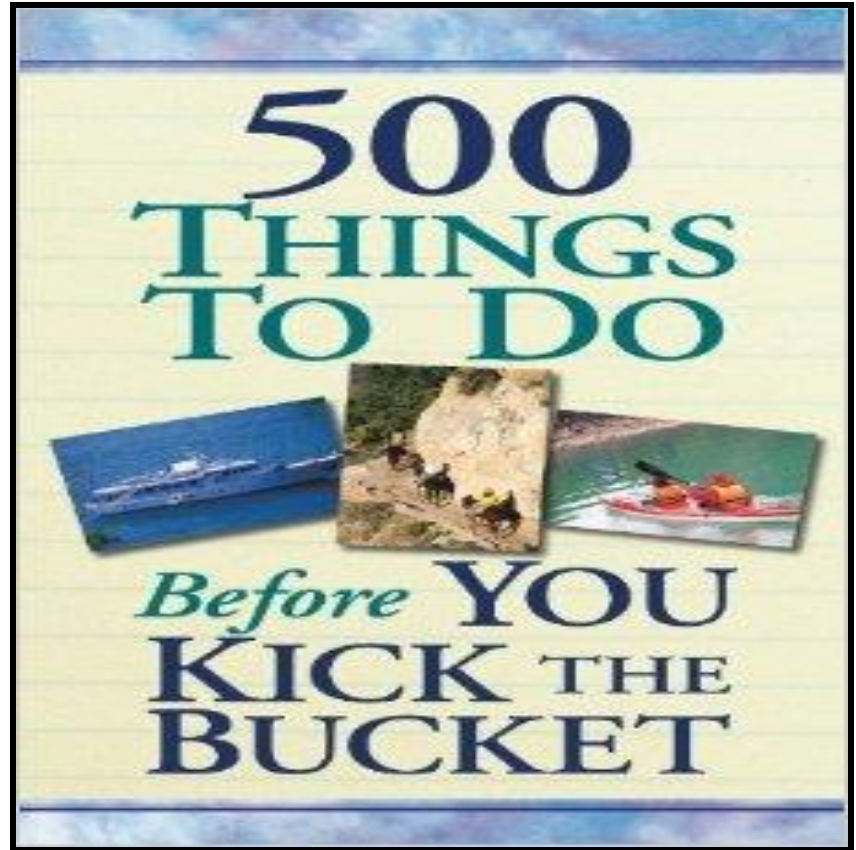
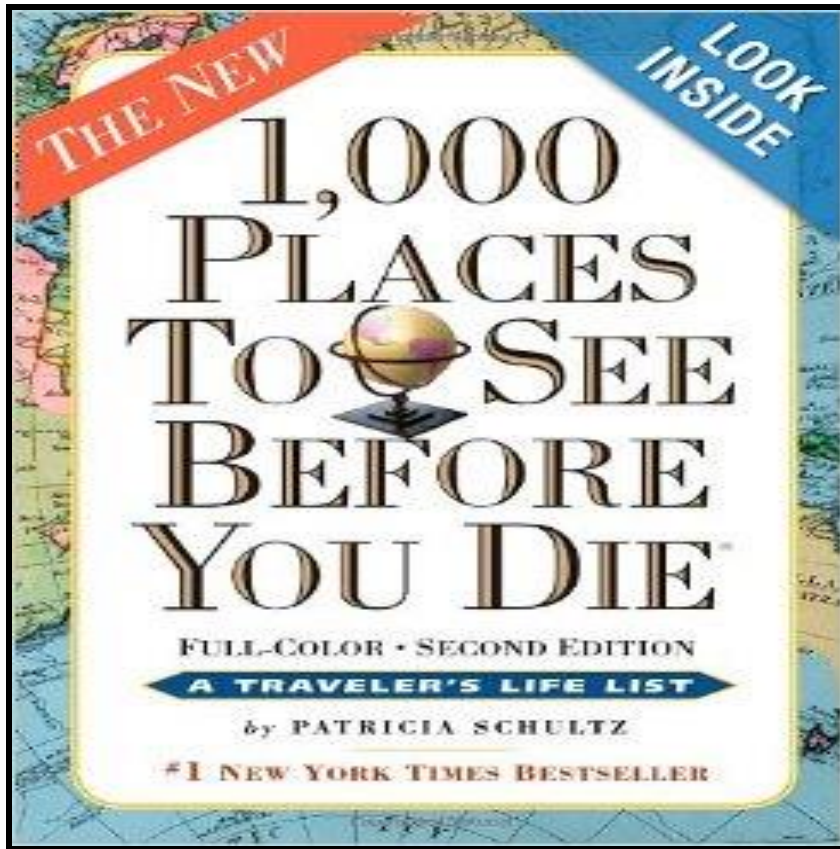


101 Places a Hazardous Materials Professional Must Visit Before They Die!



Rich Cartwright PE, CHMM (Fellow), CPIM (Fellow)

Happy or Unhappy Retirement?



Proactive Semi-Retirement

- Volunteer AHMP Goodwill Ambassador
- Daily LinkedIn & Facebook HMM Blogger
- YMCA “America’s Got Talent” Dance Team
- Senior Citizen Community College Student taking **free** “STEAM” courses
- “Rent-A-Cartwright” part-time “1099” independent contractor jobs
- Personal bucket list of places, with HMM historical significance, to visit before I die!

Cartwright Family Vacation Slides



Hazardous Materials Are Everywhere!



**Which sites have made the greatest impact
on our hazardous materials profession?**

Paracelsus (1493-1541)

