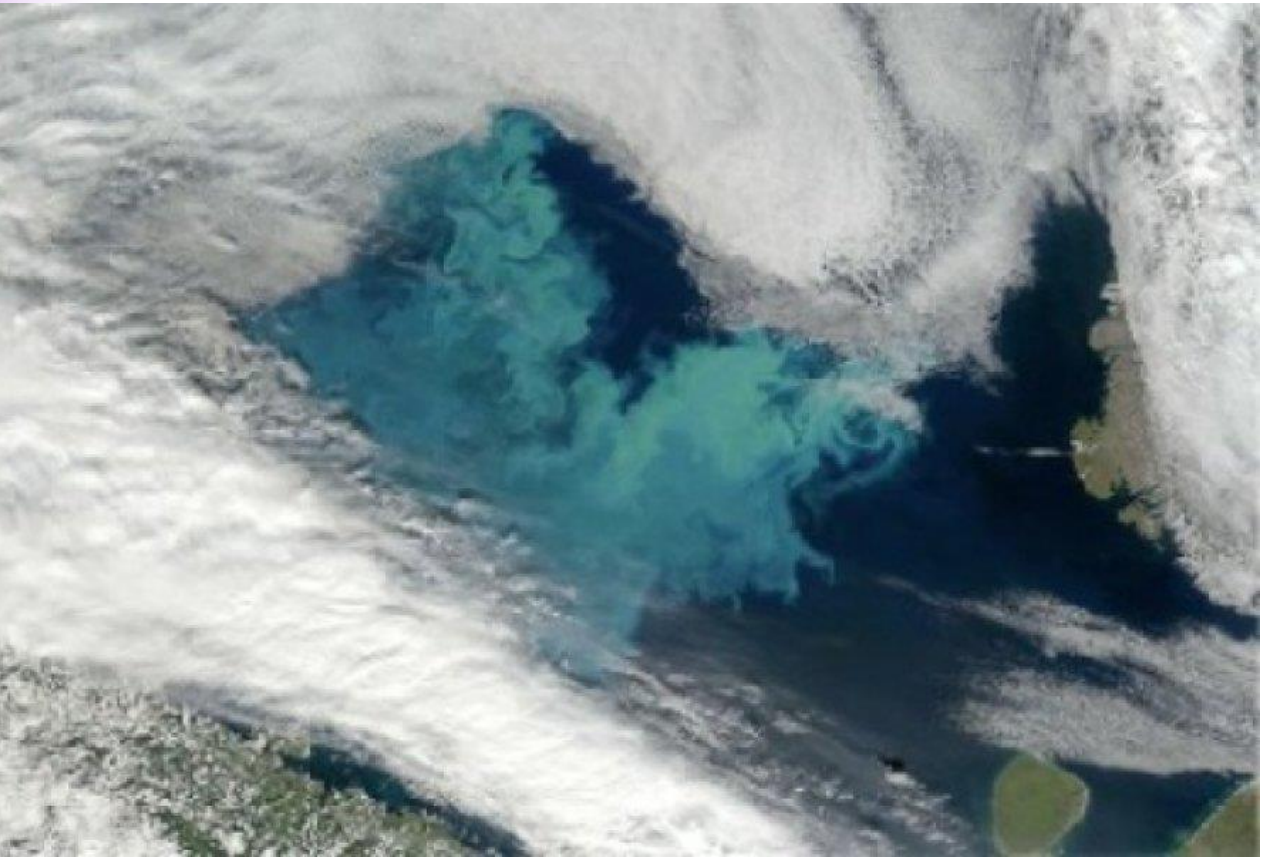
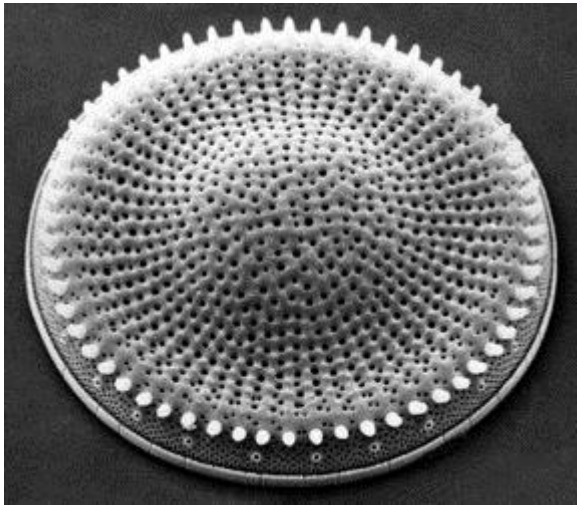
# Ohh..Glaciers and Diatoms





Diatoms Live In Oceans
Need Silica to Grow

Melting Glaciers—Full Of Silica From Rocks

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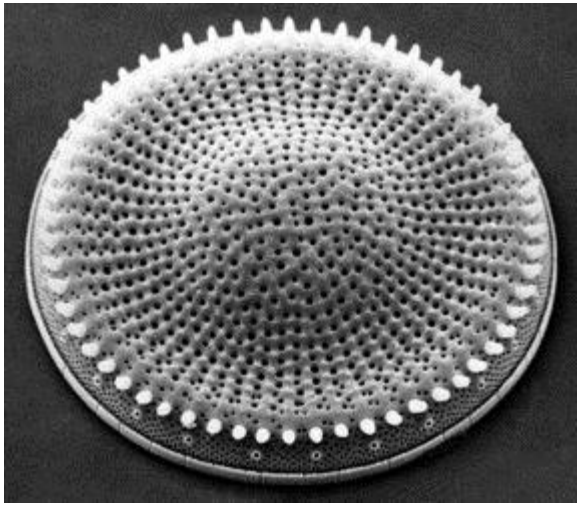
Silica Released to Oceans
Algal Blooms..Lots of Diatoms
Diatoms suck up 40% of $CO_2$
Produces 20%-30% of $O_2$ !!!!

# Producing Oxygen On Earth

Takes in $CO_2$ produces $O_2$



20%-30% Atm Oxygen from Diatoms!
Actually Needed Glacial Melting in Past!

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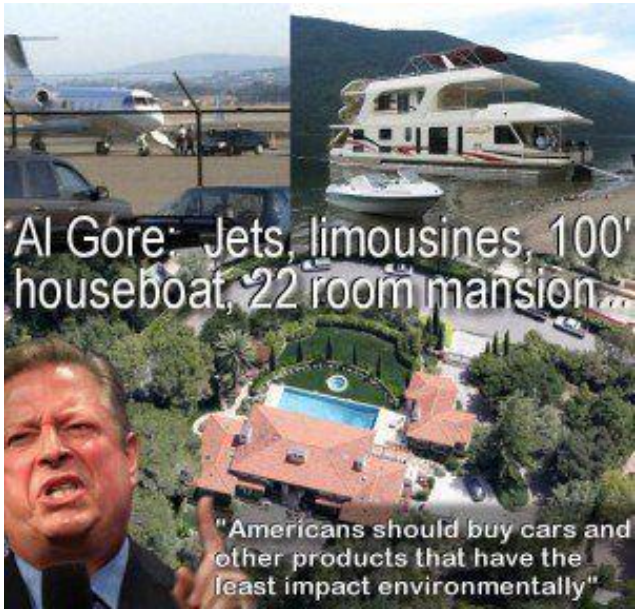
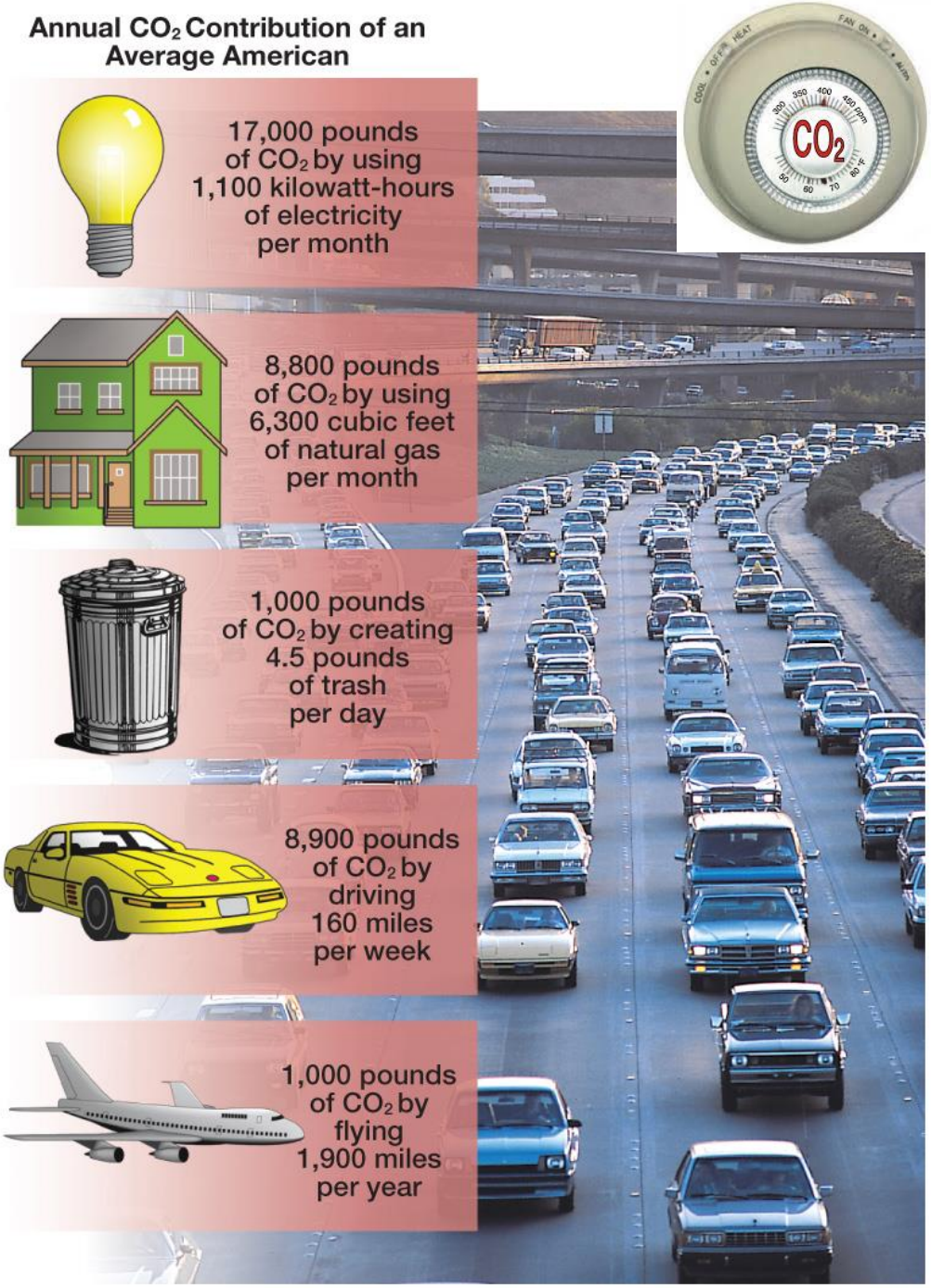
# Human Influences







