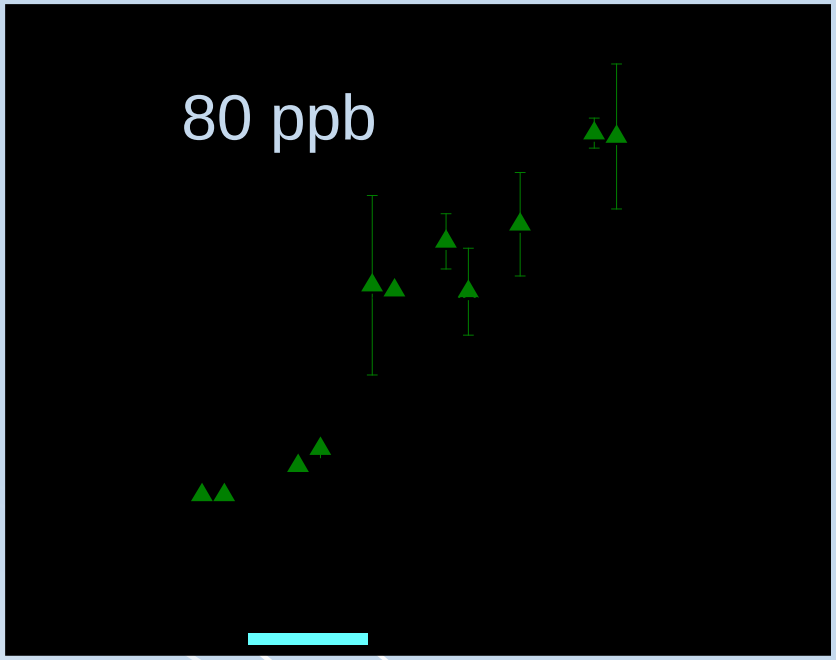
"Nanotech already affects products and wastes"

- Nanoscale products currently on market:
  - novel plastics
  - cosmetics
  - sunscreen
  - stain-resistant fabrics
  - scratch-resistant glass
  - cancer treatments
  - catalysts
  - military propellants
  - enhanced antibiotics
  - batteries and fuel cells

NanoX: Not Toxicology As Usual

Are single-walled carbon nanotubes toxic?

