

**From fossil fuels
to renewable energy**
**--who delivers prosperity and salvation
to our planet**

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Beijing, winter, 2014



© 2002 Credit: Toppan Picturepoint

Great smog, London, 1952



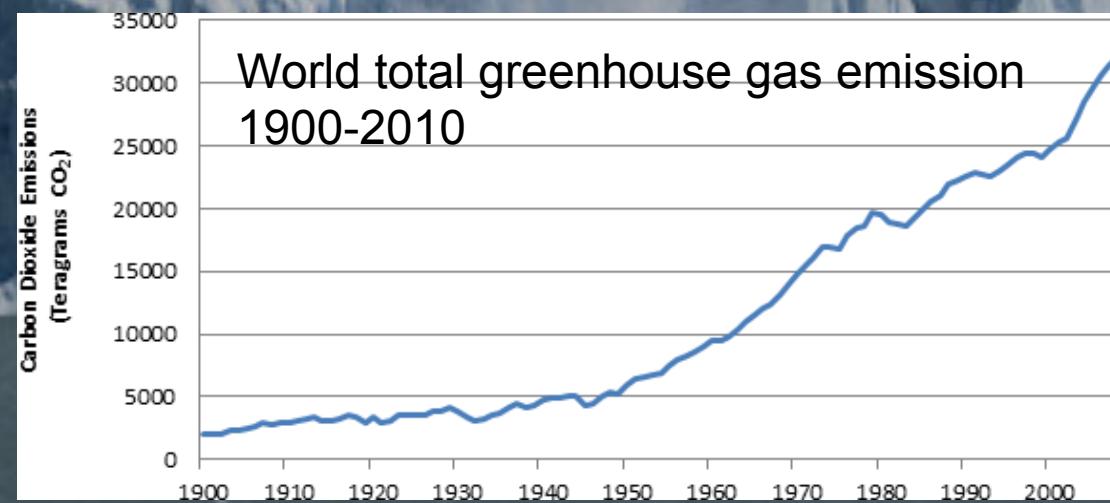
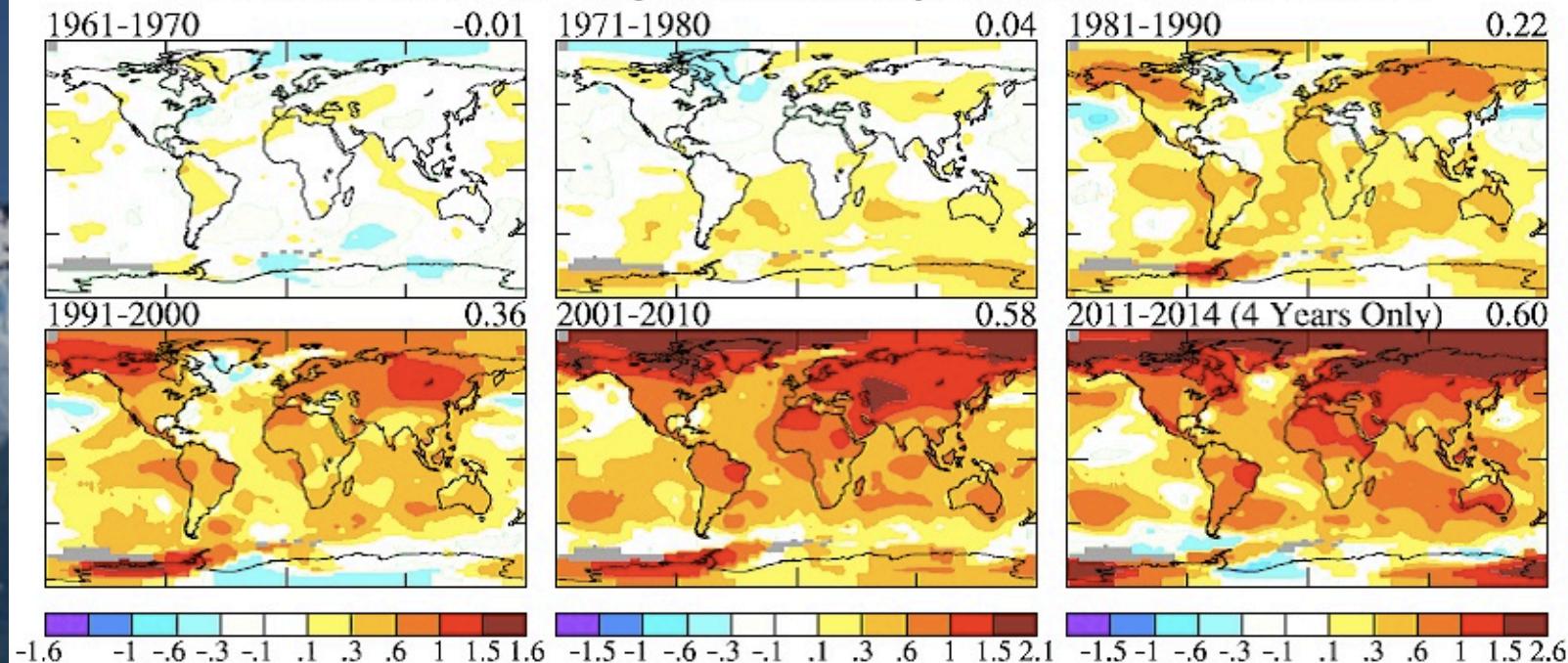
Los Angeles, 1943