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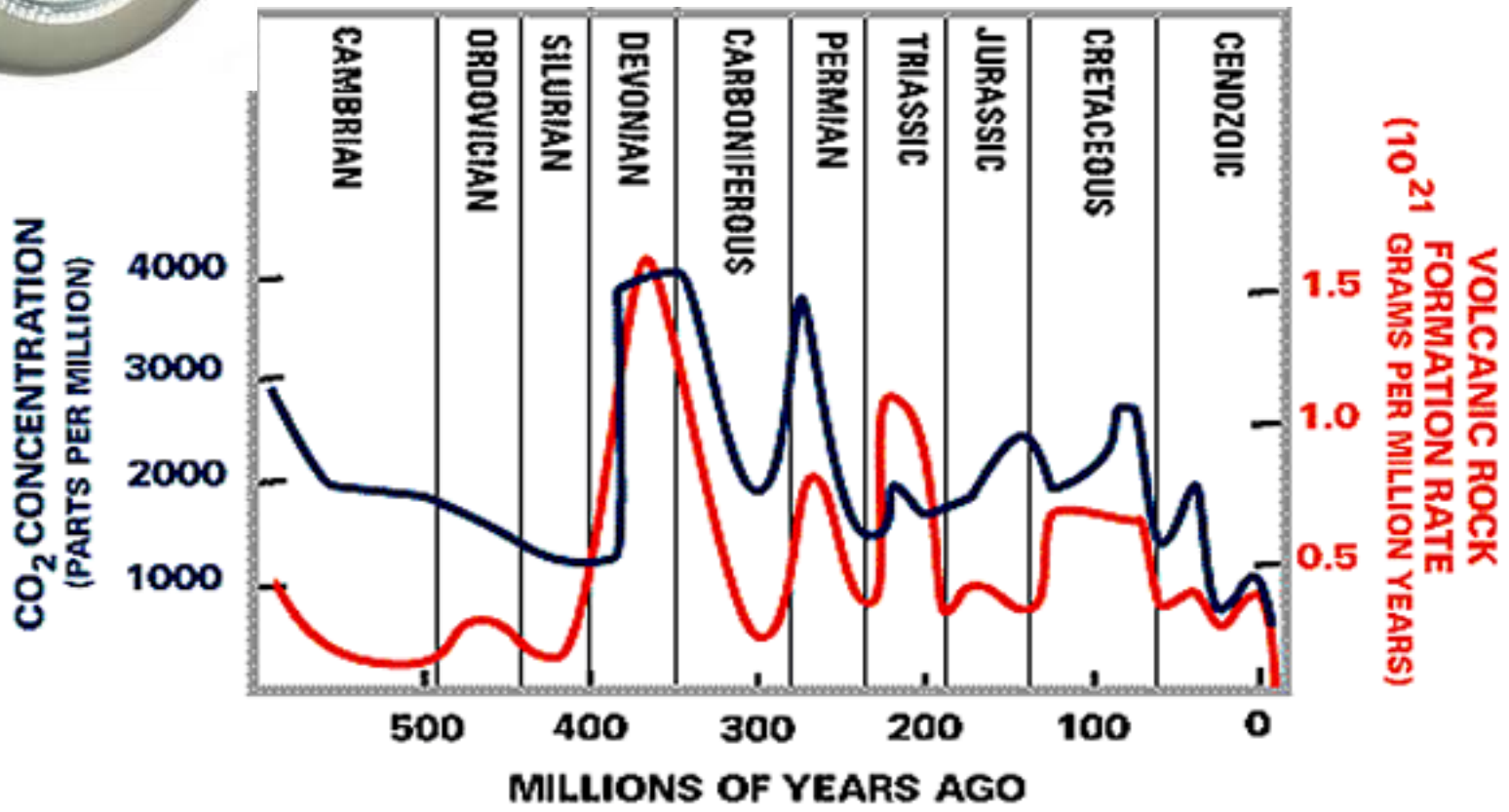
# Shhh…We Think it Has A Lot To Do With Volcanos!!