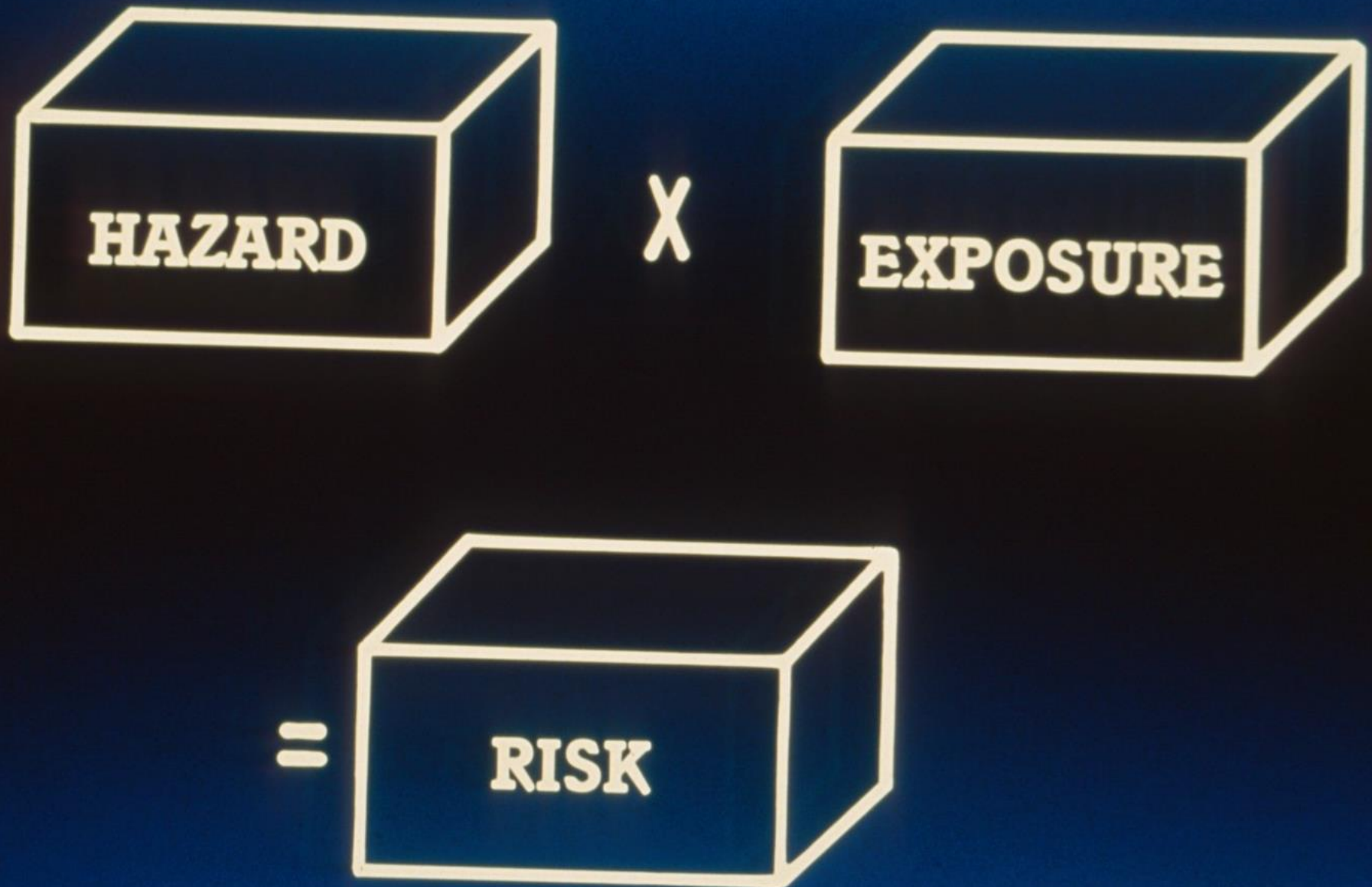
Historical CHMM #001

Alchemist, Industrial Hygienist & Toxicologist

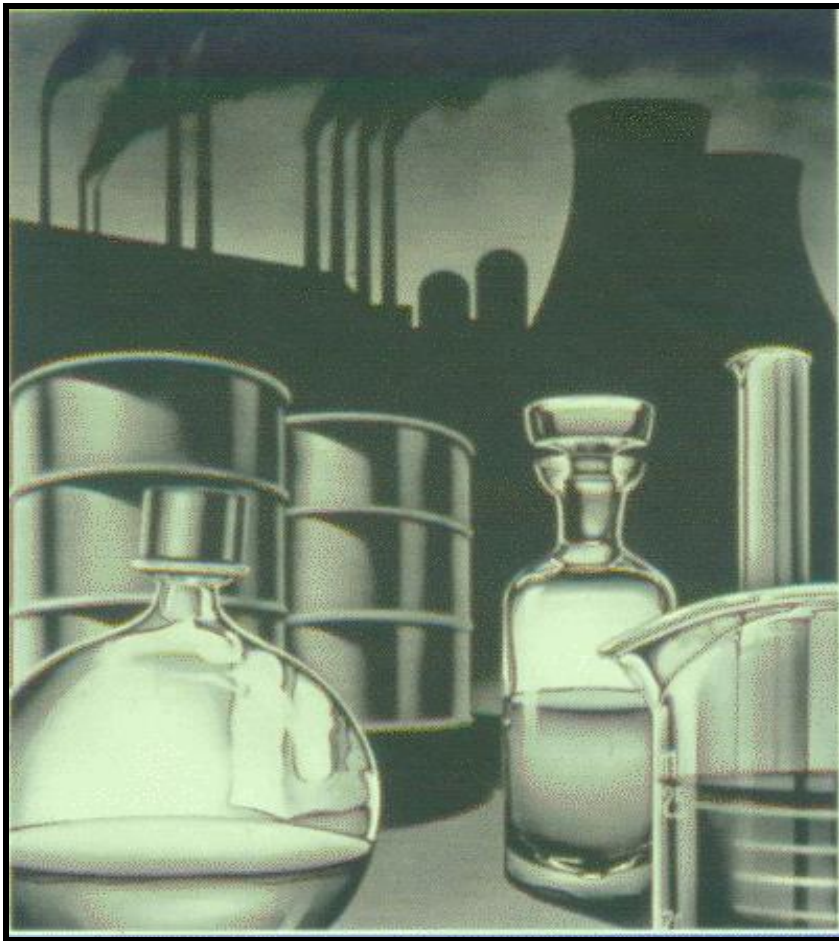


**All substances are
“poisonous”; there is
none which is not a
“poison”. Right dose
differentiates poison
and a remedy**

Fundamental HazMat Risk Equation

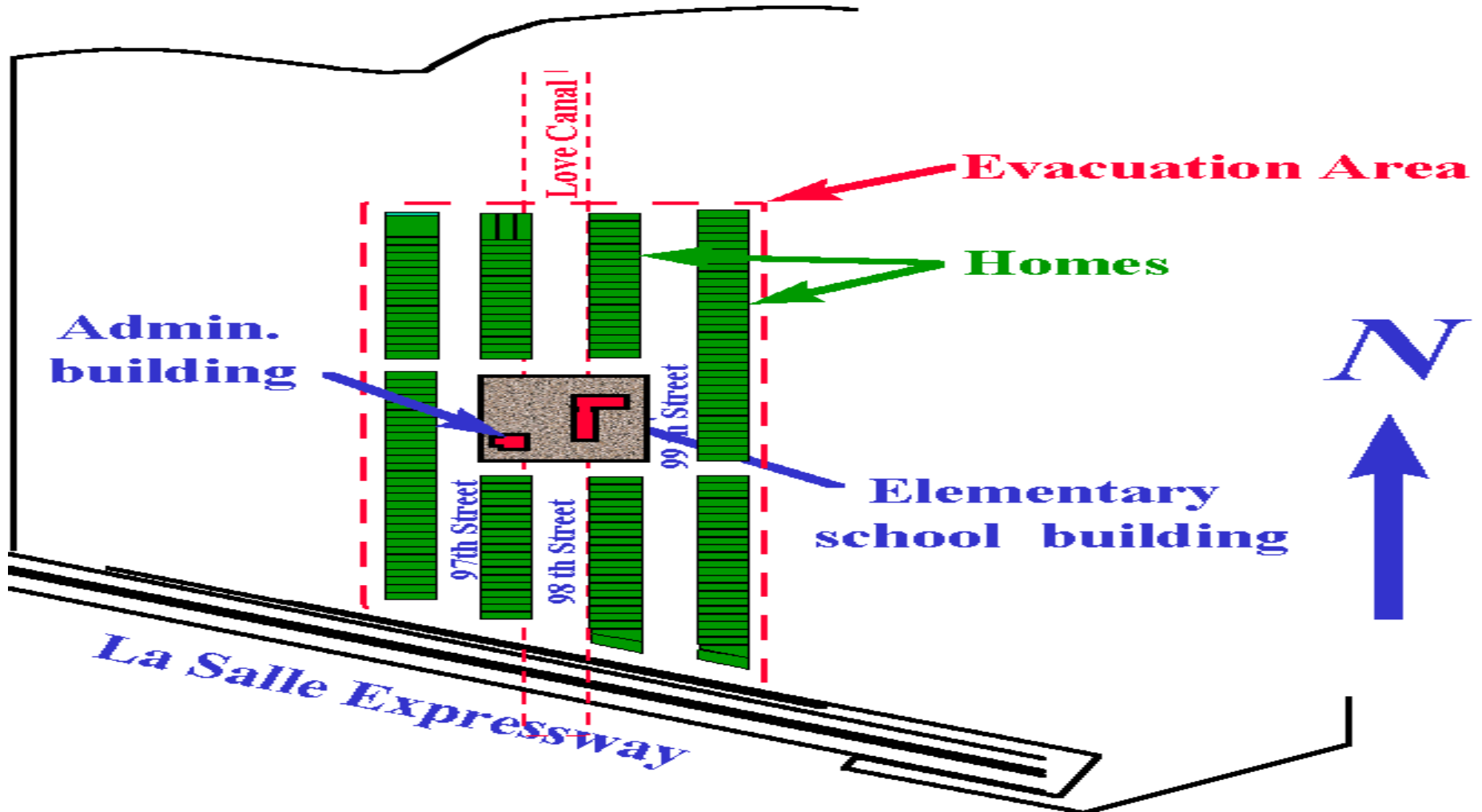


Better Living Through Chemistry?