Gulf of Mexico, oil spill, 2010

<http://www.dailymail.co.uk>
<http://airfactsjournal.com>
<http://www.nature.com>

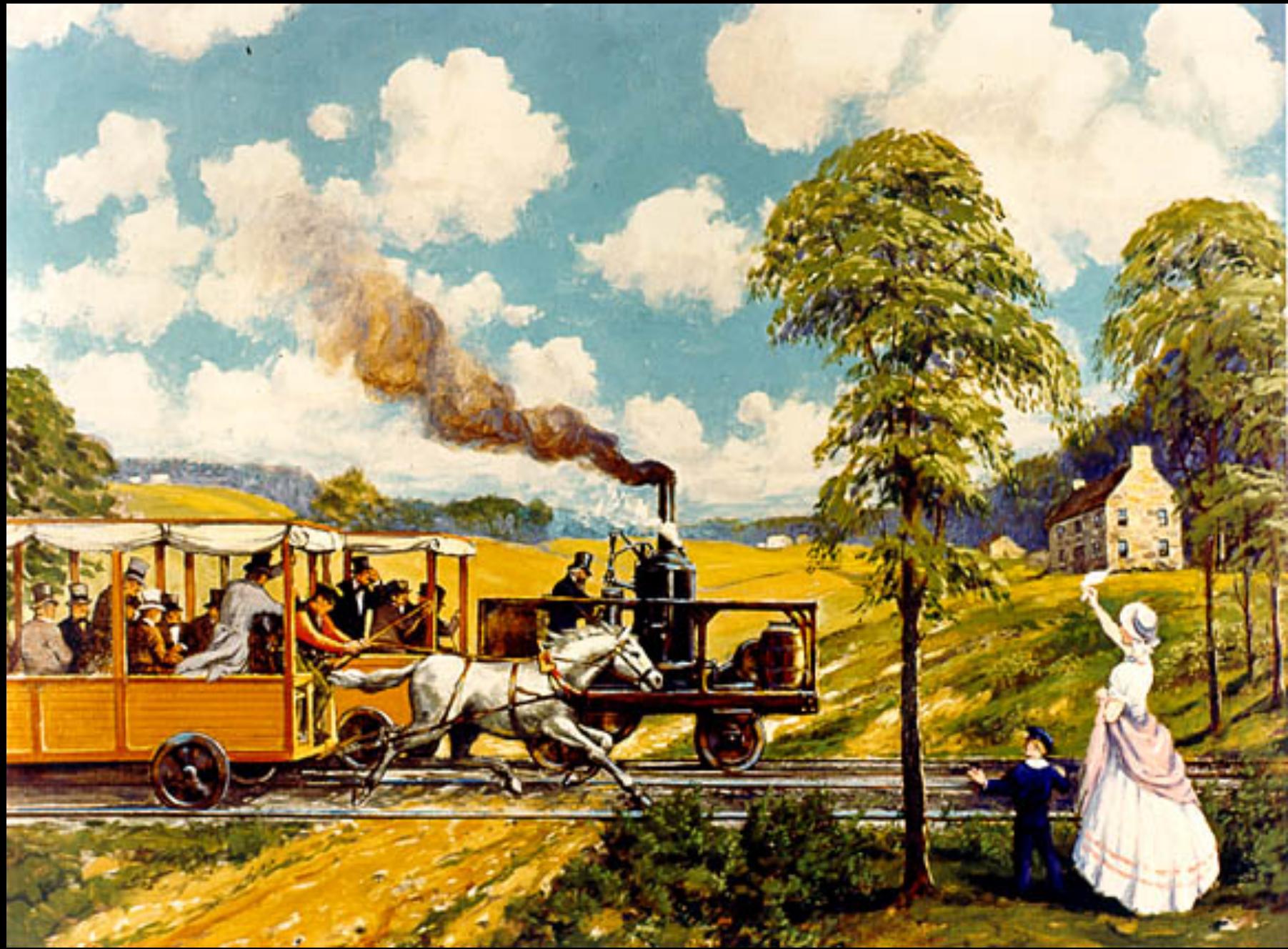
Decadal Mean Surface Temperature Anomaly (°C): 1951-1980 Base Period