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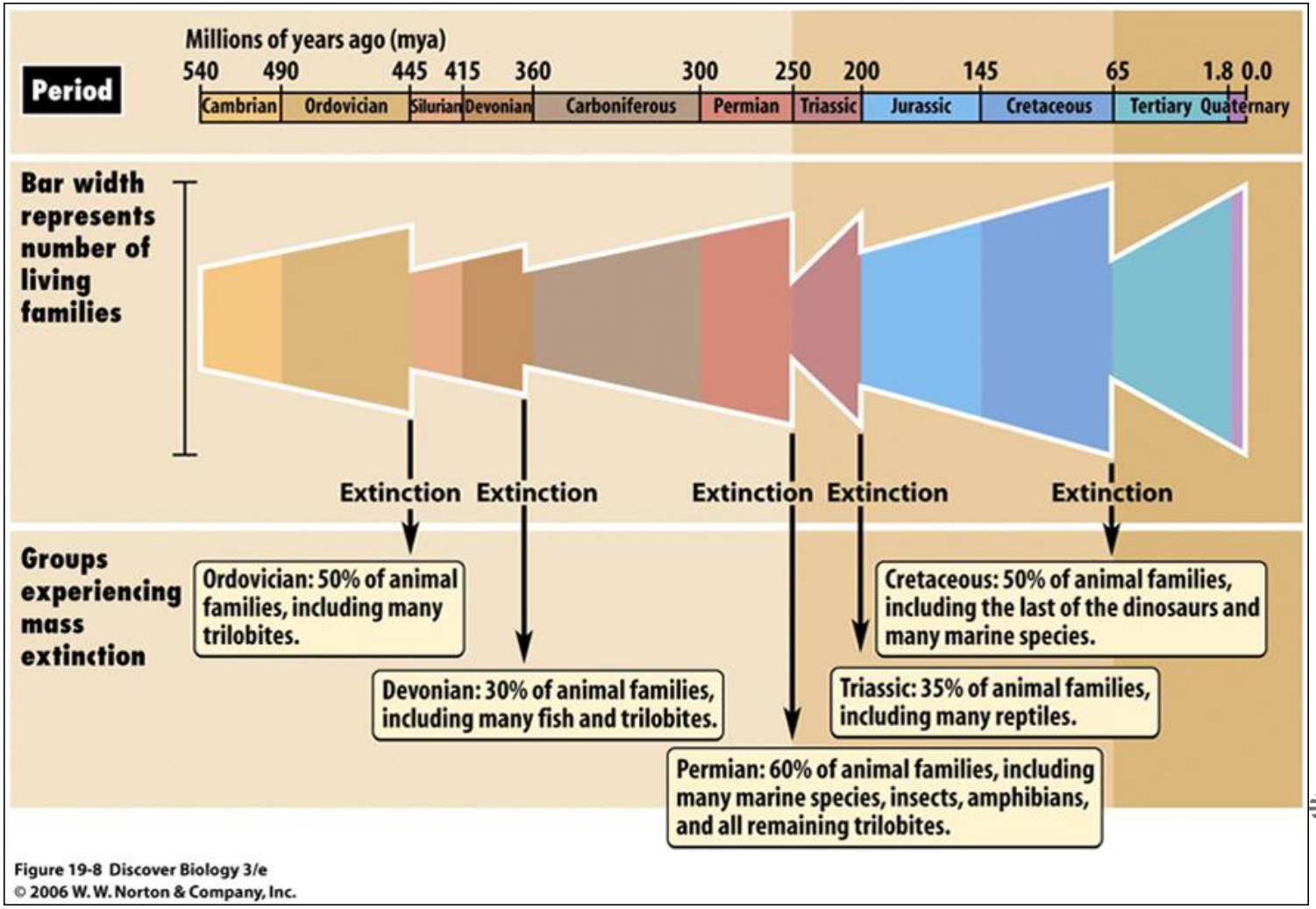
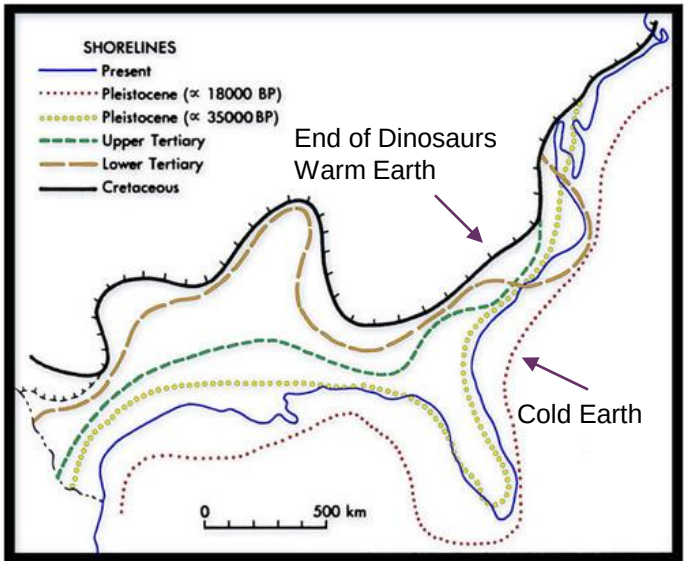
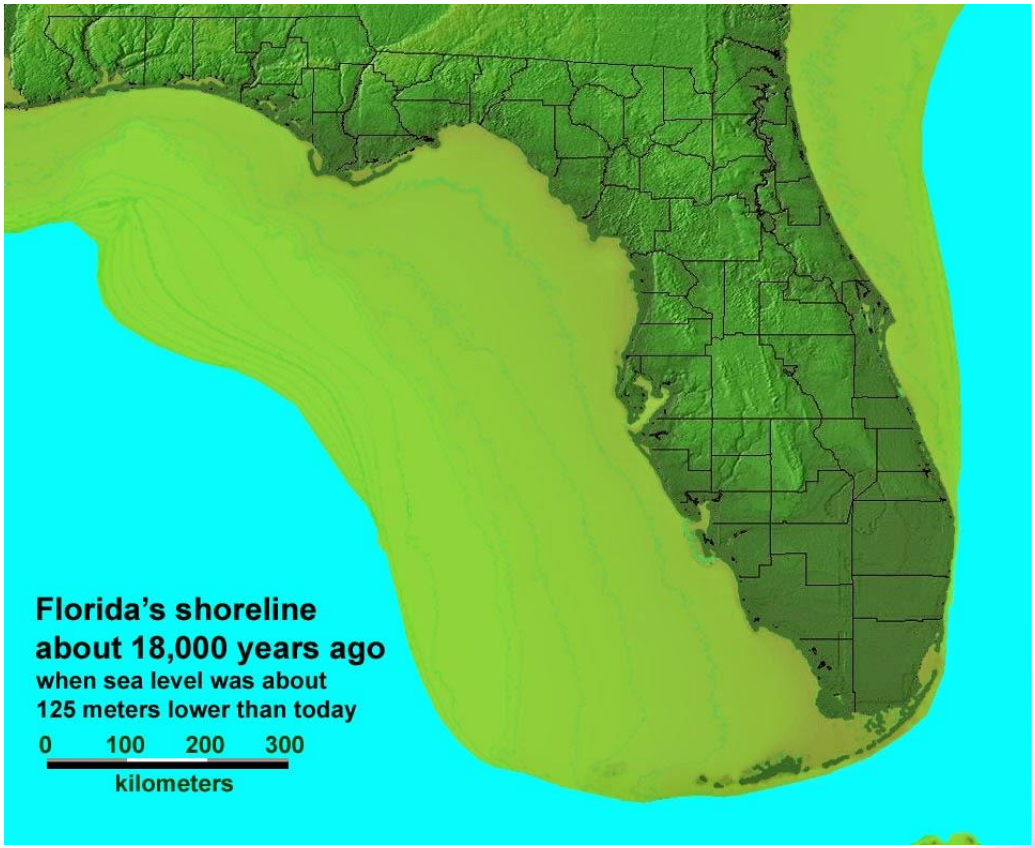
# Cold Earth = Massive Glaciers--5 Global Mass Extinctions Followed By Warm Earth = Explosion of Life!!




Not One Warming Period Has Caused in an Overall Loss of Species
All Warming Periods Resulted In Dramatically More New Species!

# Going From a Colder Earth to A Warmer Earth…Change Happens




Lowered 125 m = 4500 inches
4500/18000 = 0.25 in/yr!!

Today only 0.12 in/yr!!!!

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# Two Scenarios Of Change For Global Warming


*"Once again, there is no conclusive evidence of climate change. From Fairbanks, Alaska, this is Joe Matthews reporting."*

Worse Earth vs Better Earth

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?????

# Global Warming

- **Possible Effects** – Global warming could have some positive and negative effects
  - **Positive Effects** – A global climate change could have positive effects in areas that are currently considered hostile
    - Areas currently too cold for farming could warm up enough to produce good crops
    - Amounts of rain could increase in desert areas enough to create forests
    - Extremely hot areas could become cooler with more moderate temperatures

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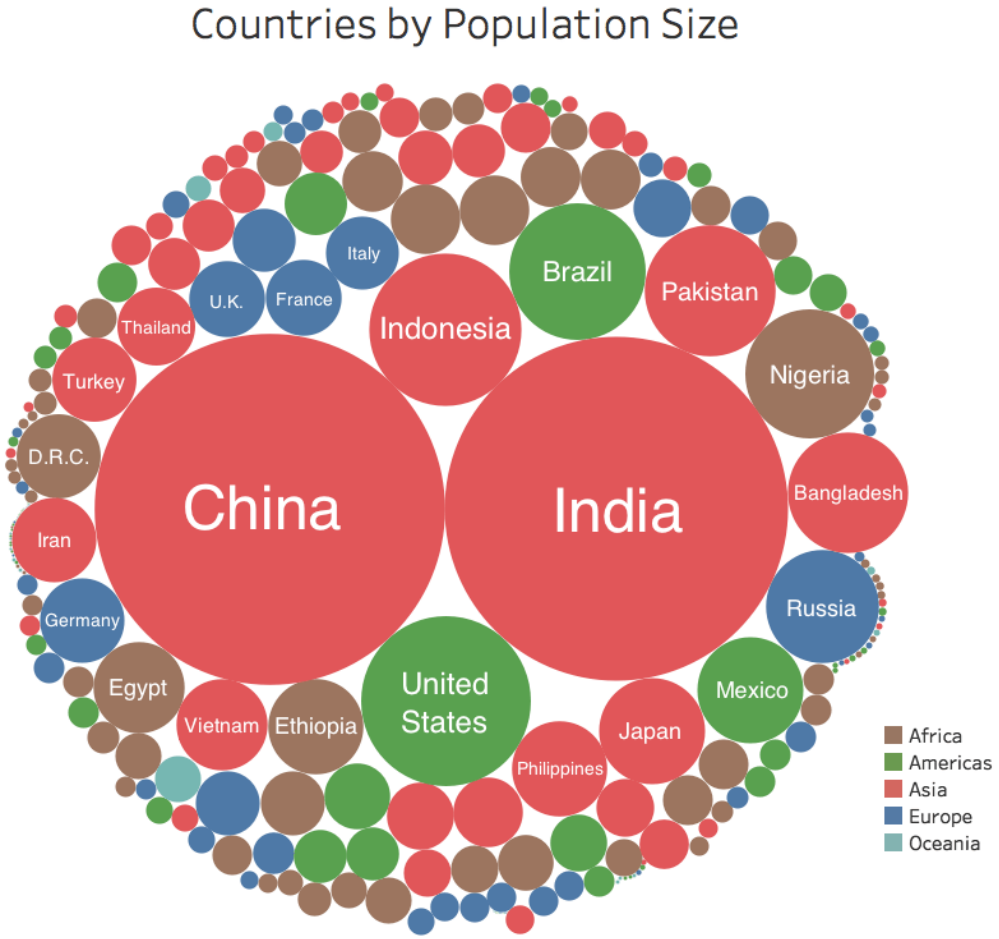
# The Global Energy Dilemma

