

# Air Pollution, Smoke and the Scientific Method

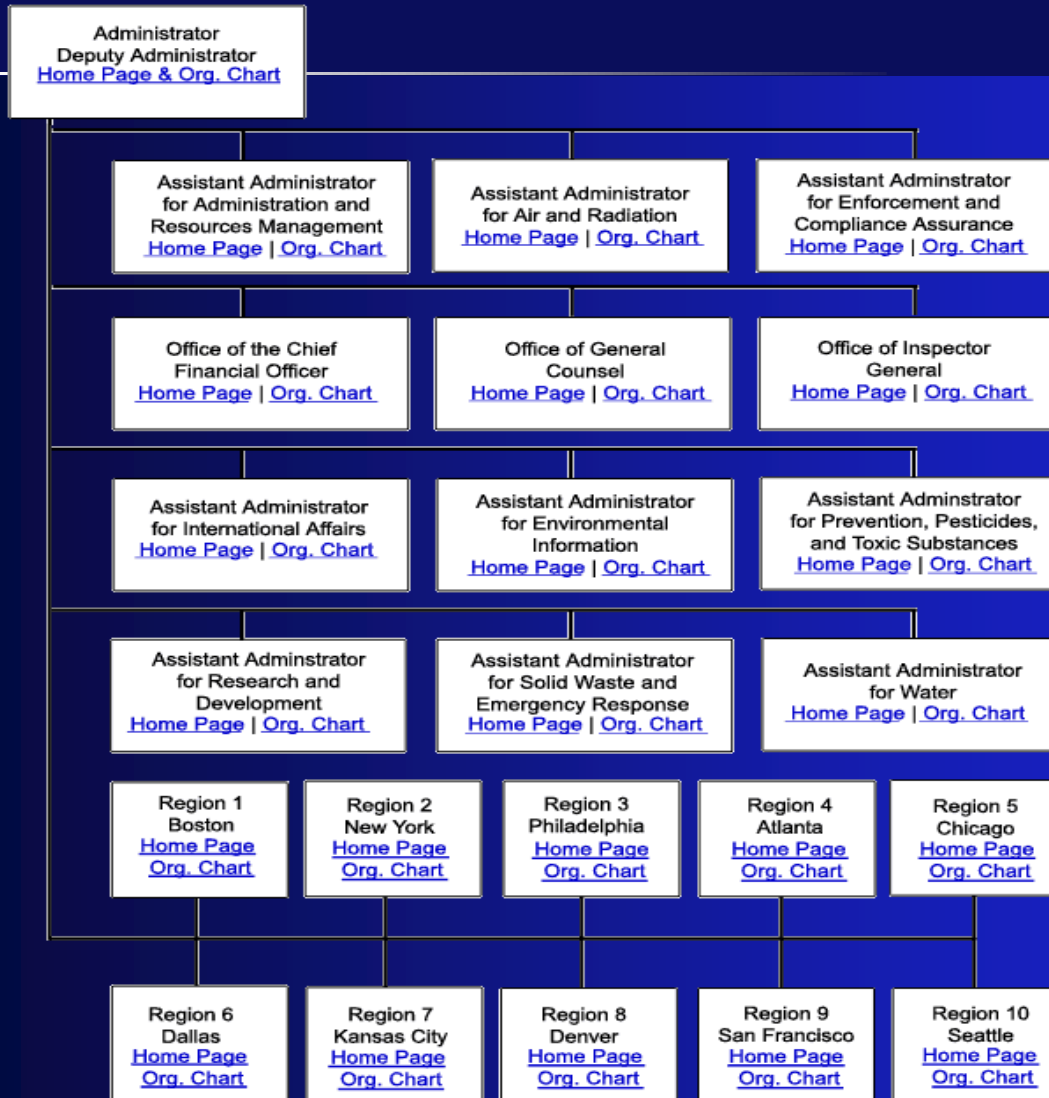
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Doctors for Disaster  
Preparedness