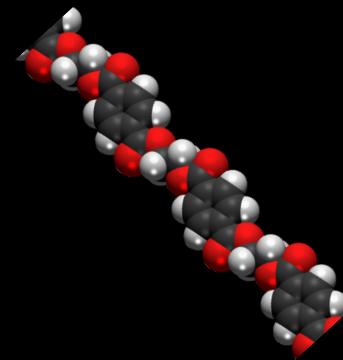
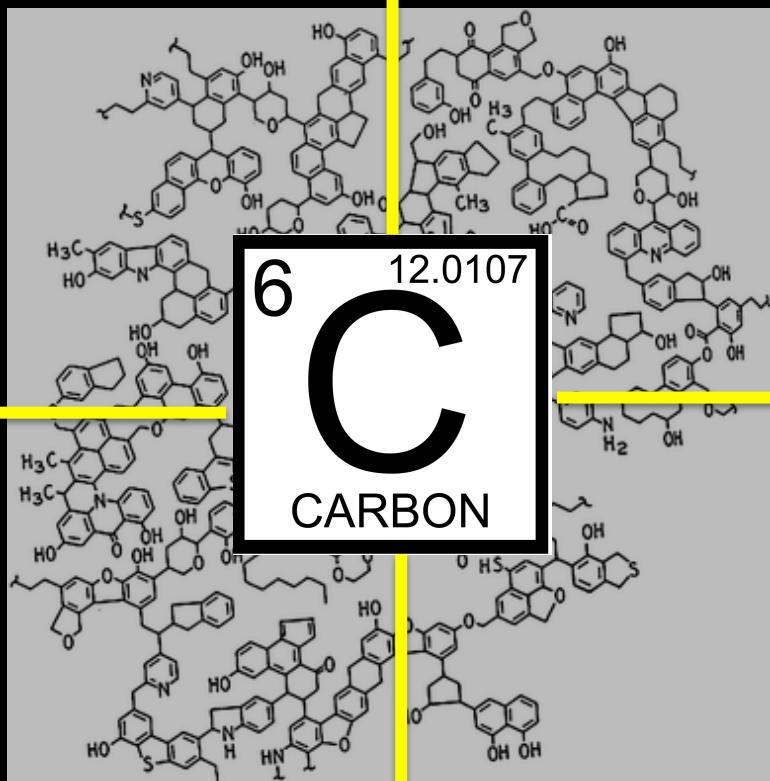


Fossil fuel: amazing gift from God

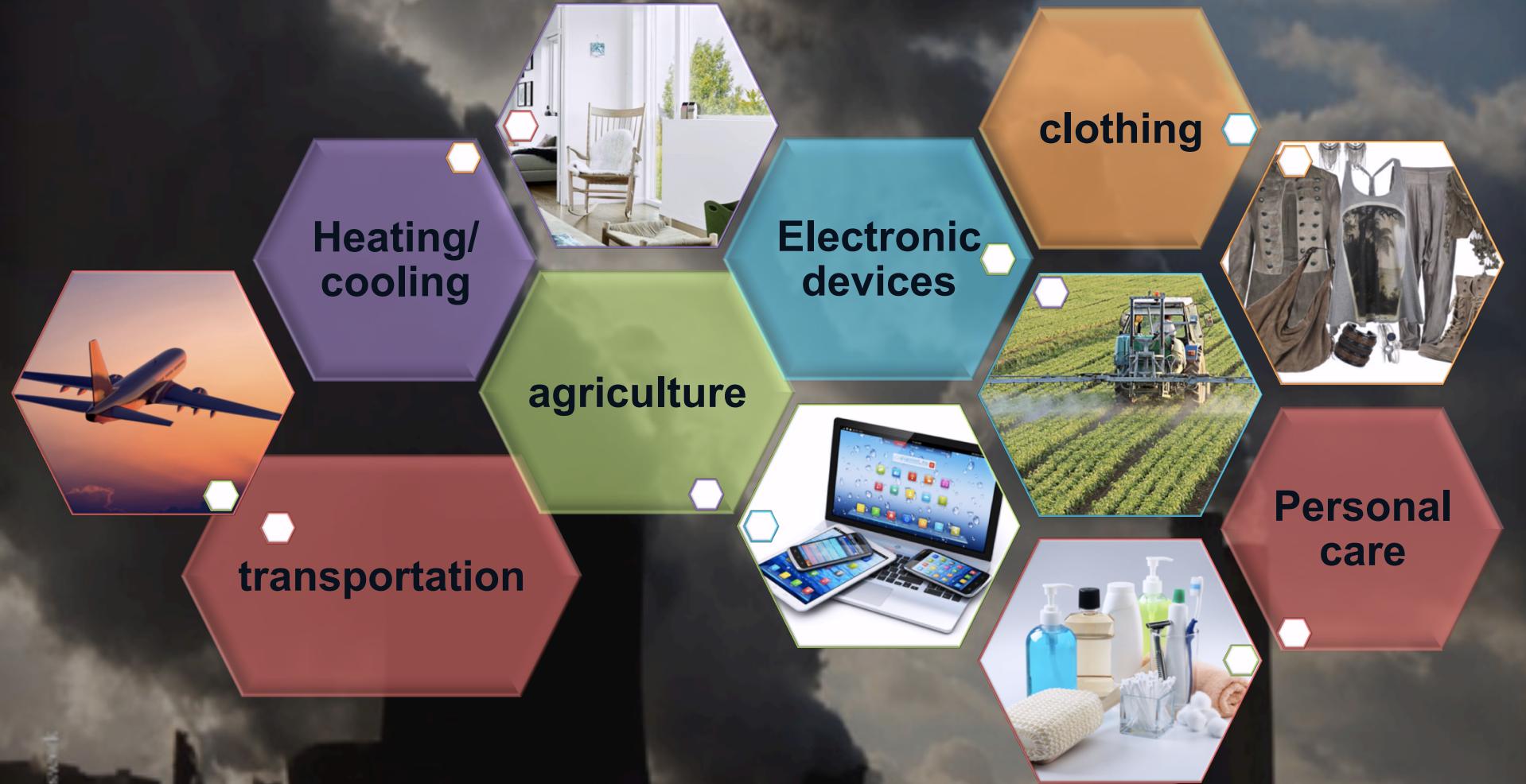
- Higher energy density and calorific value
- Easily available and abundant
- Low cost
- Stable and easy to transport
- Very well developed, easy to set up