Energy




Food

Water

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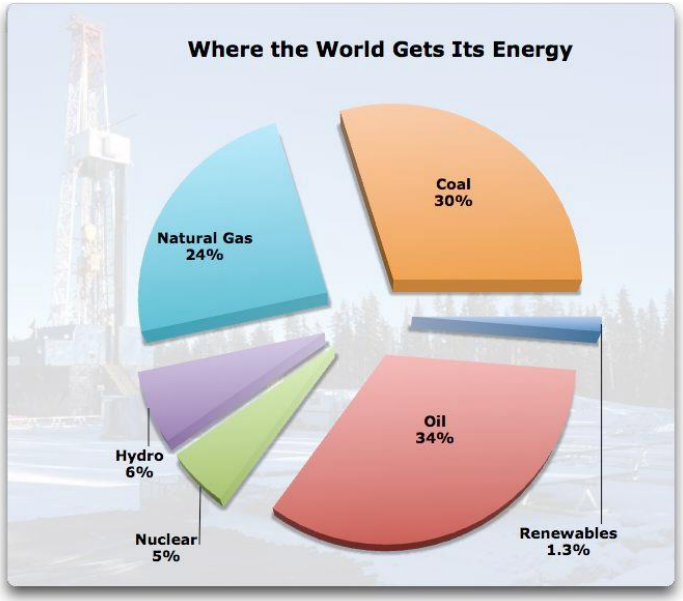
# **Global Energy Reality**

- U.S = 100 Q-BTUs
  80% FF, 8% Nuclear, 12% Renewables
- World = 500 Quads
  20% U.S., 17% China (2x), 16% Europe
- 2030….600 Quads!!!




Who will produce it?
How will they produce it?
What will it cost??

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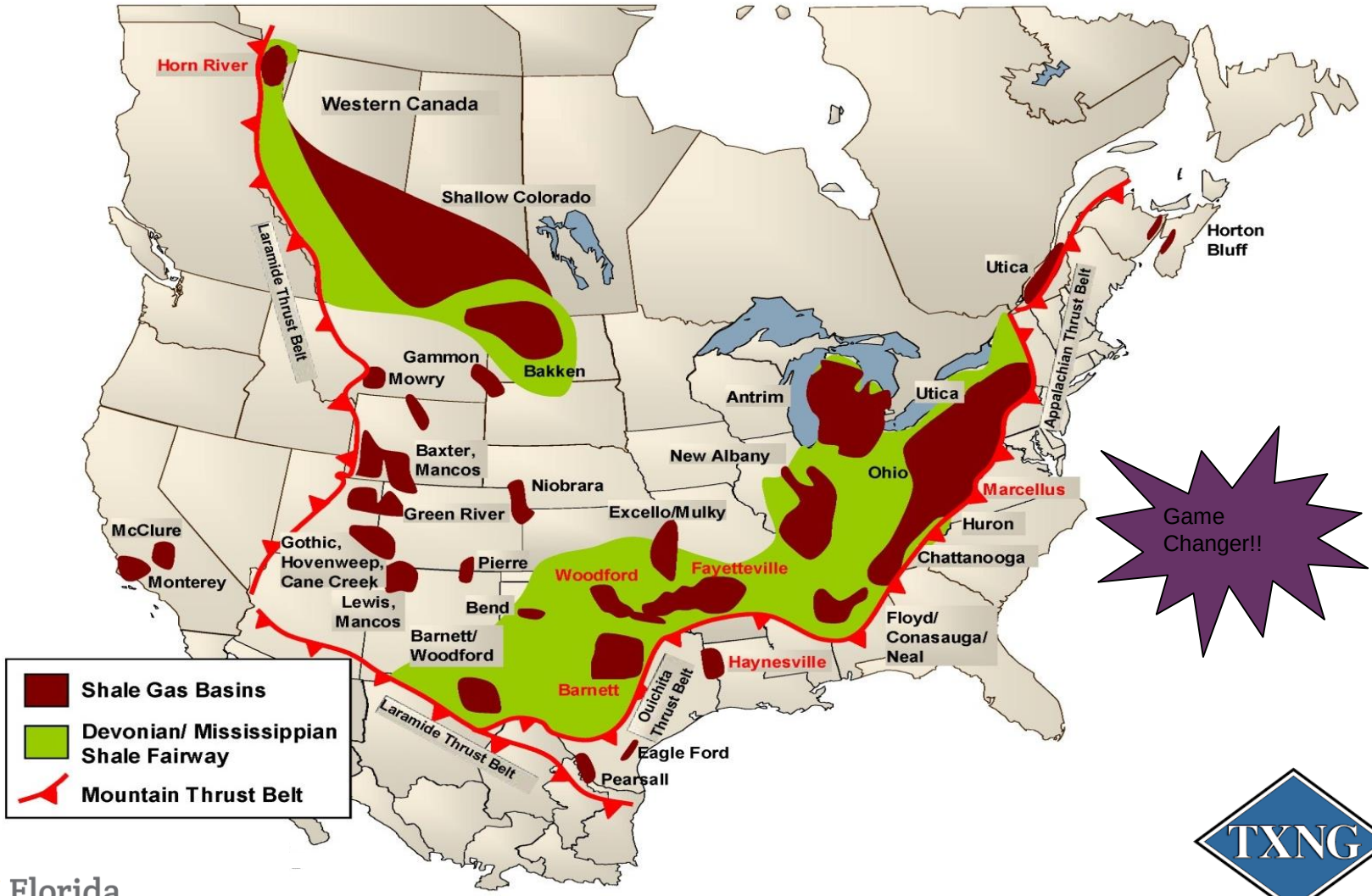
# Abundance-Energy Security

- 100+ years of secure natural gas resource

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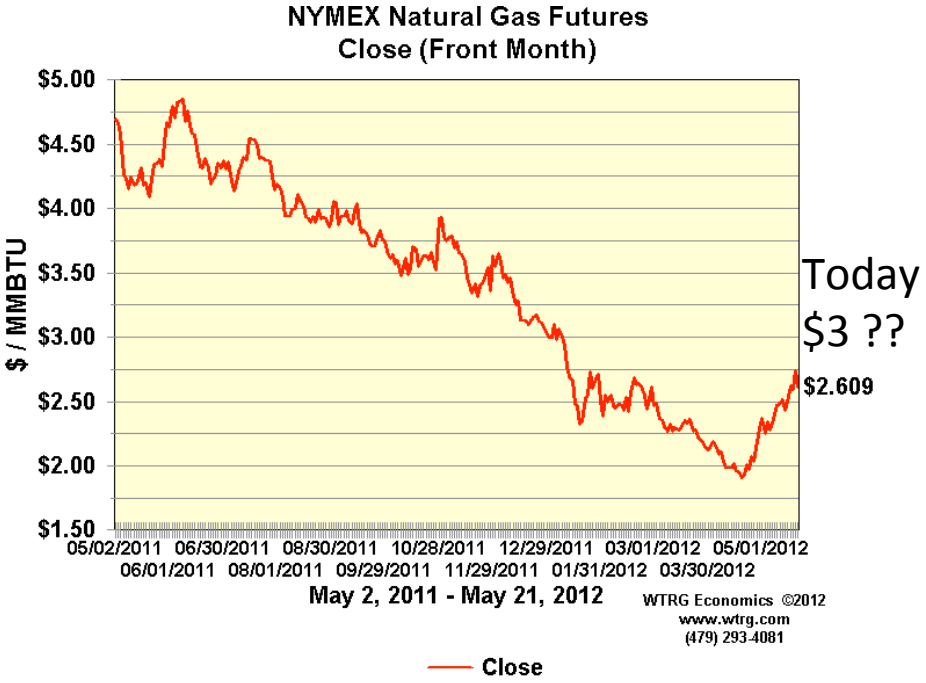
# New Technologies