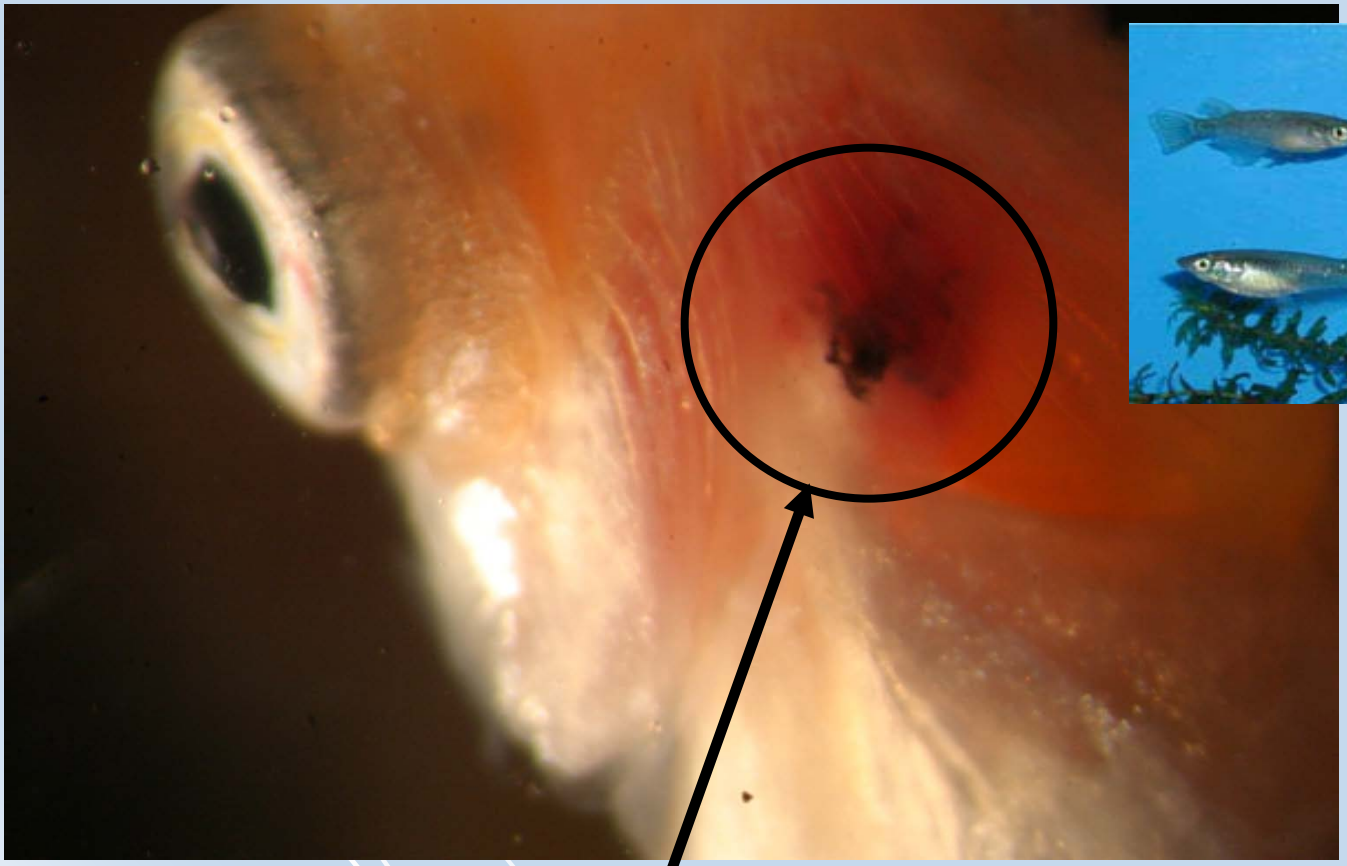


- 20 major types of SWNT
- 4 manufacturing types (trace impurities)
- Lengths ranging from 5 – 300 nm
- 5 methods of purification
- 10 possible surface coatings

> 50,000 SWNT samples

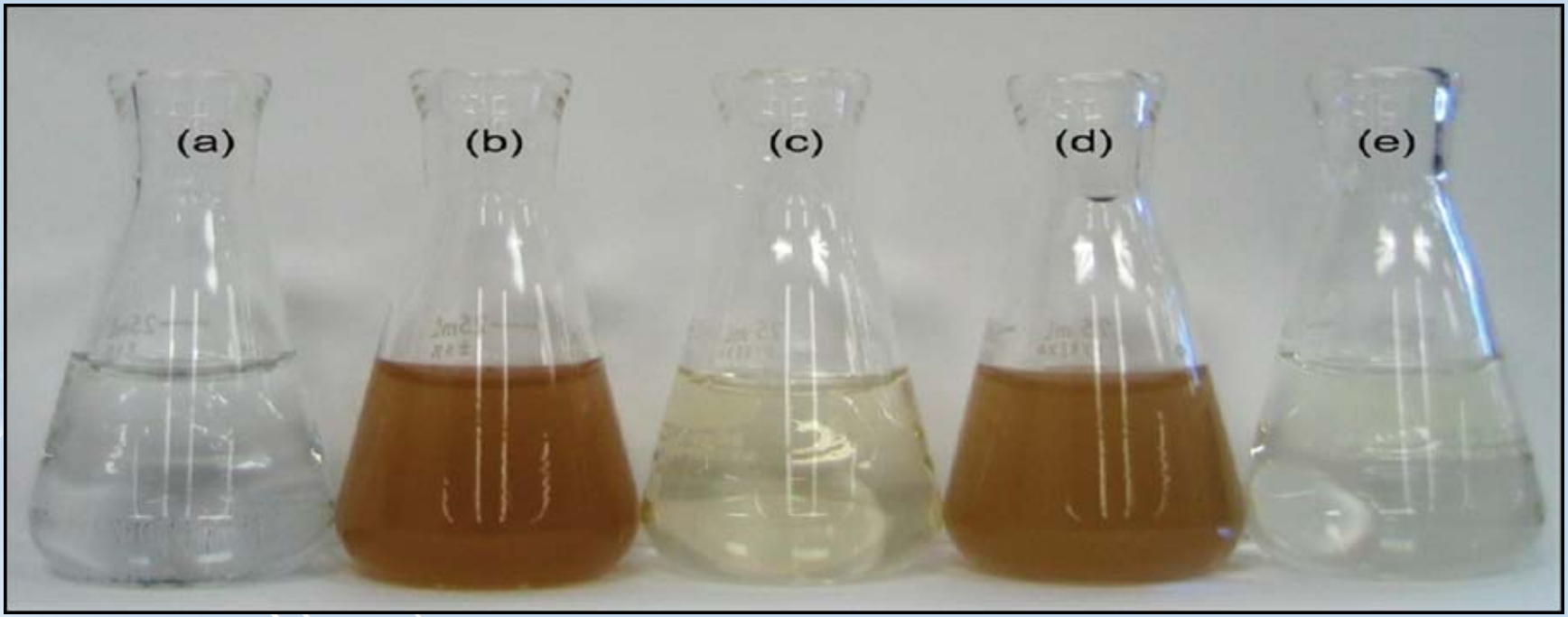
Basic structure-function relationships for nanomaterials and biological impacts are necessary