We built modern society from fossil fuels



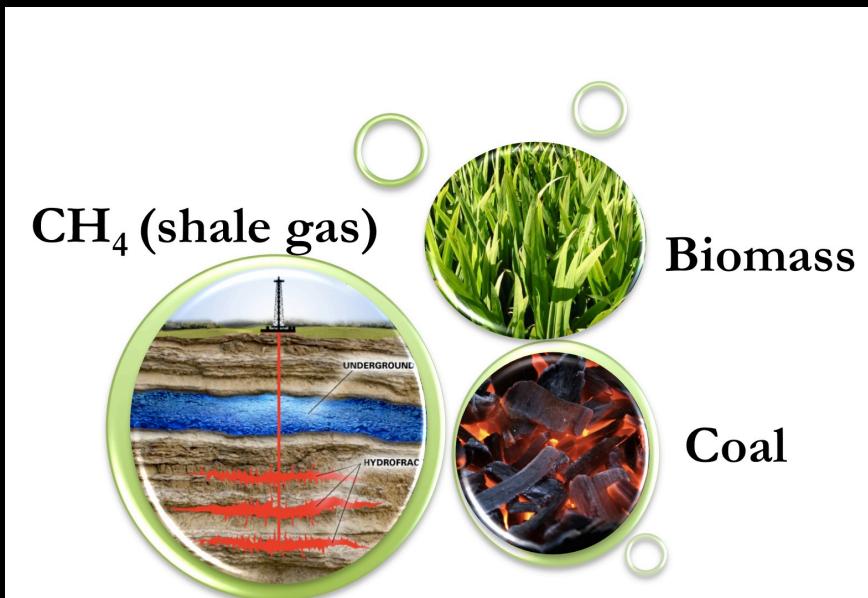
Something we “worship”