Love Canal 1978

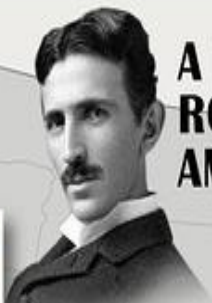
Nation shocked by contaminated neighborhood in Niagara Falls, NY



Love Canal Tour @ Niagara Falls



A NIKOLA TESLA ROADTRIP ACROSS AMERICA



CALIFORNIA
Fremont, Calif.
Palo Alto, Calif.

NEW YORK
Shoreham, Long Island
New Yorker Hotel
Tesla Corner
Liberty Science Center

Niagara Falls Heritage Area
Chicago, Ill.



Thomas Edison National Historical Park



West Orange, New Jersey
where America's greatest
inventor changed our world forever

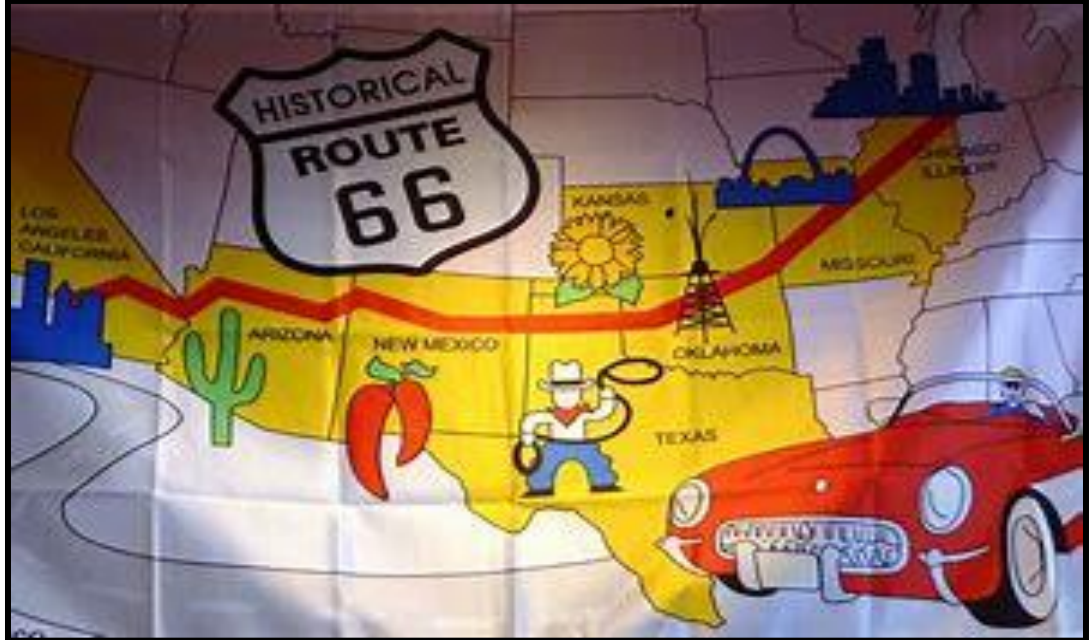
Bhopal, India

December 3, 1984

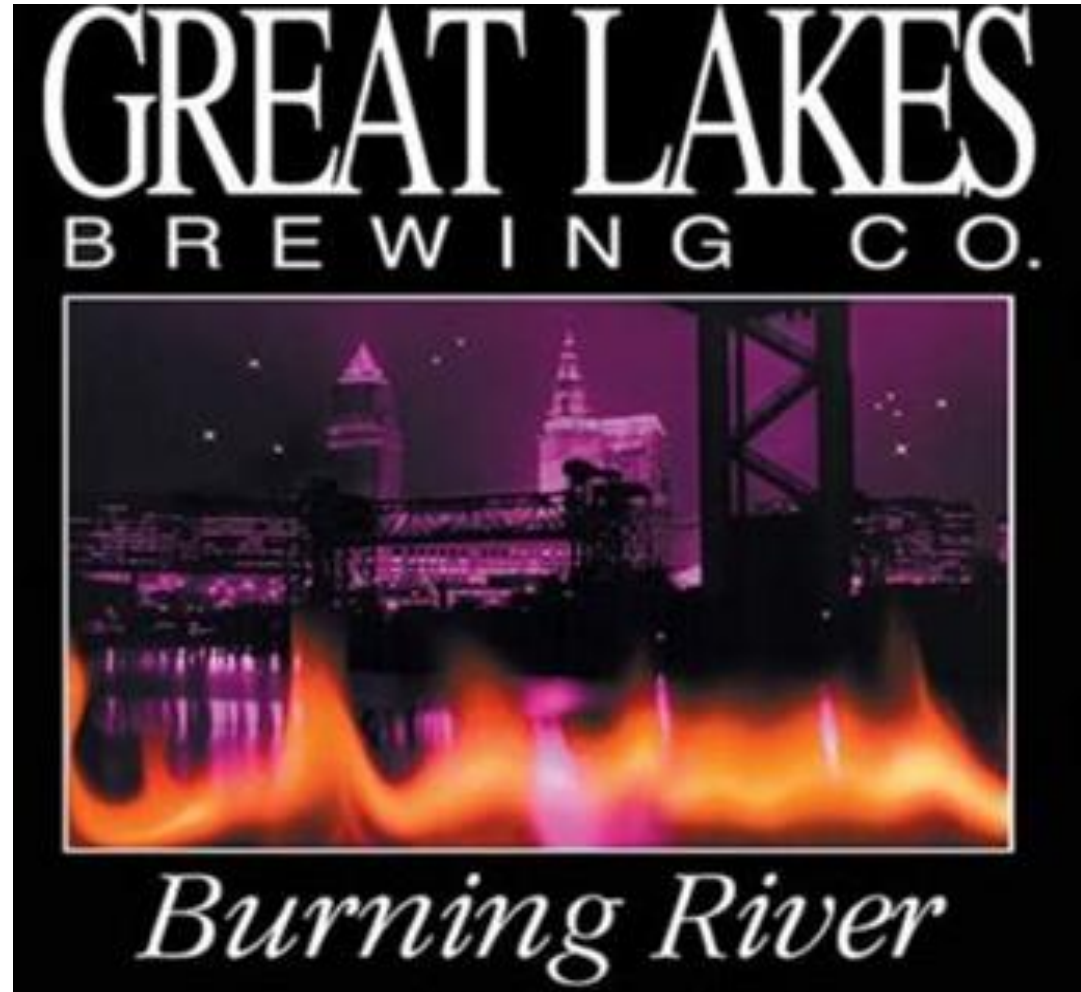


Union Carbide paid \$470 million damages, half a million people exposed, 2,259 immediate deaths, 60-80 thousand long-term deaths