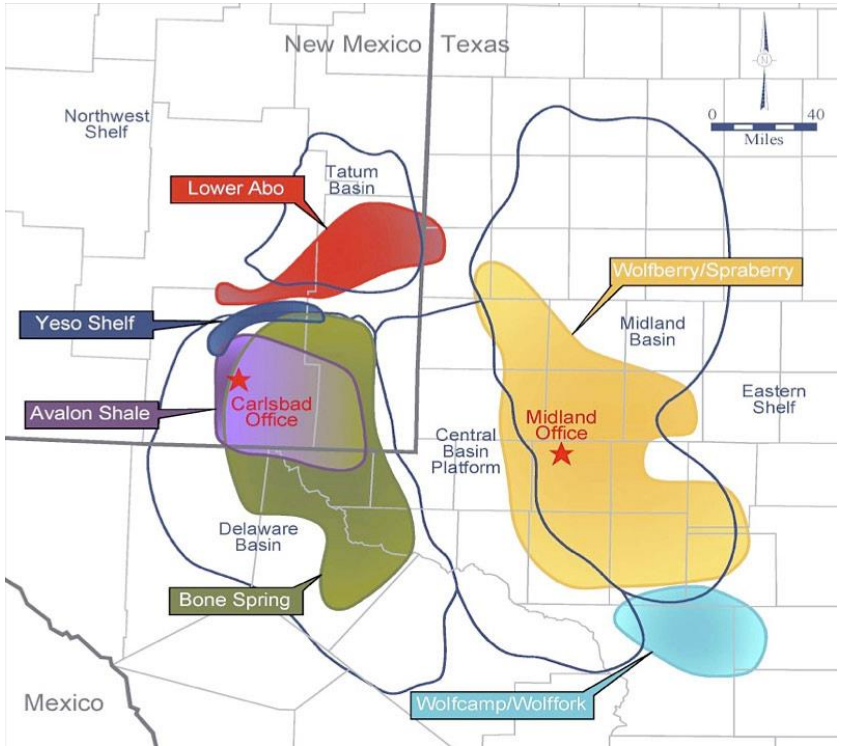



Today
$3 ??
$2.609

Nat Gas Prices


Shale Oil

The Wolfberry!




Gasoline Prices!!!!

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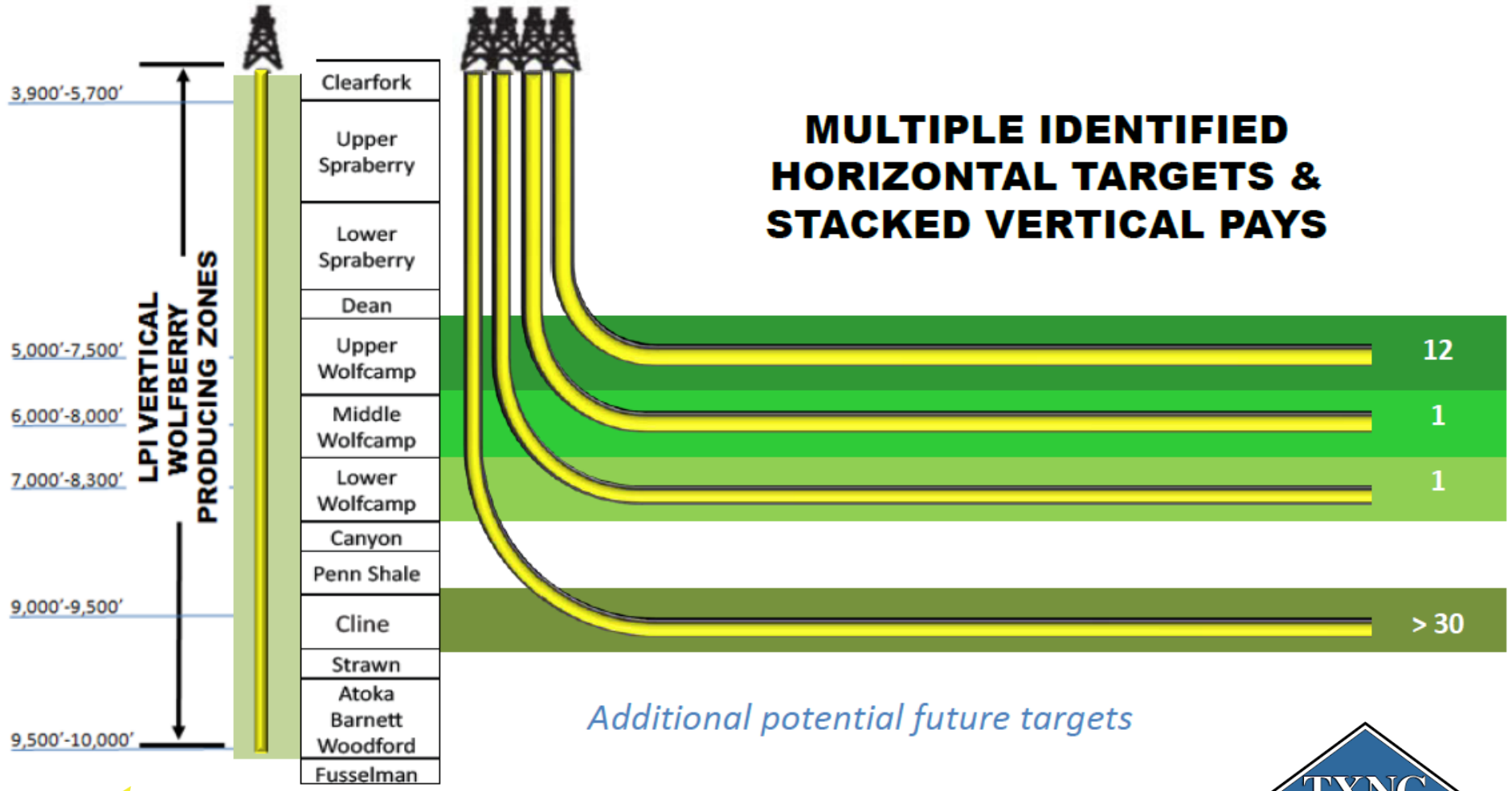
# Permian Basin: Multiple Targets of Opportunity




*Additional potential future targets*

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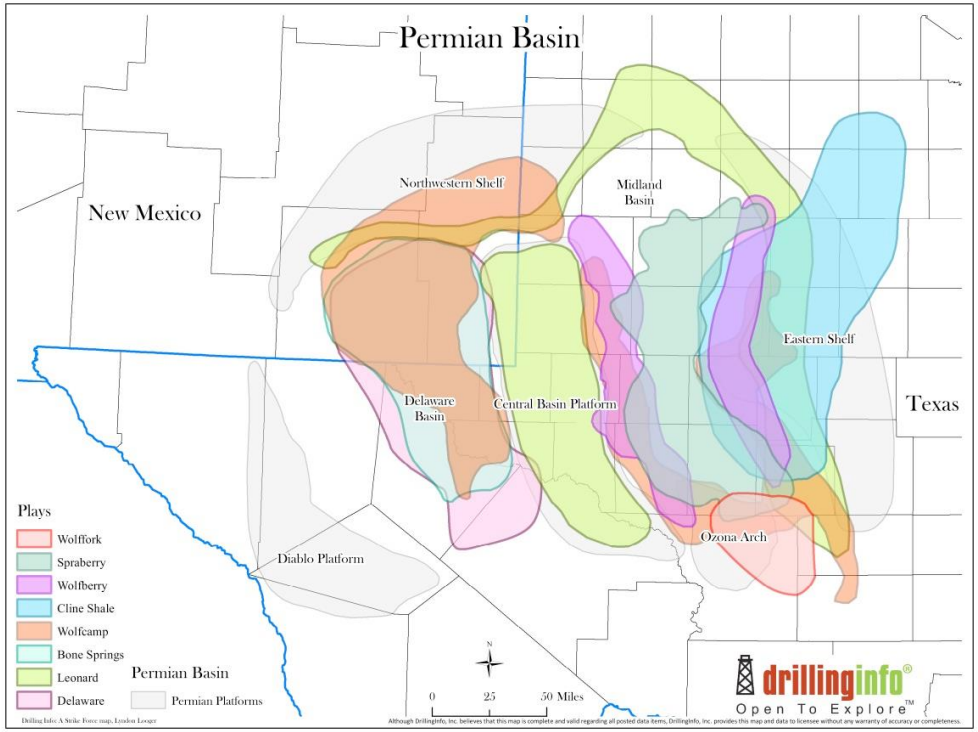
# Lots and Lots of Oil-Sweet Crude!!




USGA estimates 20 Billion Barrels

Companies estimate 60 Billion Barrels!!

1/3 of U.S. Production by 2018??

EXXON Mobil

Just to Name a few!!!

Almost $6B!!!

noble energy

$3 Billion

Shell

MARATHON

$700 M

PIONEER NATURAL RESOURCES

800,000 acres

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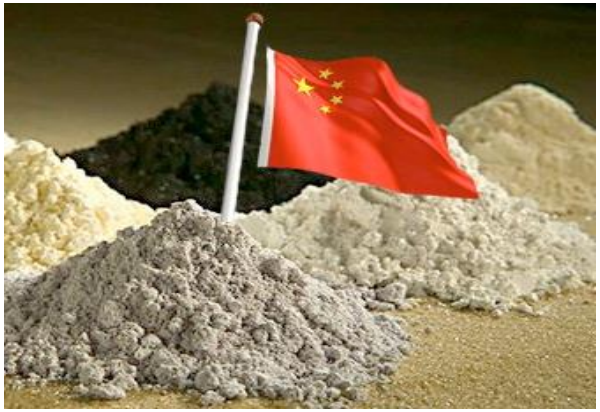
# 2019: We Still Import Energy!