Nanoiron on Medaka Fish Gils

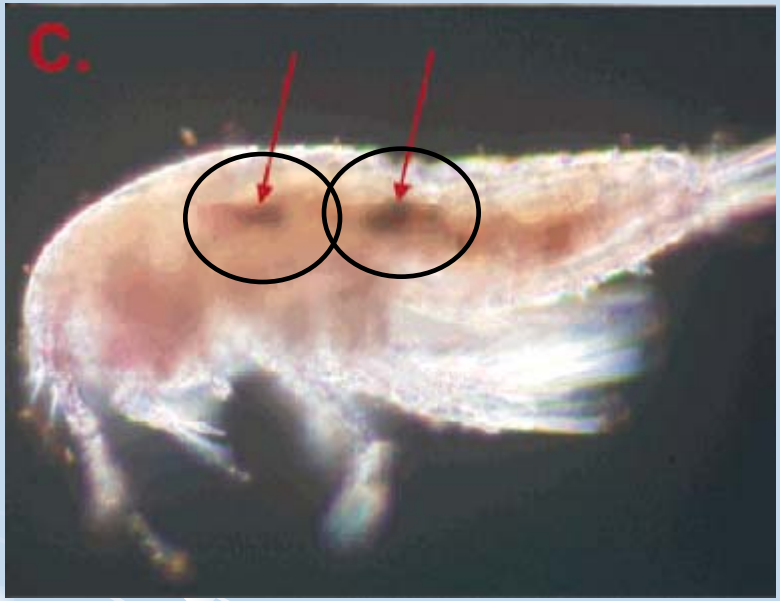


Nanoiron aggregates accumulate on Medaka fish gills-(Richard Winn UGA)