Oakland, California

August 4, 2007

# EPA Divisions



# National Ambient Air Quality Standards (NAAQS)



**National Ambient Air Quality Standards**

Pollutant	Primary Stds.	Averaging Times	Secondary Stds.
Carbon Monoxide	9 ppm (10 mg/m <sup>3</sup> )	8-hour <sup>(1)</sup>	None
	35 ppm (40 mg/m <sup>3</sup> )	1-hour <sup>(1)</sup>	None
Lead	1.5 µg/m <sup>3</sup>	Quarterly Average	Same as Primary
Nitrogen Dioxide	0.053 ppm (100 µg/m <sup>3</sup> )	Annual (Arithmetic Mean)	Same as Primary
Particulate Matter (PM <sub>10</sub> )	Revoked <sup>(2)</sup>	Annual <sup>(2)</sup> (Arith. Mean)	
	150 µg/m <sup>3</sup>	24-hour <sup>(3)</sup>	
Particulate Matter (PM <sub>2.5</sub> )	15.0 µg/m <sup>3</sup>	Annual <sup>(4)</sup> (Arith. Mean)	Same as Primary
	35 µg/m <sup>3</sup>	24-hour <sup>(5)</sup>	
Ozone	0.08 ppm	8-hour <sup>(6)</sup>	Same as Primary
	0.12 ppm	1-hour <sup>(7)</sup> (Applies only in limited areas)	Same as Primary
Sulfur Oxides	0.03 ppm	Annual (Arith. Mean)	-----
	0.14 ppm	24-hour <sup>(1)</sup>	-----
	-----	3-hour <sup>(1)</sup>	0.5 ppm (1300 µg/m <sup>3</sup> )

# 1997 Standard Cost vs. Benefit

- EPA estimate
  - Prevents 16,000 deaths each year
  - Saves \$69-\$144 billion each year
  - Costs \$6.3 billion each year
- Independent estimate
  - Causes thousands of deaths each year
  - Saves \$2 to \$40 billion each year
  - Costs up to \$150 billion each year
  - Eliminates hundreds of thousands of jobs each year

# 1993 Harvard Six Cities (HSC)

- 8,000 subjects
- Study period 14-16 years
- Mortality increased 26%

# 1995 American Cancer Society Study (ACS-I)

- 500,000 subjects
- 50 cities
- 1982-1989
- Mortality increased 17%

# 2000 Health Effects Institute Restudy (HEI)

- Migration made PM 2.5 effect statistically insignificant
- When SO<sub>2</sub> added, the PM 2.5 effect disappeared
- SO<sub>2</sub>, not PM 2.5, is the most important pollutant

# 2002 ACS II (Restudy of ACS I)

- Follow-up time doubled
- Mortality increased by 4%, 6% and 8% for all cause, “cardiopulmonary” and lung cancer respectively
- Joint pollution analysis of PM 2.5 with SO<sub>2</sub> was not performed



# Causation

- Epidemiological observational studies must show:
  - A **STRONG** association (300% or 400%)
  - PLUS**
  - A plausible biological mechanism



# PM 2.5- Health Effects

“Health studies have shown a significant association between exposure to fine particles and premature mortality. Other important effects include aggregation of respiratory and cardiovascular disease..., lung disease, decreased lung function, asthma attacks, and certain cardiovascular problems such as heart attacks and cardiac arrhythmia.”