China discovered its major oil reservoir, Sep 26th , 1959

Fossil fuels: what we worship can harm us

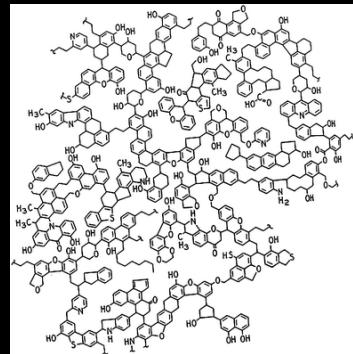
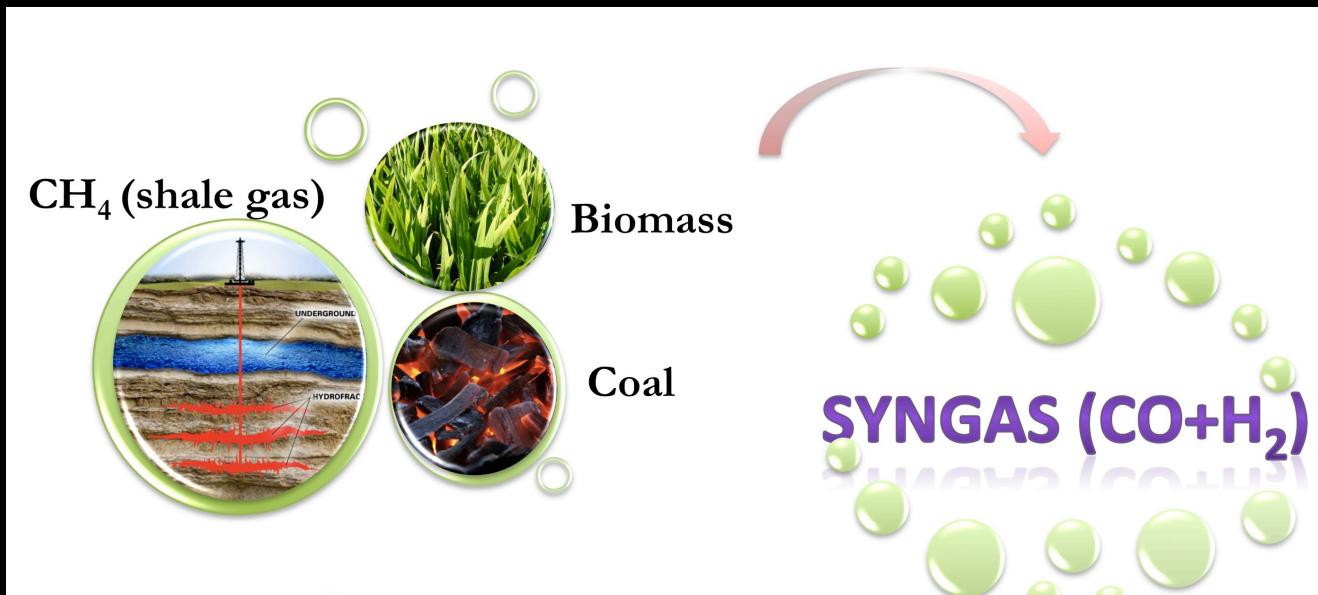
- “Nonrenewable” & “unsustainable”
- Contains N,S,P, heavy metals...generate pollutants
- Emission of green house gases



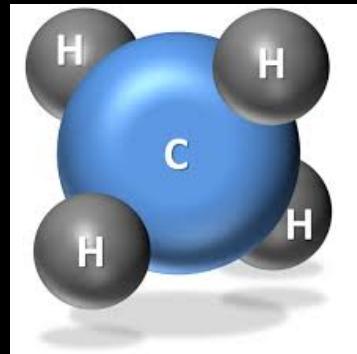
Can we use fossil fuels in a cleaner way?