Environmental Weathering and Carbon Fullerenes

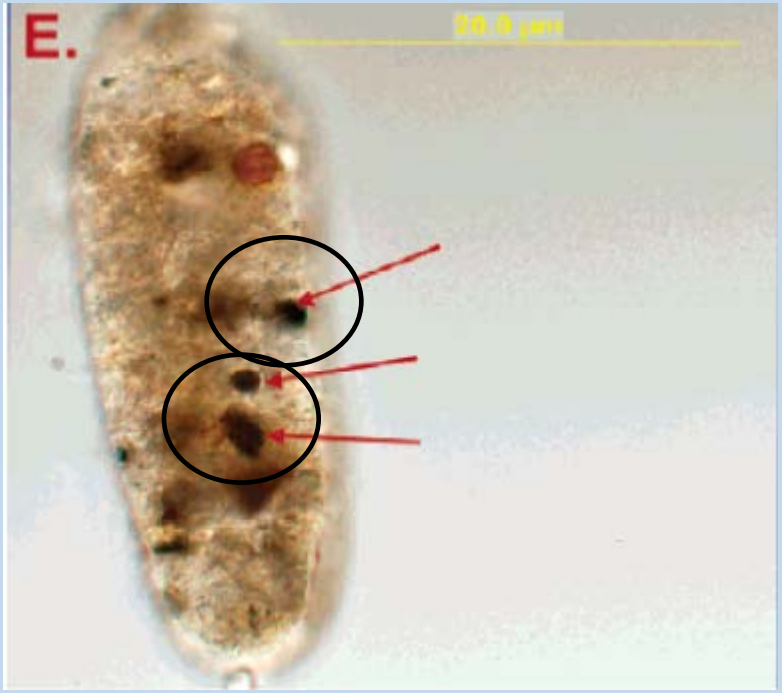


SWNT ingested by Benthic Copepods



Aggregated SWNTs moving through the gut

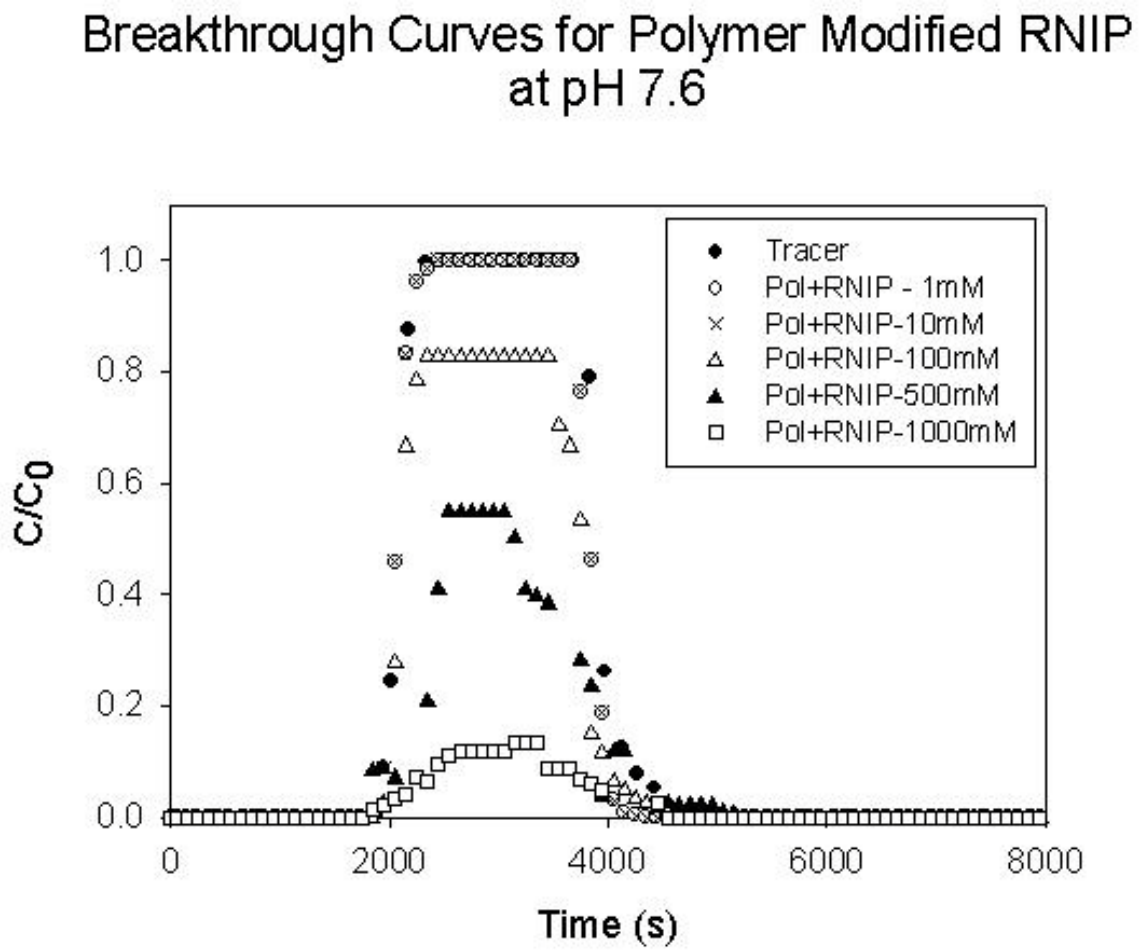
SWNTs in Copepod Feces

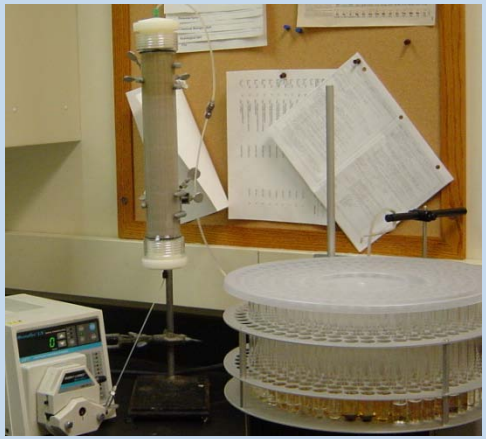


Templeton, et al. (2006) *Environ. Sci. Technol.* 40(23); 7387-7393

Note: SWNT were hydroxylated and carboxylated

Mobility Depends on Ionic Strength and Composition



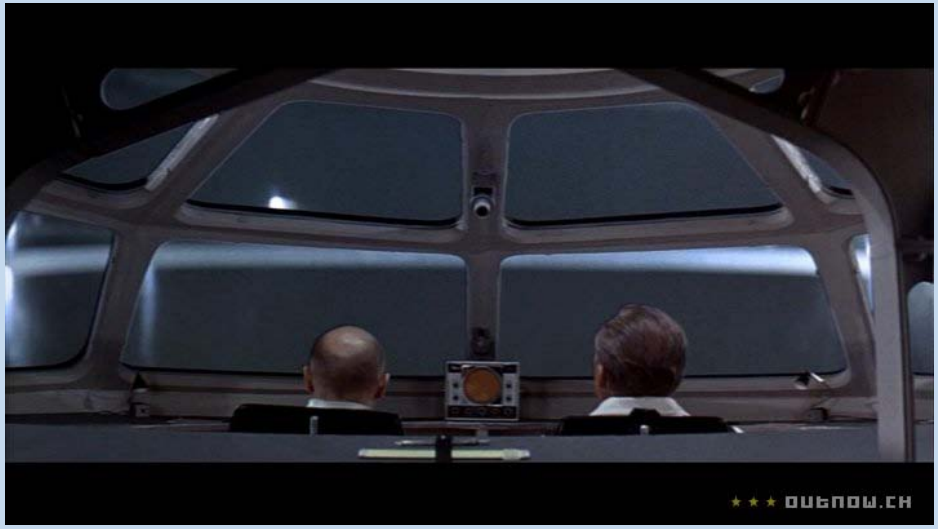


Sand
L=61 cm
porosity=0.33
Velocity 3.2^{-2} cm/s
I=1-1000 mM
Na^{+} or Ca^{2+}
30 mg/L particles

Saleh et al. ES&T (in prep)

"Anticipating nano risks with proactive policies"

- ED/DuPont Risk Framework
- Insurance and risk spreading
- Avoiding the "Wow to Yuck" trajectory



Five Thoughts on Legal Issues

- Nanotech already affects industry products, emissions and waste generation
- Producers must comply with existing environmental laws
- Nanotech will be regulated and litigated
- Current nanotech disposal practices will be judged by future standards
- Producers and users are anticipating future regulatory developments and tort liability