# Pure vs. Applied Medical Science

- Pure medical science
  - Evaluated retrospectively
  - Validated by decades of peer usage
  - Personal biases don't invalidate
- Applied medical science
  - Evaluated by prospective peer review
  - More bias prone
  - Conflict of interest statements are inadequate to prevent bias

# Epidemiology vs. Science

- Epidemiology: A statistical discipline
  - Association between exposure and disease
  - Uses statistical models
- Science:
  - Discovers universal laws
  - Determines causation using the scientific method

# Epidemiological Studies

- Randomized Clinical Trials
- Cohort Studies
- Case Control Studies
- Ecological Studies

# Ecological Studies

- Plagued by systematic errors
  - Confounding factors
  - 56 biases
  - Methodical weaknesses
  - Model inconsistencies
- “Ecological Fallacy”
  - When group data are applied to individuals

# Statistical Malpractice

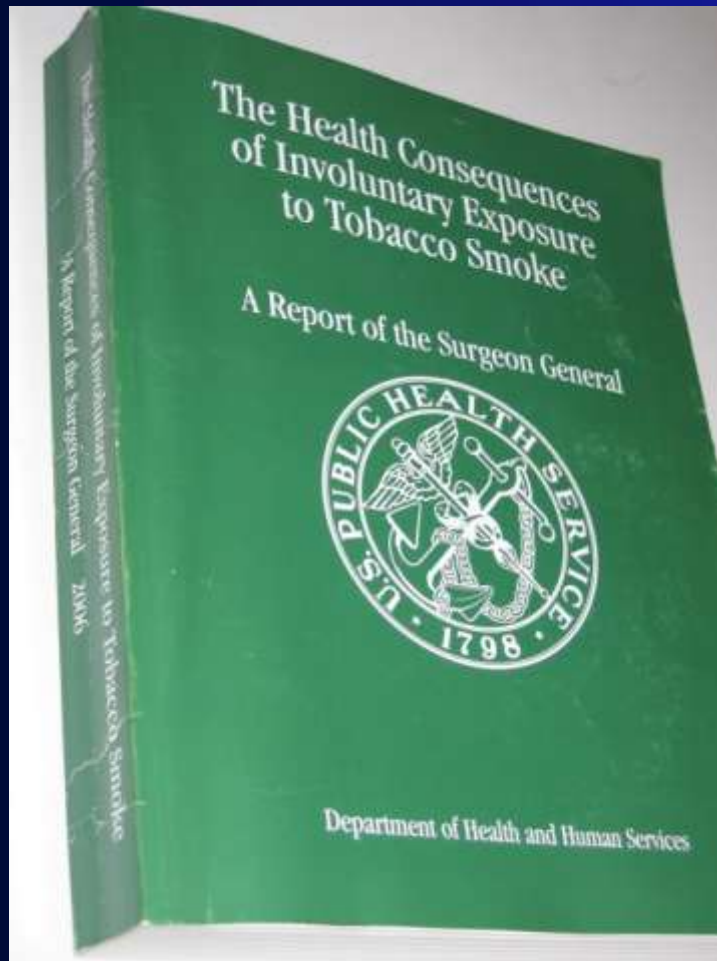
- Fields of Epidemiology and Health Economics
- Driven by requirements of health policy and management
- Complex analytical techniques combined with large data sets
- Causal assumptions introduced without any scientific grounds

# “Black-box” Epidemiology

- “Risk factor epidemiology”
- Associations between diseases and “exposures”
- Converts fortuitous associations into causal links
- Performs science by logical “sleight-of-hand”
- Perfect for the fantasies of politically correct moralists



# 2006 Surgeon General's Report



- 709 pages
- Editor- Dean of Epidemiology at Johns Hopkins School of Public Health
- 123 Scientists