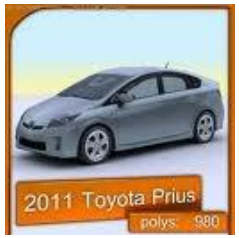
Importing Oil
No Nat Gas!


Importing 9-10 million bbls/day
Mostly Heavy Crude for Diesel!

"Green Technologies"
Rare Earth Elements



China…97%




Batteries, Magnets, Control Rods, Lasers

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# Rare Earth = Problems!!

Air, Water and Land Environmental Disaster!!

1 Ton of Mining of Rare Earths Produces:

- 1 Ton Radioactive Waste Liquids
- 10,000 $M^3$ Waste Gas (S, HF etc)
- 2,000 Tons of Mine Tailings

Source: EWI.ORG, 2016

Google: China, Rare Earths, Leukemia!!

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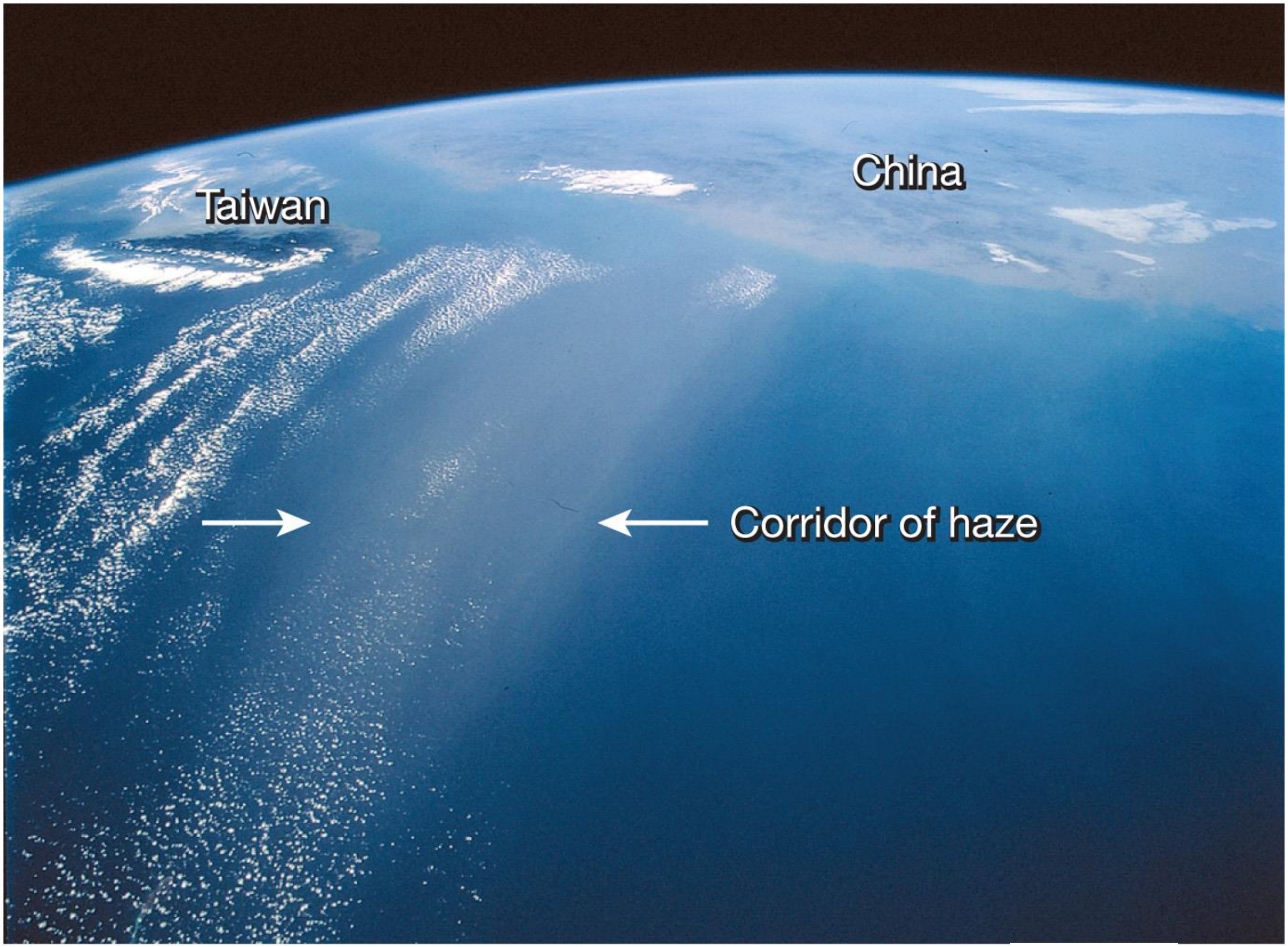
# Air Pollution Haze from China-Climate Change?



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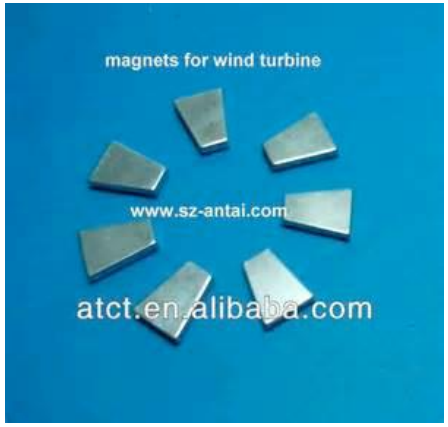
# Wind Generators

2000 lbs of Rare Earth Materials per Wind Turbine!!
45 Wind Turbines = 45 Tons of REMs From China!!

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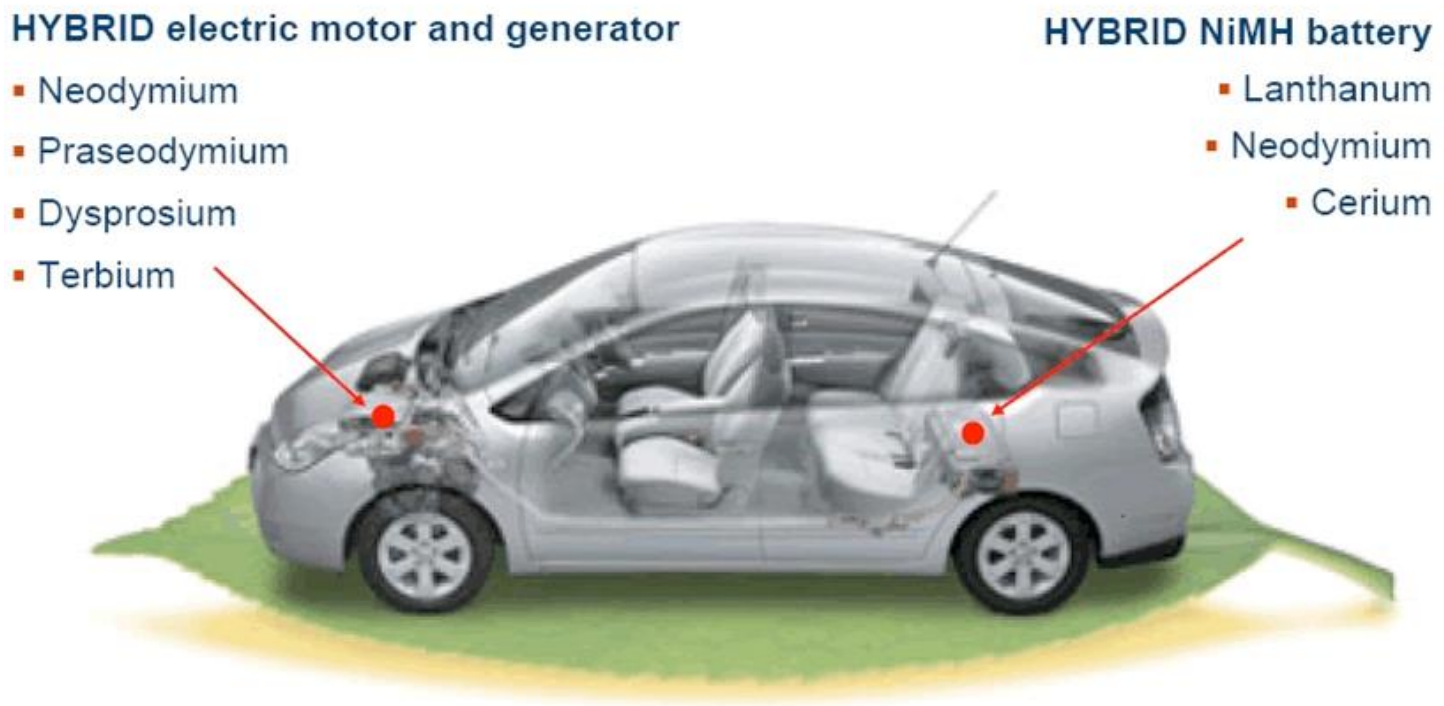
The U.S. has about 60,000 “Clean Energy” Wind Turbines
*Source: American Wind Association*
That’s 58,000 Tons of RE and 58,000 Tons of Radioactive Waste!!
Need 583,000 Wind turbines for Total US Energy Needs!!