Times Beach, Missouri



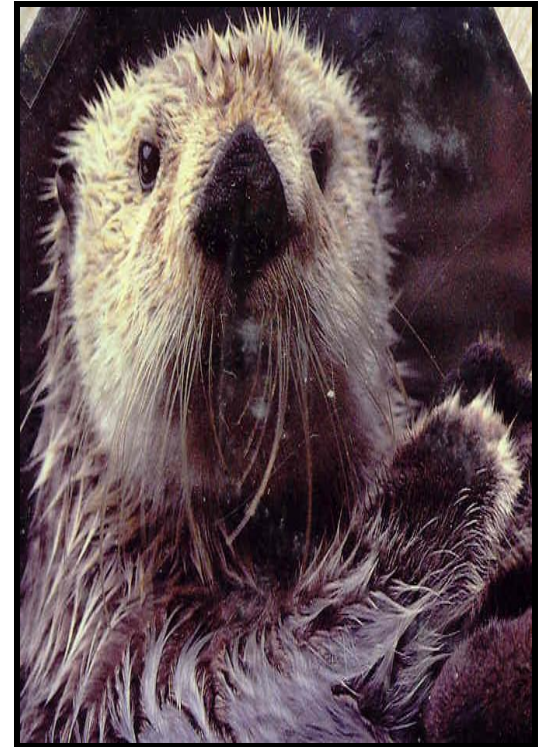
- June 22, 1969 Cuyahoga River fire
- Made Cleveland butt of many jokes



Resulting Regulation - CWA

Exxon Valdez Oil Spill

March 24, 1989



Ten Million Gallons of Crude Oil Was Spilled

Deep Water Horizon Explosion-2010

Crude oil spilled into Gulf of Mexico at 2 million gallons per day for three months



Donora, Pennsylvania 1948

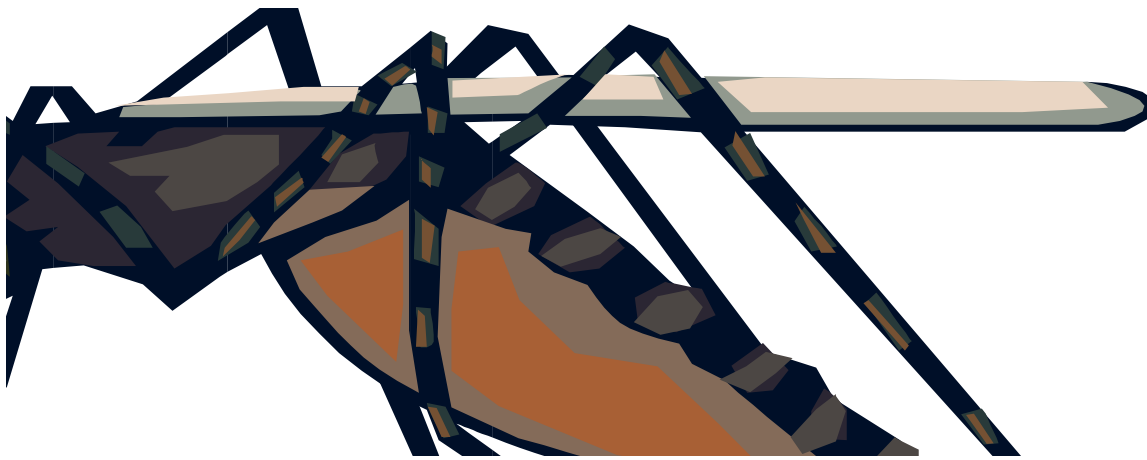


- Temperature inversion trapped stagnant air
- Thick, yellowish, acrid smog accumulated for 5 days
- 2,000 people became sick & 20 people died

“Silent Spring” (1962)

- Misuse of pesticides threatened balance of nature
- Book became symbol of environmental movement





1948: Paul Hermann Muller awarded **Nobel Prize** for discovery of dichlorodiphenyltrichloroethane



Rachel Carson Sites



Springdale, Pennsylvania



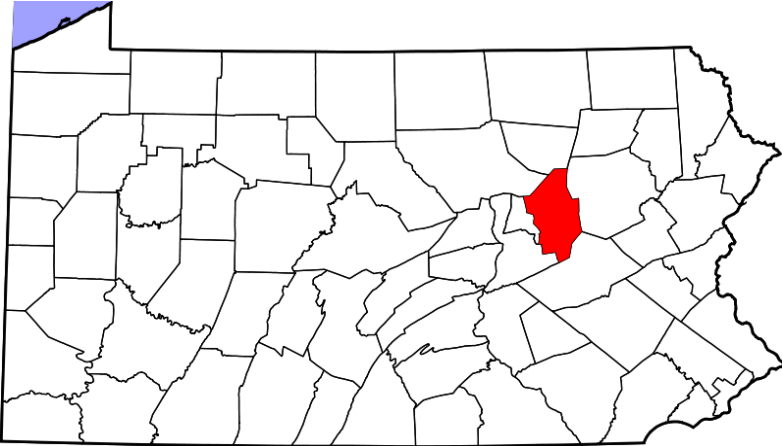
Near Kittery, Maine

Centralia, Pennsylvania Mining Disaster



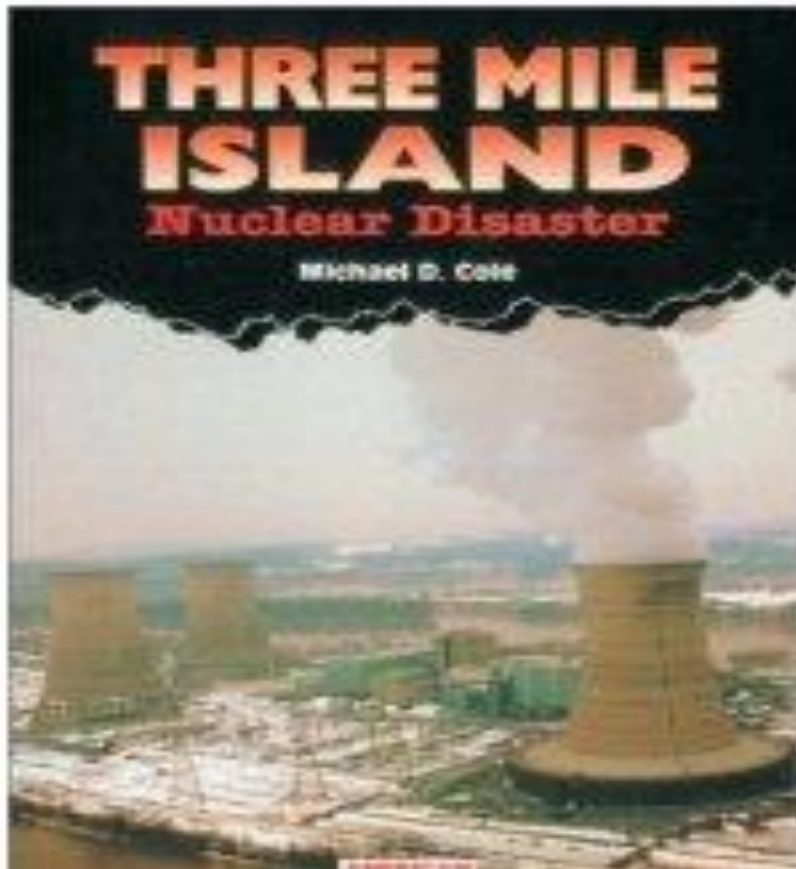
- 1947 coal dust detonation killed 111 miners
- National work stoppage by 400,000 miners
- Congress resolution called on Bureau of Mines to inspect & report violations of federal codes

Centralia, Pennsylvania May 1962 (2,761 population now down to 9)