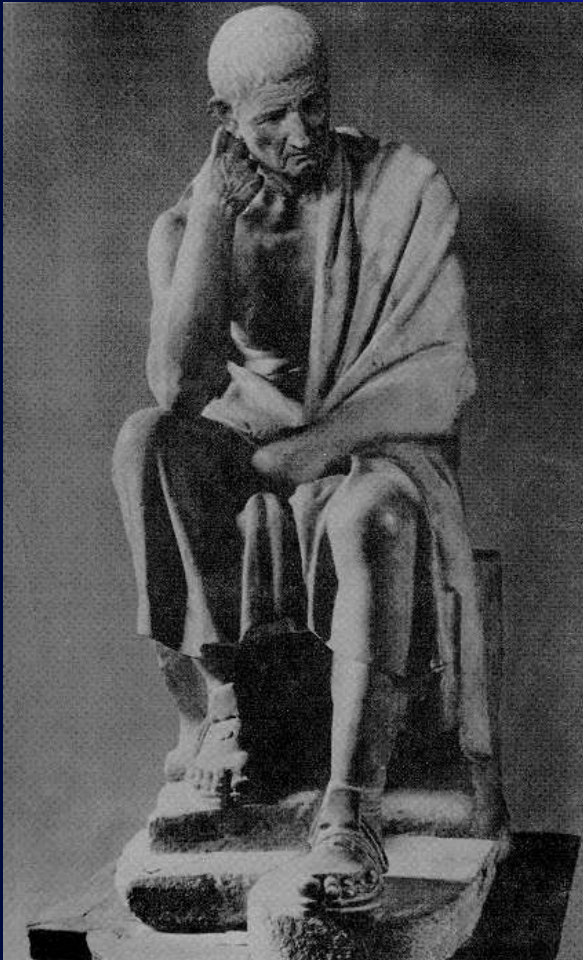
# Press Conference on Second Hand Smoke

## June 27, 2006

### U.S. Surgeon General Richard Carmona

QuickTime™ and a  
YUV420 codec decompressor  
are needed to see this picture.

# Aristotle



- 384BC - 322BC
- The teleological tools to discover a rational ethics
- Universe controlled by natural laws that can be discovered
- Objective thinking frees us from subjective biases

# Branches of Philosophy

- Metaphysics: reality, existence
- Epistemology: how we learn
- Ethics: discover and validate a code of values
- Politics: the proper form of govt.
- Aesthetics: art

# Epistemology

- Our faculty of rationality allows
- Sensations to be retained as perceptions
- Perceptions are integrated into concepts
- Concepts can be organized into abstractions
- Abstractions can be expanded to unlimited fund of knowledge
- Abstractions can be applied to the real

# Ethics

- A code of values
- Different goals: Utilitarianism, social justice
- Can use intuition, tradition, authoritarianism or rationality
- Standard of value: life

# Business

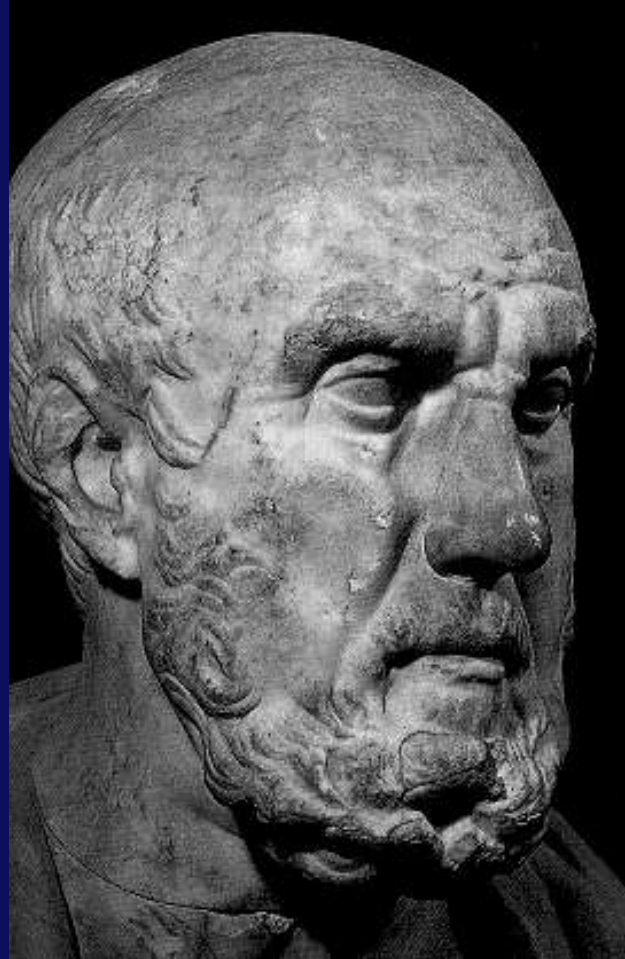
- Goal: Maximizing long-term profit
- Virtues: Integrity, reliability, honesty