# The Electric Car




Great concept—Use batteries and electric motors
Average Electric Car has >10 pounds of Rare Earth Materials
The Economist, 2010

1 Million E-Cars = 10 Million lbs of REMs Needed

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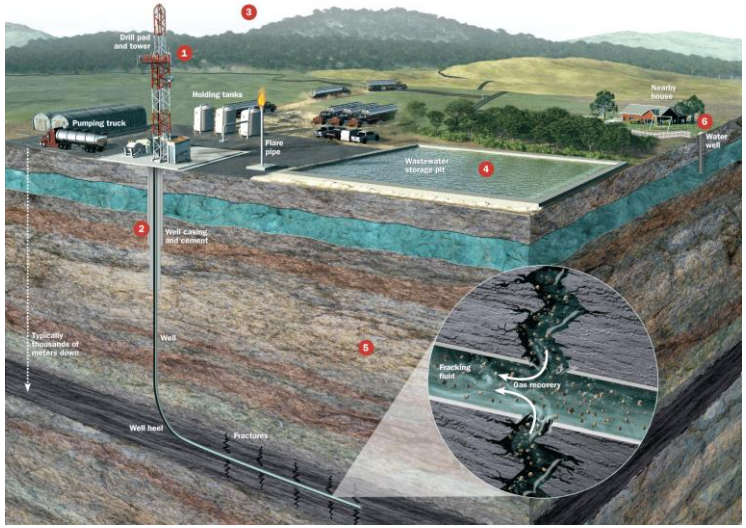
# Natural Gas





# VS Rare Earth's From China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"May be Hazardous To your Health If You Work in China"

7,000 Batteries!!

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# Newest Rare Earth Mining by Chinese: Afghanistan and Africa!!
## For Batteries!

# Help Afghans Exploit Their Mineral Riches

By Michael Silver

I met with President Trump recently to discuss American development of Afghanistan's mineral deposits. Afghanistan owns one of the world's richest untapped deposits of rare-earth and critical metals. The Afghans cannot develop these vast deposits on their own, but if they get U.S. help to do the job right, they will have an opportunity to move from a war-torn nation to a self-sustaining economy.

These materials are essential to green technology. A misconception in the environmental movement is that green technology eliminates mining. In fact it simply changes what you mine. You can't build an electric car without neodymium and lanthanum, or produce solar or wind energy without indium and gallium.

No doubt the entire supply chain, from rare-earth ore to a solar panel, has less environmental impact than mining and burning coal, but bottom line it's still mining. And building a multitrillion-dollar infrastructure of wind and solar farms and millions of electric vehicles is going to involve a *lot* of mining. The Afghans are fortunate that plate tectonics pushed much of the good stuff their way, and they are now well-positioned to take advantage.

**China controls the supply of rare-earth and critical metals.**

I proposed this idea to the White House along with a package of suggestions to fill a gaping hole in the plan to rebuild America's manufacturing base. At its most basic, manufacturing has two key operating costs: labor and materials. While the U.S. does a lot of hand-wringing over labor costs, the Chinese are quietly on their way to controlling every important deposit of rare-earth and critical metals on the planet. The only operating rare-earth mine outside China is in California—and three months ago, it was bought by a consortium that granted its Chinese shareholder the exclusive license to sell the ore.

The Chinese aren't evil, merely smart. The U.S. has taken its eyes off the ball, and Afghanistan provides an opportunity to regain the right focus. One obstacle is a media narrative of rapacious Americans stealing the riches of a defenseless nation, while destroying its environment. One recent article opined: "This isn't to say that Afghanistan cannot profit from its resource wealth—it can and should—but that the United States is not the right country to lead that charge."

Have we forgotten our long history of leading the charge, starting with the Marshall Plan? If America is serious about bringing manufacturing back, it needs to get in the minerals game—and to do so in a way that benefits the Afghans and other sovereign owners of these deposits. It's what the Chinese are doing all over the world—building roads, rail lines and power plants in exchange for ground leases.

The U.S. can do it too. It has in the past. I was personally involved in assisting the Chinese government when it began exporting rare-earth metals in the 1990s under Deng Xiaoping's policy of global engagement. Postwar Afghanistan is the perfect test case for Americans to prove that we are as generous to other nations and as thoughtful in advancing our own interests as the earlier Americans who wrote and implemented the Marshall Plan.

*Mr. Silver is chairman and CEO of American Elements.*

WSJ 8/31/17 op ed page

Congo-Kinshasa (The Congo): Is Child Labor the Price for E-Cars? Aug 2017 Copyright © 2017 Deutsche Welle-News Outlet—All Africa

Children as young as seven used for mining **cobalt** in Africa for batteries, says Amnesty International, Jan 2016

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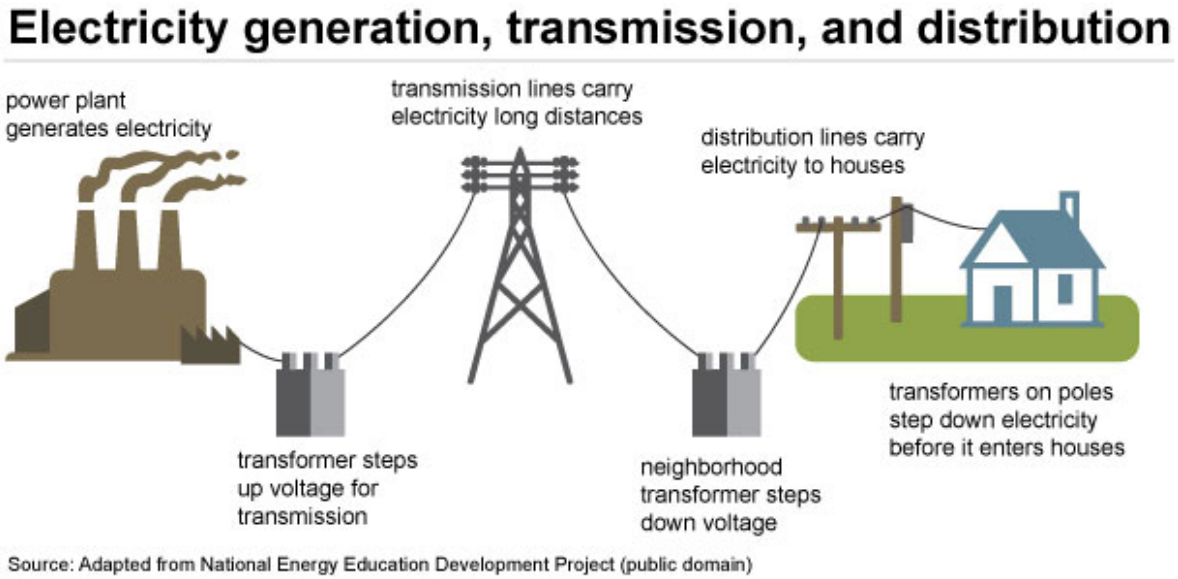
# Needs Electricity!





About 2 Million on World Roads-Project 100 M by 2030
50% of World's Electricity Comes From???

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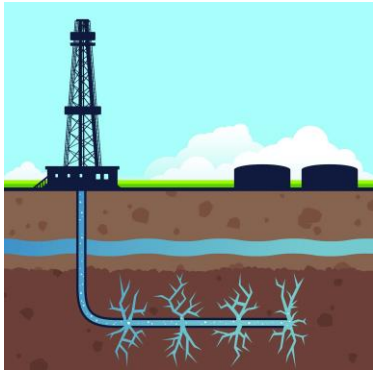
# Our Real Energy Dilemma

3 Laws of Energy (Thermodynamics)—The Good, The Bad & The Ugly
There is No Free Energy—Always a Price
With Any Energy Use -There is Always Waste/Pollution
Oh...And You Must Use Energy!


## The 4 F's of Our Energy-Pick Your Poison!

Foreign Oil

Fukashima



Fracking

"Freaking" Rare Earths!!

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# Global Sellers-Buyers



What will the U.S. be by 2030?