Three Mile Island Nuclear Accident

March 28, 1979

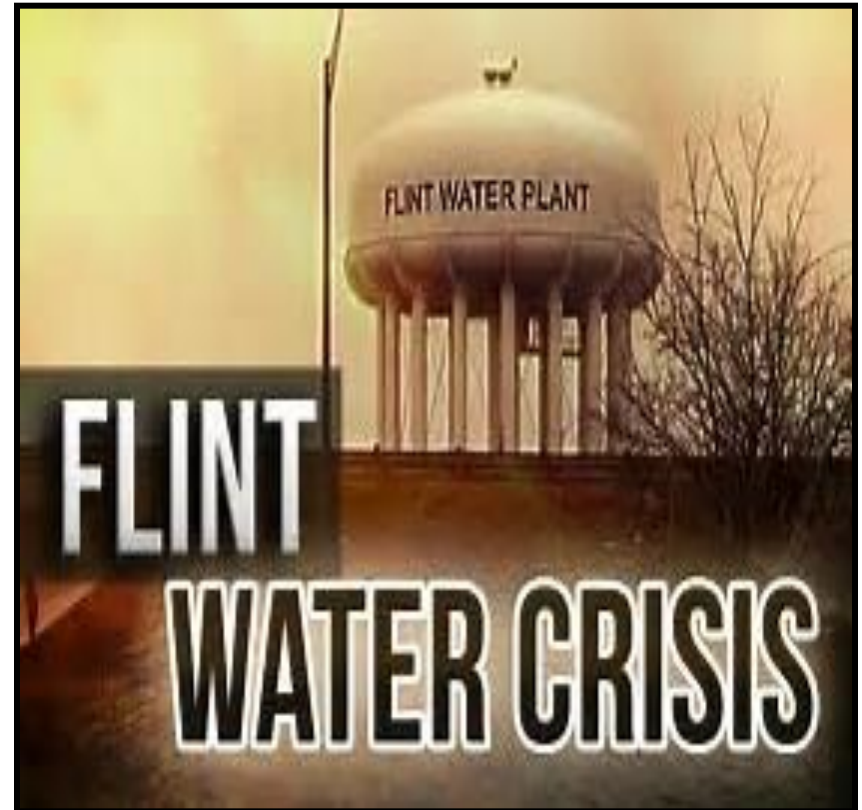


Gettysburg Battlefield National Park

- Wartime brings advances in technology with positive & negative HMM consequences
- Rifled artillery, Minie balls, & breach-loading repeating rifles with brass cartridges

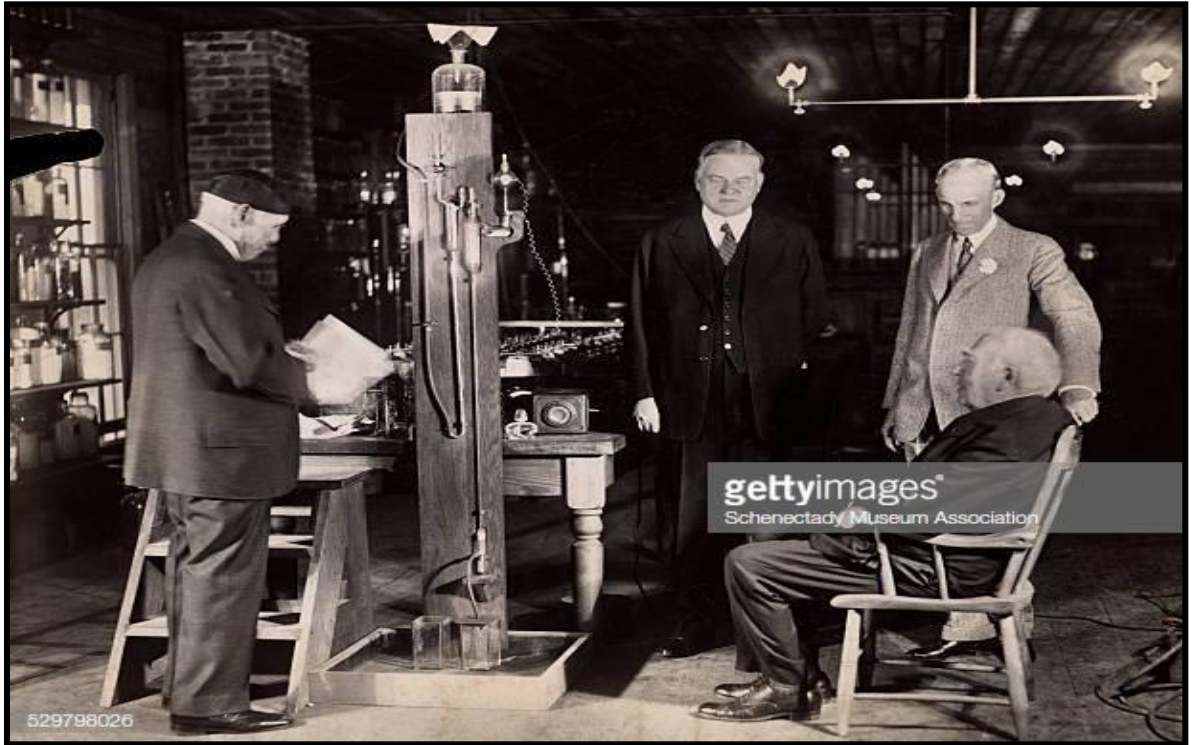
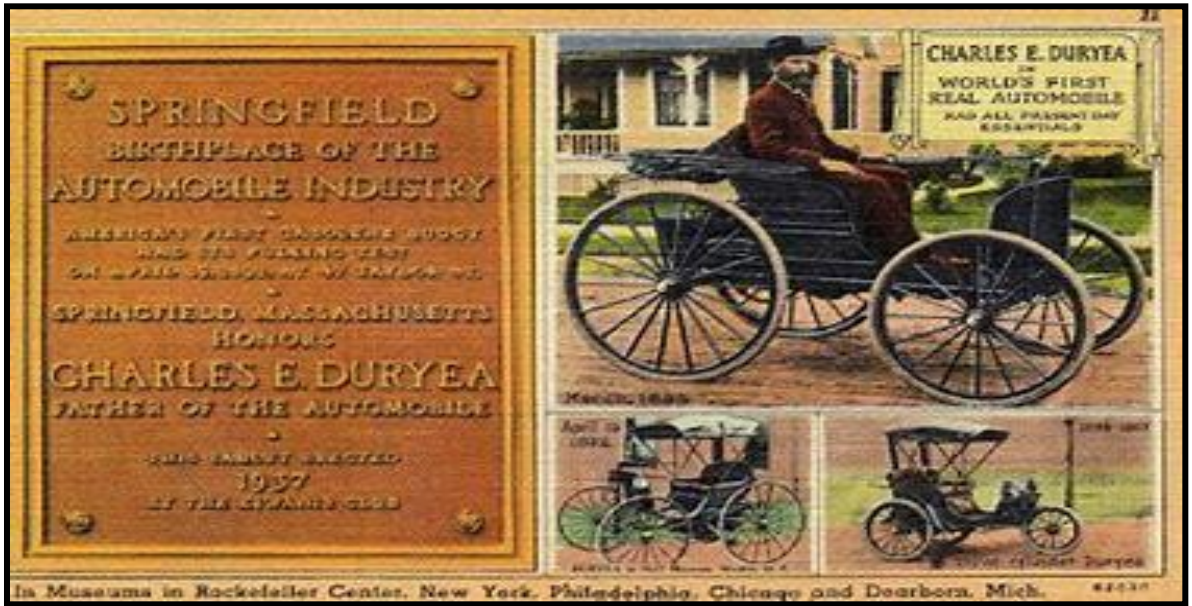