# Medicine

- Highest goal: Always the good of the patient
- Primary virtue: Trust



# Hippocrates



ca. 460BC- ca.  
370BC

# Separating Magic from Medicine



The physician  
with his magic  
wand and bag of  
magic tricks

Rodney Ries, 1976

# Science

- Goal: Discovering truth
- Seeking reliable new knowledge
- Virtues: Honesty, integrity, objectivity

# “Socialista Maligna”

- Our culture of death
  - Apathy
  - Blind obedience
  - Changing the meaning of words
  - “The big lie”
  - Intolerance
  - Arrogance
  - Megalomania
  - Coercion
  - Irrational behavior

Dr. Chester Danehower

# Age of Evil

- Ignorance and evil rampant
- Conformity essential
- Dominated by selective thinking and social reasoning

# Social Reasoning

- Identify a social group that can help you
- Identify their opinions that are important
- Focus on reasons that support their opinions
- Avoid thinking about reasons that don't support them

# Technical Reasoning

- Objective thinking
  1. State clearly the question
  2. State clearly the possible answers
  3. Search for contradictory evidence until all answers have been eliminated except one
  4. That which remains will be the truth

# “Word Men”

- Hated the technical mind and capitalism
- Catered to evil and irrational values
- Became journalists, lawyers, teachers, and philosophers
- Two characteristics
  - 1. Use of words to make a living
  - 2. No feedback to expose unsound ideas



# Immanuel Kant



*The Critique of  
Pure Reason, 1780*

1724 - 1804

# Kant's Philosophy

- The primacy of consciousness
  - Categories
  - Innate knowledge
  - Noumenal vs. phenomenal realms
  - The analytic-synthetic dichotomy
  - The Cogito (I think, therefore I am)
- None of these is real

# Immanuel Kant

- The Al Capone of philosophy
- The Copernican Revolution switched philosophy from objective to collective
- New levels of mass irrationality and destruction of human values
- Fascism, Nazism, Marxism, the Holocaust, our current Welfare-Warfare state

# The Georgetown Mantra

- Guidelines for the new “Bioethics:”
- Four “ethical principles”
  - Autonomy
  - Beneficence
  - Nonmaleficence
  - Social justice
- These are amoral outcome-justifiers

# The Tavistock Principles

- Health care is a human right
- Work must generate the greatest possible health gains for groups and populations
- The system must prevent illness and alleviate disability
- Cooperation
- All individuals must help improve the quality of healthcare

# Revised Tavistock Principles

- Rights: People have a right to health and healthcare
- Balance: The care of individuals is central, but health of populations is also our concern
- Comprehensiveness
- Cooperation
- Improvement: We must improve health
- Safety: Do no harm
- Openness: Being open, honest, and trustworthy is vital

# Medical Professionalism: a Charter

1. Principle of primacy of patient welfare
  2. Principle of patient autonomy
  3. Principle of social justice
- Ten Commitments: Professional competence, honesty, patient confidentiality, appropriate relationship with patients, improving quality of care, improving access to care, a just distribution of finite resources, increasing scientific knowledge, managing conflicts of interest, professional responsibilities

# Modern Liberals vs. Conservatives

- Liberals
  - Oppose govt. censorship
  - Favor govt. control of material wealth
- Conservatives
  - Favor govt. censorship
  - Oppose govt. control of material wealth