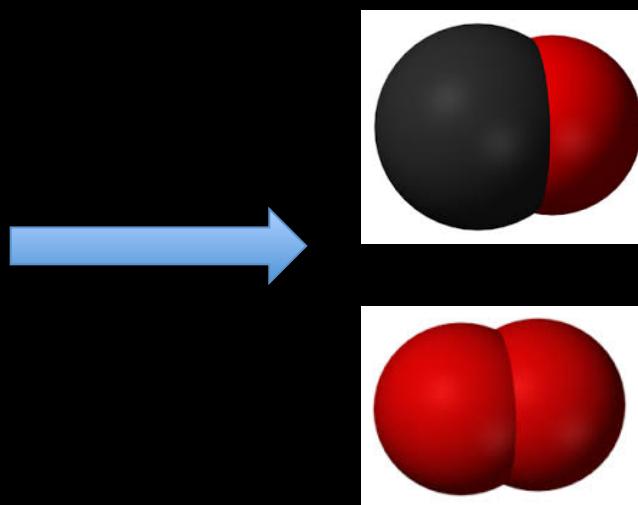
A cleaner way to use fossil fuels



Coal



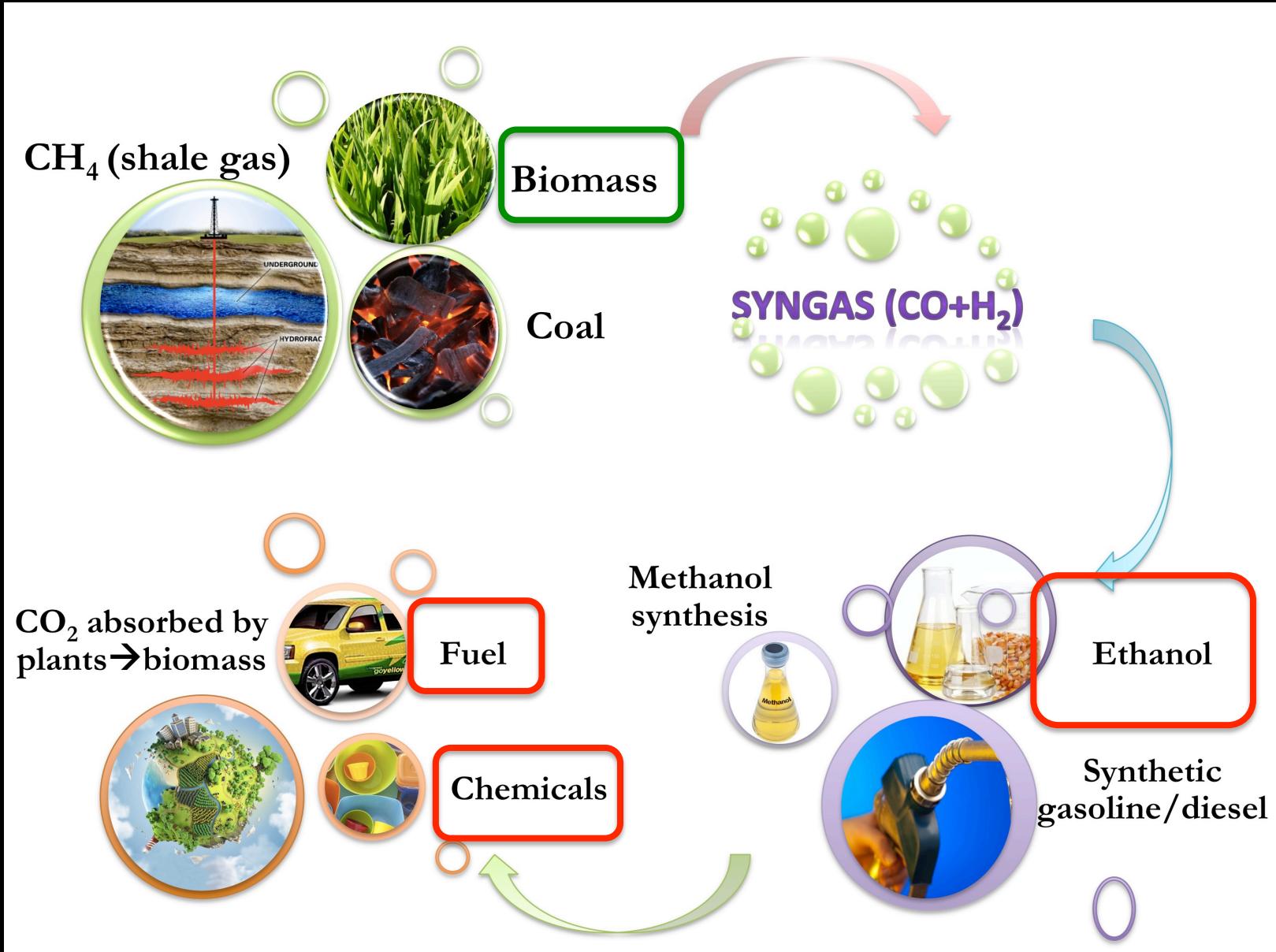
Natural gas



CO

H₂

A cleaner way to use fossil fuels





www.energyandpolicy.org
<http://1unsolar.co>

www.cchem.berkeley.edu
<http://www.bentley.com>

- Every energy resource is provided by God
- It is not that we are so smart, it is because God is so mercy
- Unsustainable V.S. renewable



<https://en.wikipedia.org>

Genesis 1:28 God blessed them and said to them, "Be fruitful and increase in number; fill the earth and subdue it. Rule over the fish in the sea and the birds in the sky and over every living creature that moves on the ground."



Thank you for your attention

Fossil fuels have not changed much,
but they have changed us.

The resource we worship cannot satisfy our ever-increasing needs without harming us.

A cleaner way to use fossil fuels



Ethanol

- High energy density
- Reduce pollutant emission
- Non-toxic
- Liquid, stable
- Basic building block for other valuable chemicals