**Flint, Michigan Public Water Supply
pH 8.3 from Lake Huron (Detroit Metro Water)
was switched to Flint River water pH 7.3**



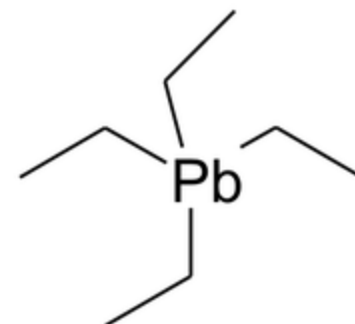
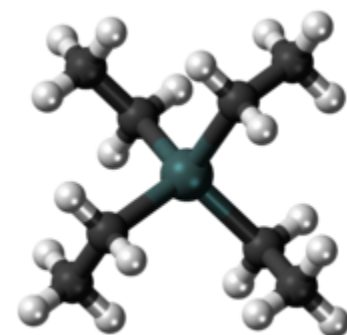
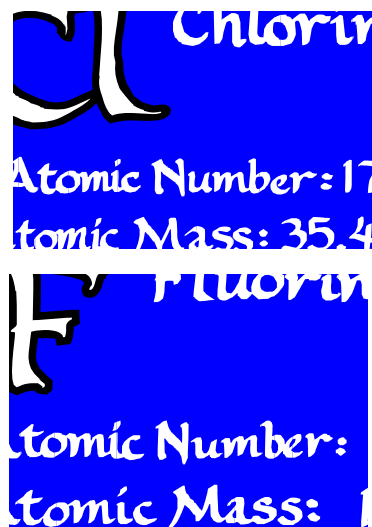
\$100/day phosphate rocks or \$1 Billion?

the Henry Ford



Thomas Midgley, Jr.

- Famous inventor (170 patents)
- Developed **tetraethyl lead** (1921) & **chlorofluorocarbons** (1928)



Dayton Innovation Legacy

People changing our lives



- Midgley suffered from severe lead poisoning
- At a press conference, he poured leaded gasoline all over his hands & sniffed from a flask of it for 60 seconds to prove it was safe
- Killed by another one of his inventions
- Built rope & pulley system to support his body while he was in bed suffering from polio
- Became entangled in the ropes & suffocated

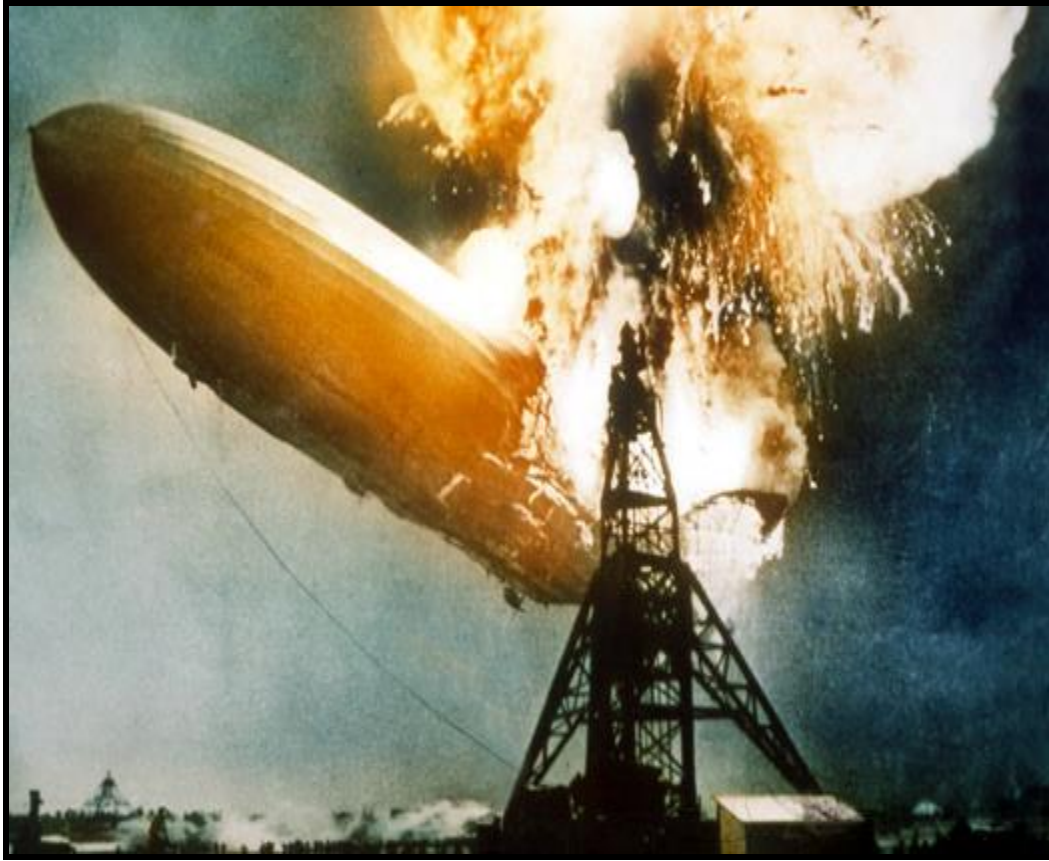
Dayton-Wright Brothers Hometown



Kitty Hawk, Outer Banks, North Carolina

Hydrogen-Filled Dirigible

May 6, 1937



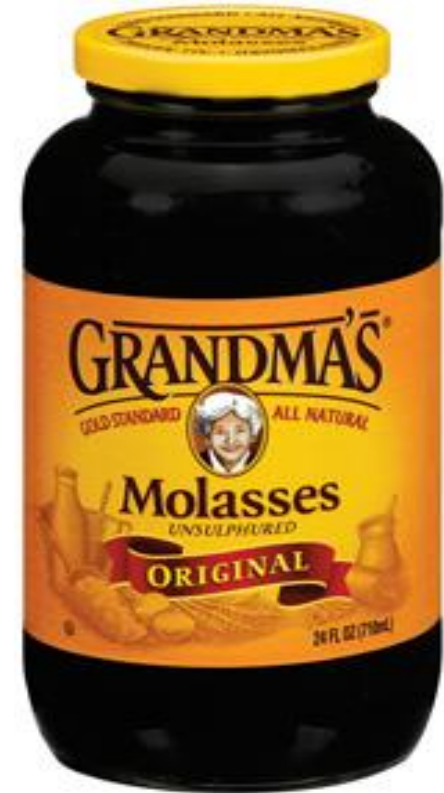
A flame appeared on the outer cover of the rear of the *Hindenburg*. Within 34 seconds, the entire airship was consumed by fire

36 people died in Lakehurst, New Jersey

Boston Hot Molasses Spill

January 15, 1919

“Tidal Wave” of hot liquid molasses flooded streets of downtown Boston, where 21 people died. Suddenly molasses burst from 58-foot-high tank filled with 2.5 million gallons of crude molasses. Eight-foot-high wave of molasses swept away freight cars & caved in the building's doors & windows. Workers in building's cellar had no chance when liquid poured down & overwhelmed them.



Hot Molasses Spill (2)

Huge quantity of molasses flowed into street outside. Knocked over firehouse & pushed over support beams for elevated train line. Hot & sticky liquid drowned & burned five workers at Public Works Department. It took weeks to clean the streets of Boston!