# Modern Libertarian Revolution

1943

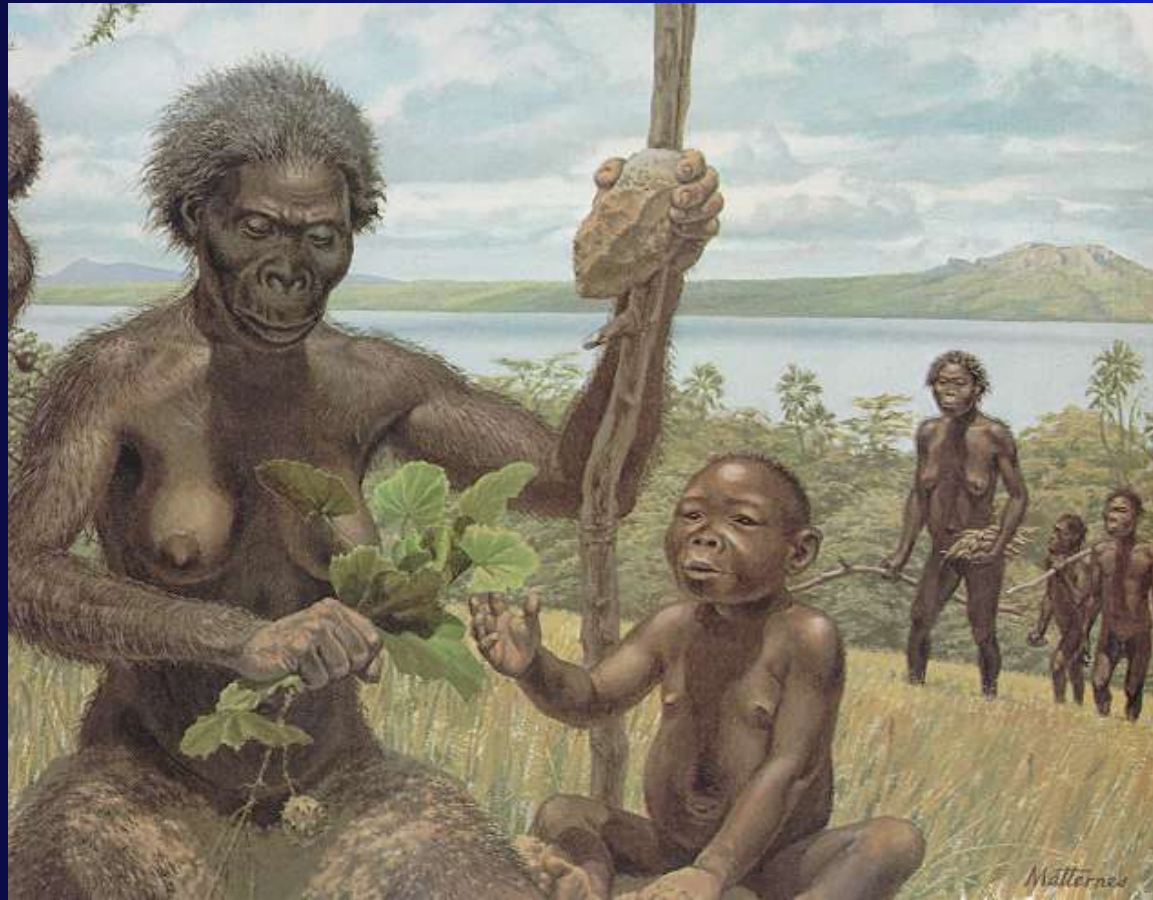
- Rose Wilder Lane, *The Discovery of Freedom*
- Isabel Paterson, *The God of the Machine*
- Ayn Rand, *Atlas Shrugged*

# Aesthetics: Art



- Non-utilitarian art object
- Africa
- Australopithecus
- 3 million years old

# Australopithecus



Africa: 4-1.2 million years ago

# Aesthetics: Cave Art



12,000 BC



# Aesthetics: Cave Art



12,000 BC

# Aesthetics: Driftwood Art



Rodney Ries, 1976

# Aesthetics: Fly Fishing



# Aesthetics





# Aesthetics: *Salvelinus fontinalis*



- Native mountain brook trout