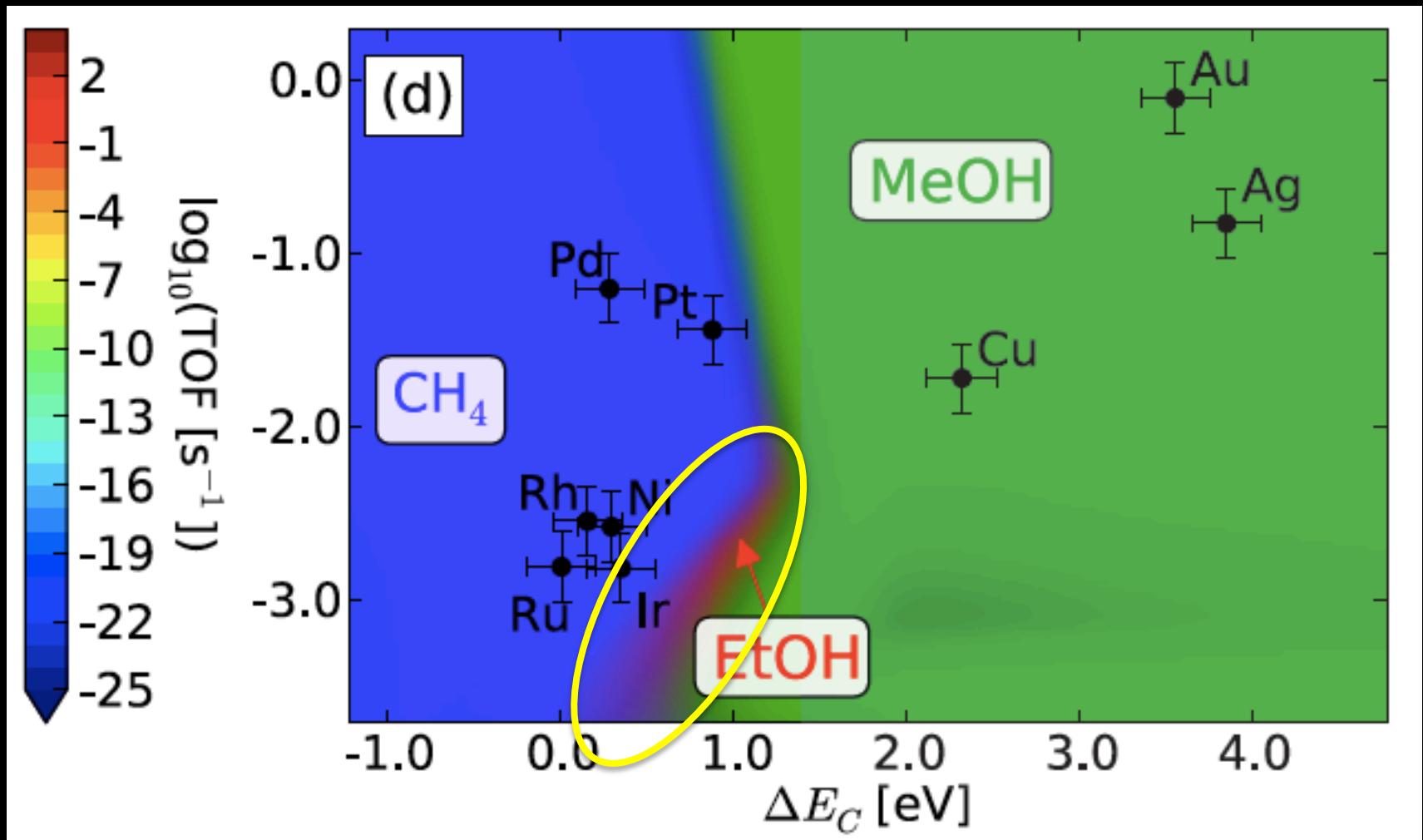
Ethanol from syngas conversion:

- Clean coal solution
- Transform natural gas into easily transportable liquid
- Utilize biomass and organic waste; reduce net carbon emission
- Ease competition with food supply

Scientifically challenging:

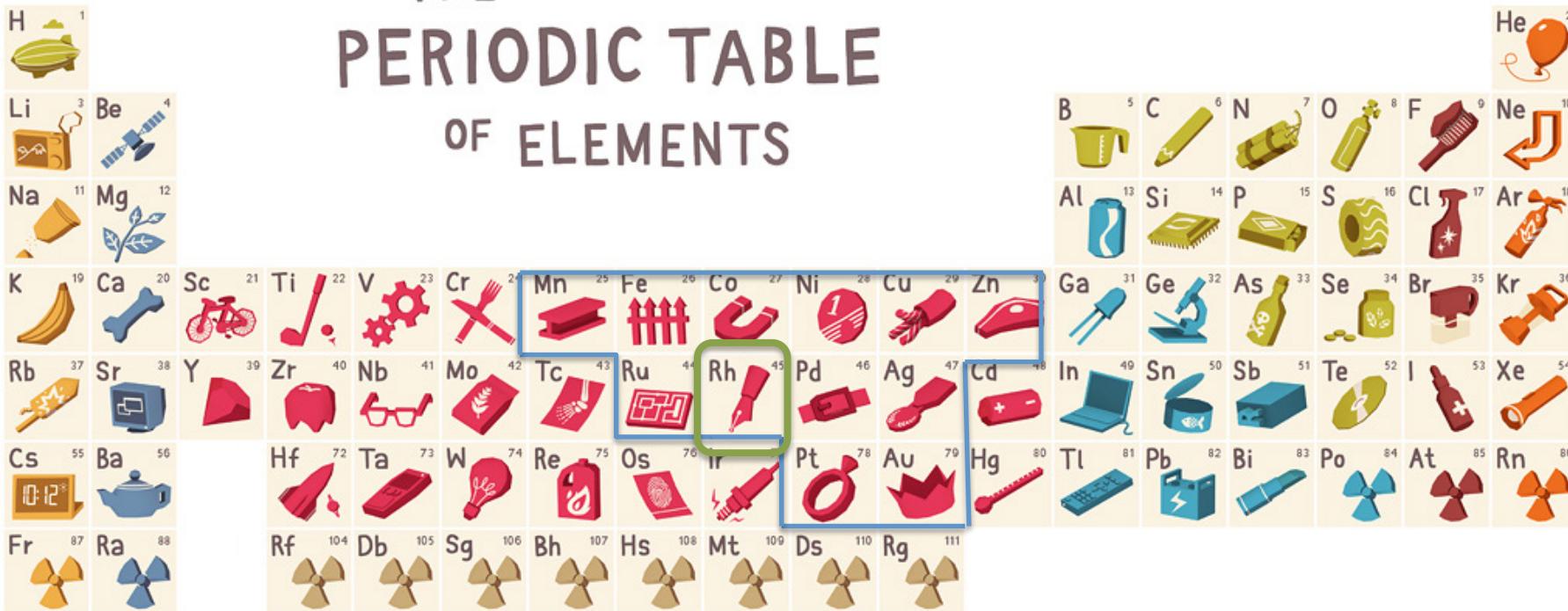
- Model system for understanding higher alcohol synthesis