Oklahoma City Bombing

April 19, 1995



168 people died

Oklahoma City National Memorial



Rocky Mountain Arsenal

National Wildlife Refuge



Visitor Center

Sarin Nerve Gas

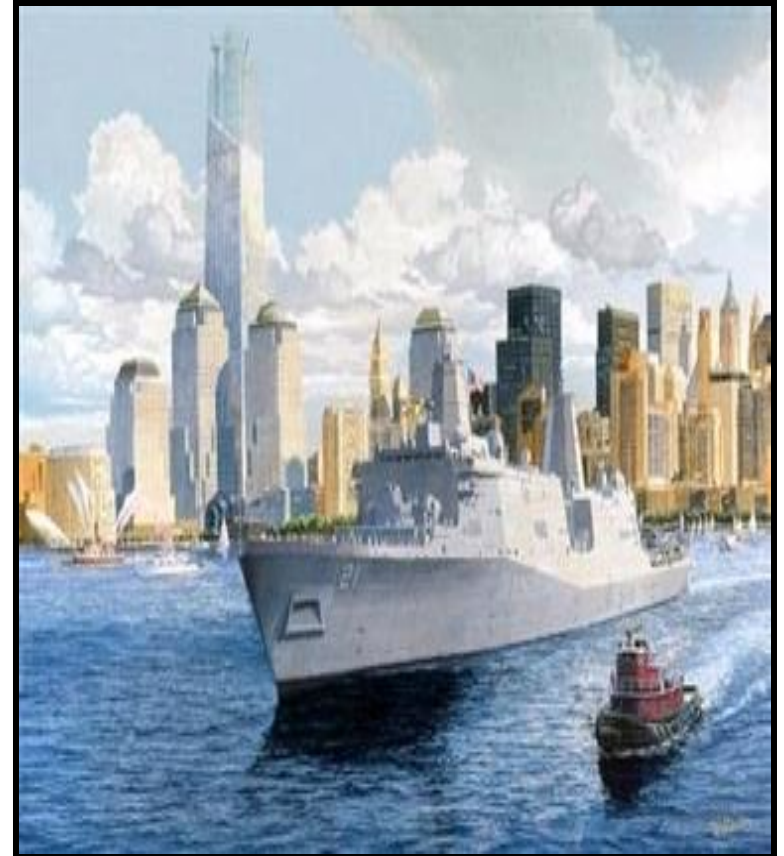
- Sarin vapor is so poisonous a tablespoonful of liquid sarin could kill or disable 25,000 inhabitants if sprayed as a fine mist
- Rocky Mountain Arsenal chemical

weapons manufacturing center stored



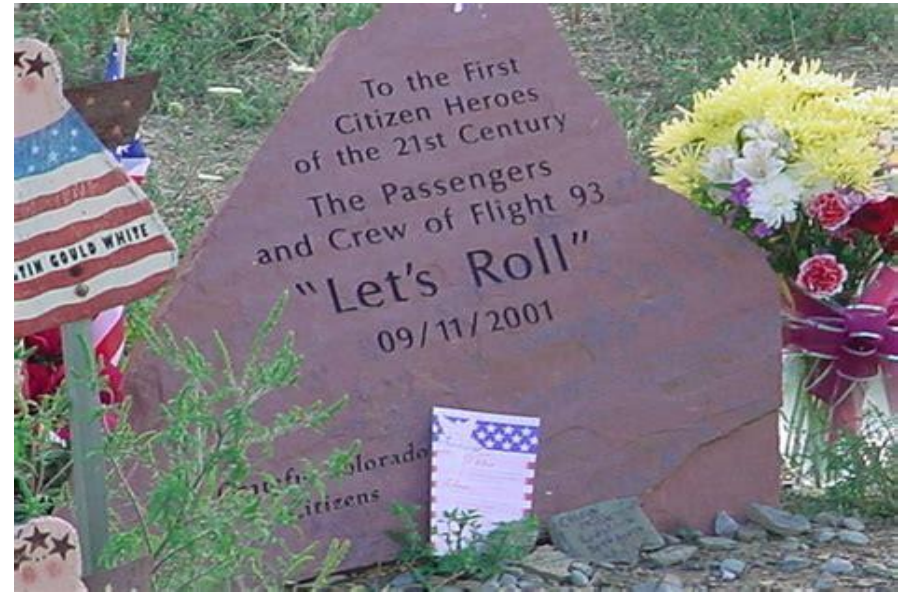
World Trade Center

September 11, 2001



Ground Zero

9/11 Memorials



Hiroshima

August 6, 1945

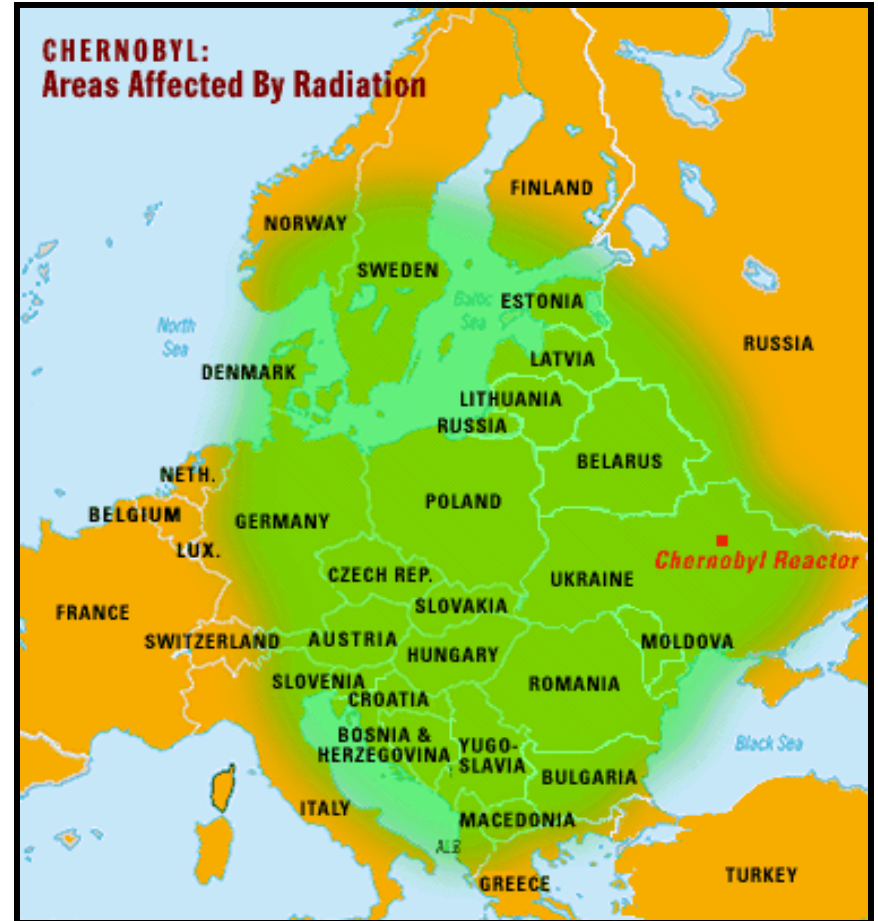
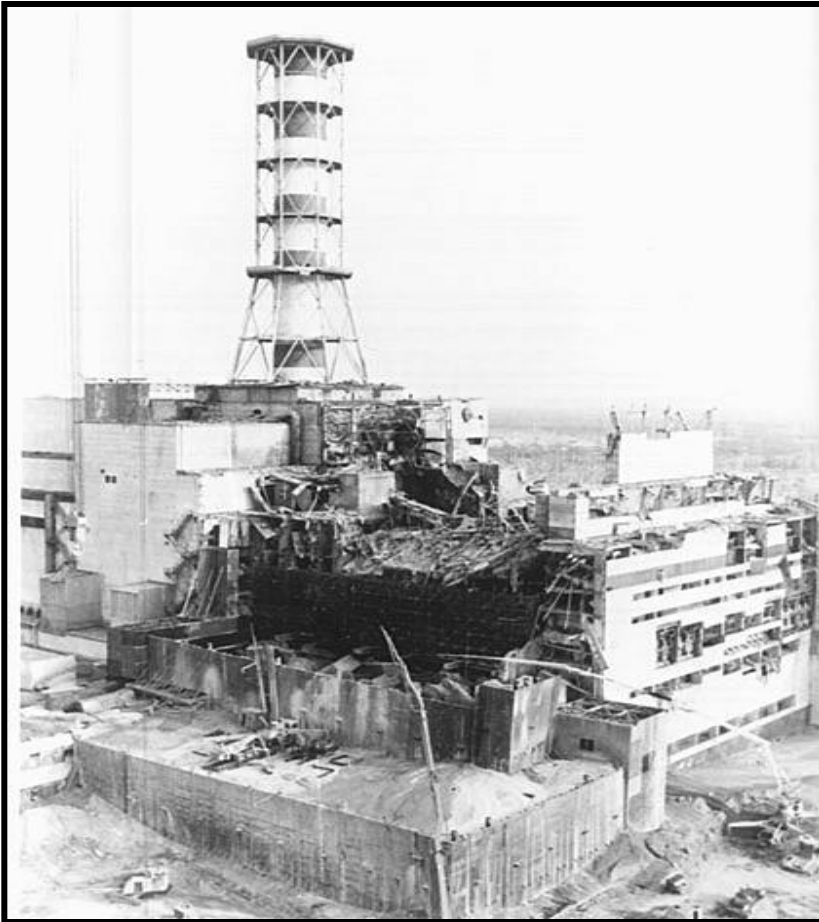


