Print version

#### **CEE 697z**

# Organic Compounds in Water and Wastewater

Introduction to Organics in Water and Wastewater

Lecture #1

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#### Organic Compounds: Types?

- Natural Compounds
  - ▶ Fulvics
  - Proteins, carbohydrates, etc
- Domestic WW Organics
- Industrial Synthetic Organics
  - Plasticizers: phthalates
  - solvents: tetrachloroethylene
  - waxes: chlorinated parafins
  - ▶ others: PCB's
- Hydrocarbons & oil derivatives
  - includes products of combustion: PAH's
- Agricultural Chemicals
  - pesticides: DDT, kepone, mirex

- ▶ Pharmaceuticals, etc
  - Anti-epileptics
  - Beta-blockers
  - X-ray contrast media
  - antibiotics
- ▶ Home & Personal Care Products
  - triclosan
  - Musks, flame retardants
- Endocrine Disrupters
  - Steroidal estrogens
- Natural process byproducts
  - Conjugated pharmaceuticals
- Engineered process byproducts
  - disinfection byproducts, etc

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#### Tentative plan

Week of:	Торіс
Sept I	Introduction & Planning
Sept 8	
Sept 15	Natural Organic Matter
Sept 22	
Sept 29	
Oct 6	Fracking Fluids
Oct 13	PPCPs & Estrogenic Compounds
Oct 20	
Oct 27	
Nov 3	
Nov 10	Cyanotoxins
Nov 17	
Nov 24	Hydrophobic Toxins
Dec I	
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### A brief history of Carbon

- ▶ 13,800,000,000 BCE: the big bang now we have matter; and about 400,000 yrs later we have the first carbon atoms
- ▶ 1,600,000 BCE human controlled fire; formation of charcoal
- 3750 BCE Egyptians & Sumerians use charcoal for reducing Cu, Zn & Sn
- ▶ I50: "Vitalism" holds that living organisms are composed of "organic" material
- 1789: carbon recognized by Antoine Lavoisier as an element
- ▶ 1824: "Vitalism" is discredited and modern view of organic compounds begins to emerge
- 1840s: water pollution worsens in major urban centers
- ▶ 1858: tetravalent nature of carbon is recognized helping to launch modern organic chemistry

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## 3 London's Water: The Dress Rehearsal of 1828

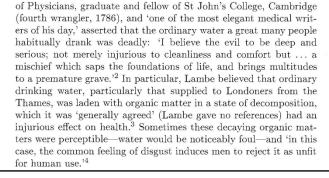
Hamlin (1990) A Science of Impurity, University of California Press

It is vain therefore to say, that where nothing is discovered there is nothing wrong. \(^1\)

In 1828 Dr William Lambe, fellow and censor of the Royal College

William Lambe

Most chemical analysis of water in the early to mid 1800s was focused on mineral waters used almost exclusively by the rich

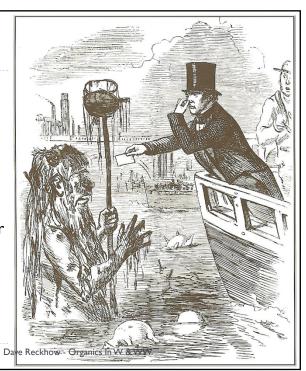




London

- ▶ The Great Stink
- Michael Faraday presenting his card to Father Thames
  - Punch, July, 1855
- Aside from using our noses, how to measure the organic matter?

Halliday (1999) The Great Stink of London, Sir Joseph Bazalgette and the Cleansing of the Victorian Metropolis, Sutton



#### Earliest Quantitative Methods

- Reaction with Oxidants
  - ▶ Hg and Pb salts
    - □ Early 1800s
  - ▶ Permanganate & Dichromate
    - ▶ Chemical oxygen demand
      - $\hfill\Box$  Permanganate test developed by Forchhammer in 1850 (Denmark)
  - Oxygen "catalyzed" by microorganisms
    - ▶ Biochemical oxygen demand
      - $\ \square$  1908 proposed BOD $_{\rm 5}$  as the best method for river pollution by the Royal Commission on Sewage
      - $\hfill\Box$  Later standardized as it is today
- Color

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