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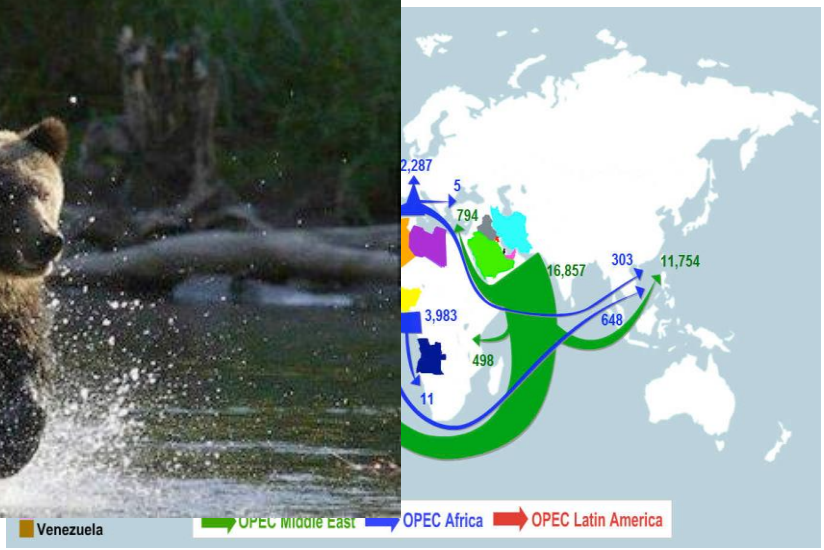
# Who's against U.S. Nat Gas & Oil Exports?


OPEC


Others??

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# Russian Nord Stream 2
# Second Pipeline To Germany



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# New LNG Export Deal with Poland





20 Year Deal-2.7 Bcf/year
15% of Poland's Needs
From New Port Arthur Facility
Starting 2023

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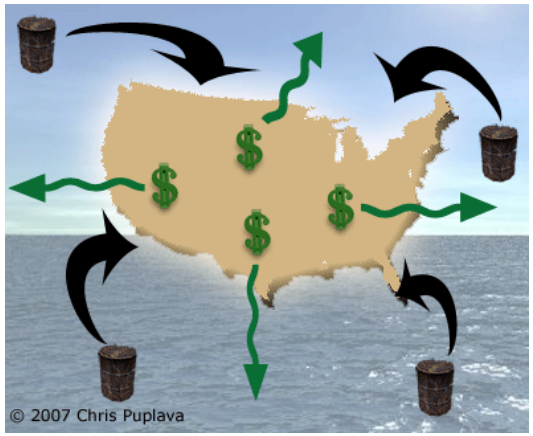
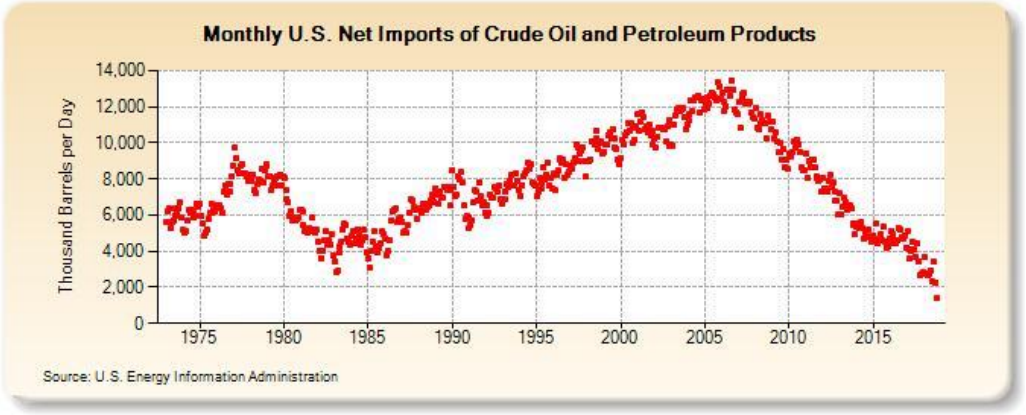
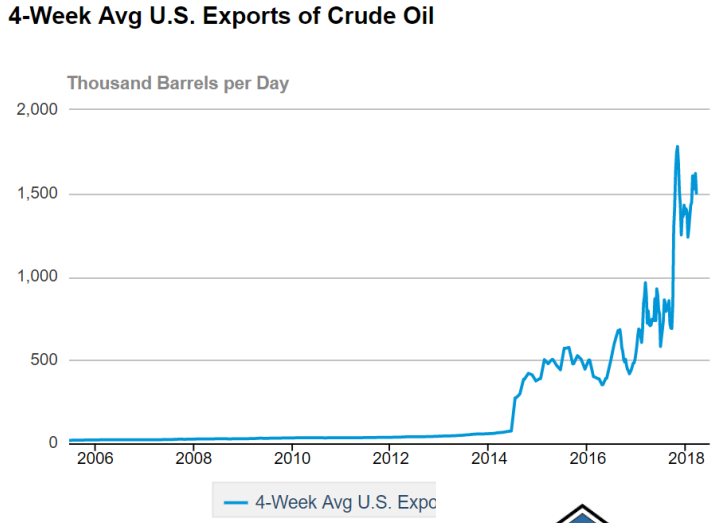
# “Living In The Fast Lane”!





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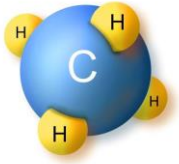
# How we Use Nat Gas

CNG
Transportation Fuel
LNG


Base Fuel-Electricity




Ultra Clean Hydrogen Source

*Clean Air-Clean Fuel For Texas!!*

Back-Up Fuel-Renewables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# An Energy Strategy-
# "It isn't Rocket Science"

- Produce All Of Our Net Energy Needs By 2025
- Export More Nat Gas, Oil & Refined Products
- Sell Energy to Our Friends--$$
- Use $$ to: Invest in Energy Infrastructure
- And Develop Cleaner Technologies & Solutions
- Secure A Sustainable, Cleaner Energy Future

LESS!

MORE!!


Future??

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# The Key is Energy Education

## Texas Natural Gas Foundation—TXNG.ORG

Working with UT Stem Center for Teacher Education

Local ISD's, Industry and Public Input

Promote "Fair and Balanced" Energy Education in Texas

Lesson Plans and Excercises

Free Use in Texas Grades 8-12

Wind
Nat Gas
Solar
Cleaner FF
Hydroelectric
Cleaner Coal
Biofuels
Nuclear
Hydrogen

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# Will Texas School Districts Adopt?


Midland Independent School District


CONNECT • LEAD • SUCCEED



Fort Worth
INDEPENDENT SCHOOL DISTRICT

# What Is Really Green?



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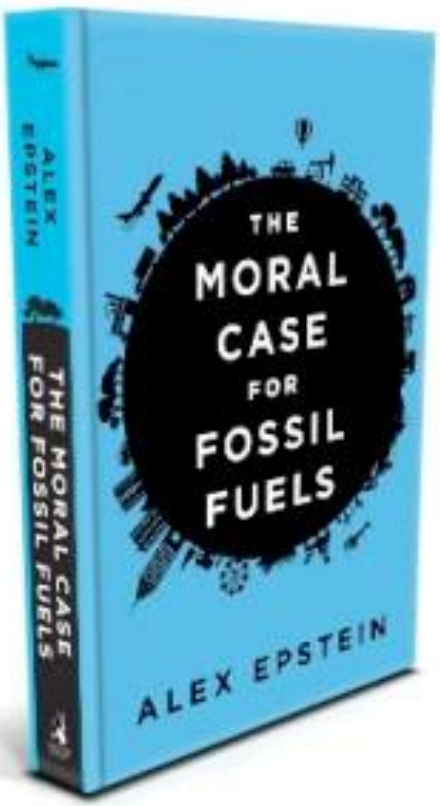
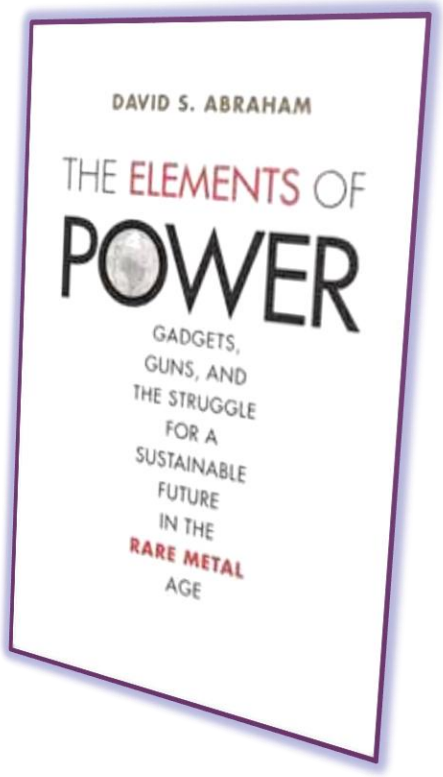
# 2 Books to Read!!

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# CLIMATE CHANGE, GREEN NEW DEAL & OUR DOMESTIC ENERGY FUTURE

Ken Morgan, Ph.D
Texas Natural Gas Foundation, Inc
WWW.TXNG.ORG
k.morgan21@outlook.com
817-845-5451