United Nations World Heritage Site



Chernobyl Nuclear Reactor

April 26, 1986



31 immediate deaths, thousands long-term

Above Ground Nuclear Testing



- National Cancer Institute determined tests at Nevada Test Site deposited high levels of radioactive Iodine-131
- Doses large enough, they determined, to produce 10,000 to 75,000 cases of thyroid cancer



NATIONAL ATOMIC TESTING MUSEUM

A SMITHSONIAN AFFILIATE



Calcium & Strontium

Periodic Table of the Elements

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89 Ac	104 Unq	105 Unp	106 Unh	107 Uns	108 Uno	109 Une	110 Unn								

hydrogen

alkali metals

alkali earth metals

transition metals

poor metals

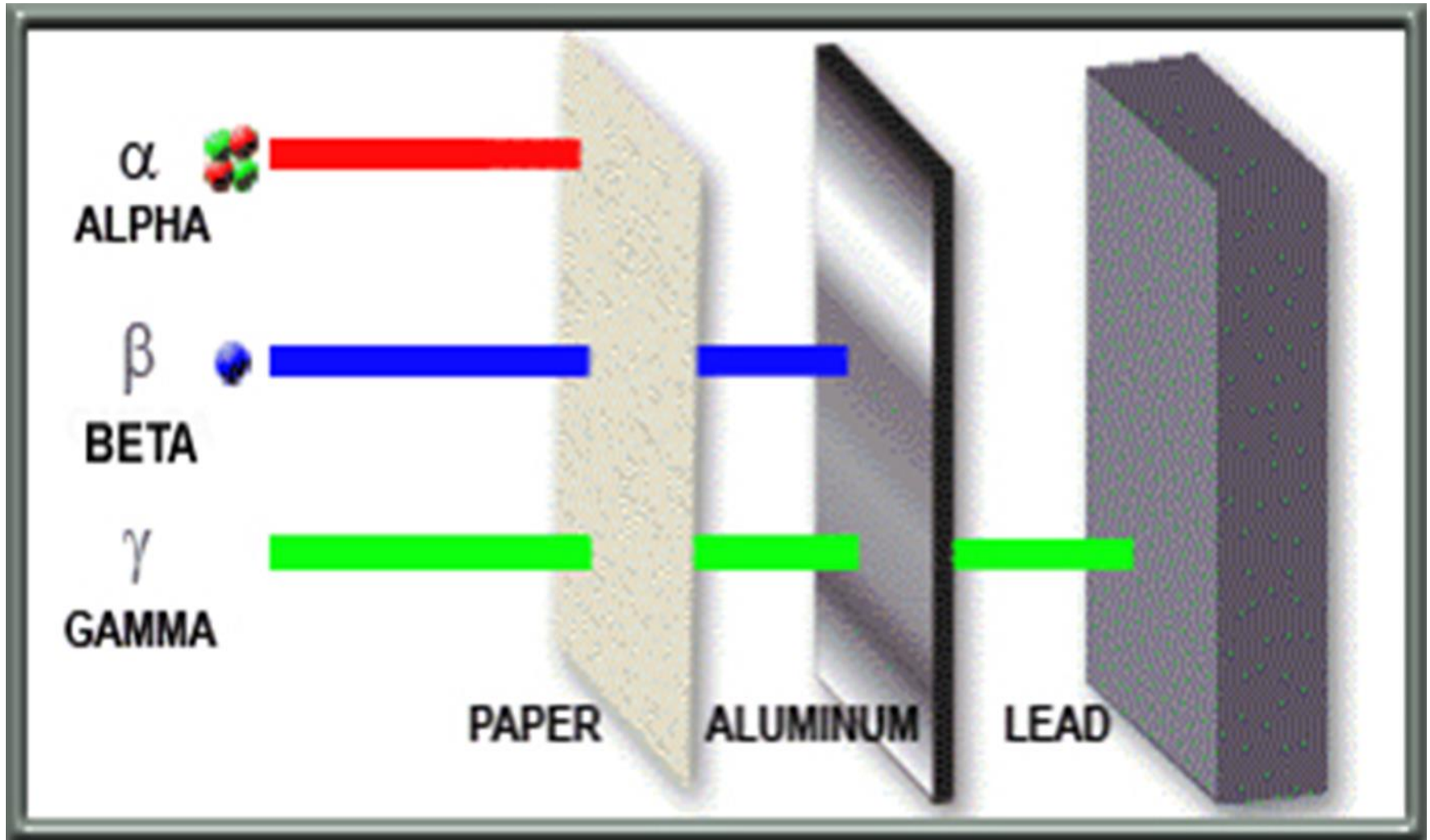
nonmetals

noble gases

rare earth metals

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

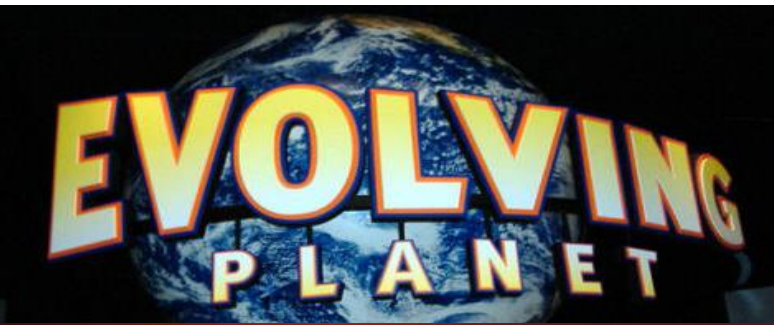
Radioactive Strontium



University of Chicago Atomic Pile



Field Museum Six Mass Extinctions!



WELCOME TO EARTH...
four billion years ago

THE PRECAMBRIAN
4.5 BILLION-543 MILLION YEARS AGO

In Earth's first four billion years—the time known as the Precambrian—life first evolved, flourished, and changed the planet forever.



Number of species that have gone extinct since 8:00 this morning:

026

The normal rate of extinction is one species every four years.

Today, species are going extinct at a rate of 30,000 per year.

(That's 82 species every day, four species every hour.)

Cartwright Vacation Slides





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