Challenge: finding the right material



Challenge: finding the right material

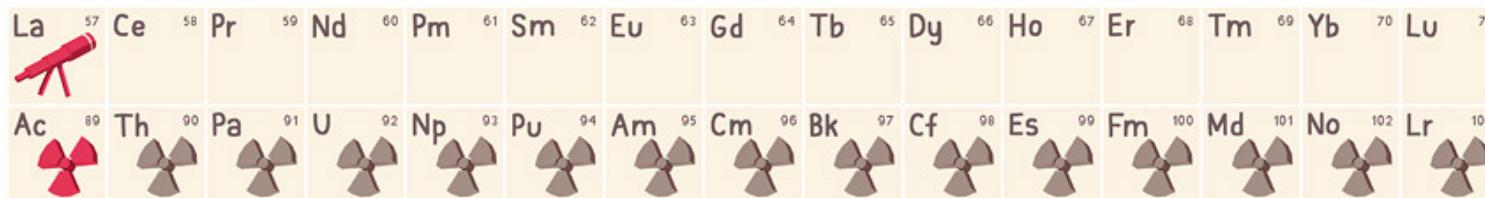
THE PERIODIC TABLE OF ELEMENTS



A periodic table where each element is represented by a small icon. The icons are color-coded by element group:

- Alkali metals (Group 1):** H (balloon), Li (battery), Na (cracker), K (banana), Rb (key), Cs (teapot).
- Alkaline earth metals (Group 2):** Be (satellite), Mg (leaf), Ca (bone), Sr (calculator), Ba (teapot).
- Transition metals (Groups 3-12):** Sc (bicycle), Ti (drumstick), V (gear), Cr (fork), Mn (book), Fe (magnet), Co (fork), Ni (clock), Cu (hand), Zn (steering wheel), Ru (book), Rh (pen), Pd (key), Ag (key), Cd (laptop), Pt (ring), Au (crown), Ir (ring), Hg (fish), Tl (key), Pb (remote), Bi (key), Po (radioactive symbol).
- Post-transition metals (Groups 13-18):** Al (can), Si (chip), P (pillow), S (egg), Cl (spray bottle), Ar (fire extinguisher), Ga (microscope), Ge (bottle), As (bottle), Se (bottle), Br (bottle), Kr (fire extinguisher), In (laptop), Sn (fish), Sb (brick), Te (fish), I (bottle), Xe (key), At (radioactive symbol), Rn (radioactive symbol).
- Actinides (Elements 90-103):** Ac (radioactive symbol), Th (radioactive symbol), Pa (radioactive symbol), U (radioactive symbol), Np (radioactive symbol), Pu (radioactive symbol), Am (radioactive symbol), Cm (radioactive symbol), Bk (radioactive symbol), Cf (radioactive symbol), Es (radioactive symbol), Fm (radioactive symbol), Md (radioactive symbol), No (radioactive symbol), Lr (radioactive symbol).

The elements are arranged in their standard periodic table positions. A blue box highlights the transition metals (Groups 3-12). A green box highlights Rh (Rhenium). A blue box highlights the actinides (Elements 90-103).



A horizontal row of the periodic table showing the actinide series from Lanthanum (La) to Lutetium (Lu). Each element is represented by its symbol and a radioactive symbol icon.

La	57	Ce	58	Pr	59	Nd	60	Pm	61	Sm	62	Eu	63	Gd	64	Tb	65	Dy	66	Ho	67	Er	68	Tm	69	Yb	70	Lu	71
Ac	89	Th	90	Pa	91	U	92	Np	93	Pu	94	Am	95	Cm	96	Bk	97	Cf	98	Es	99	Fm	100	Md	101	No	102	Lr	103

by Annika Tran