

Water Contaminants

- Office: 35-307 (discussion by appointment welcomed!)
- Email: ychoi81@snu.ac.kr
- Course material/textbook:
 1. Lecture notes
 2. Schwarzenbach, Gschwend, Imboden, Environmental Organic Chemistry, 2nd ed., John Wiley & Sons, 2003

Water Contaminants

- Study different types of water contaminants and their fate in various settings of water environment
- Some background on environmental organic chemistry
- Focus on organic contaminants and the physicochemical mechanisms involved in their fate

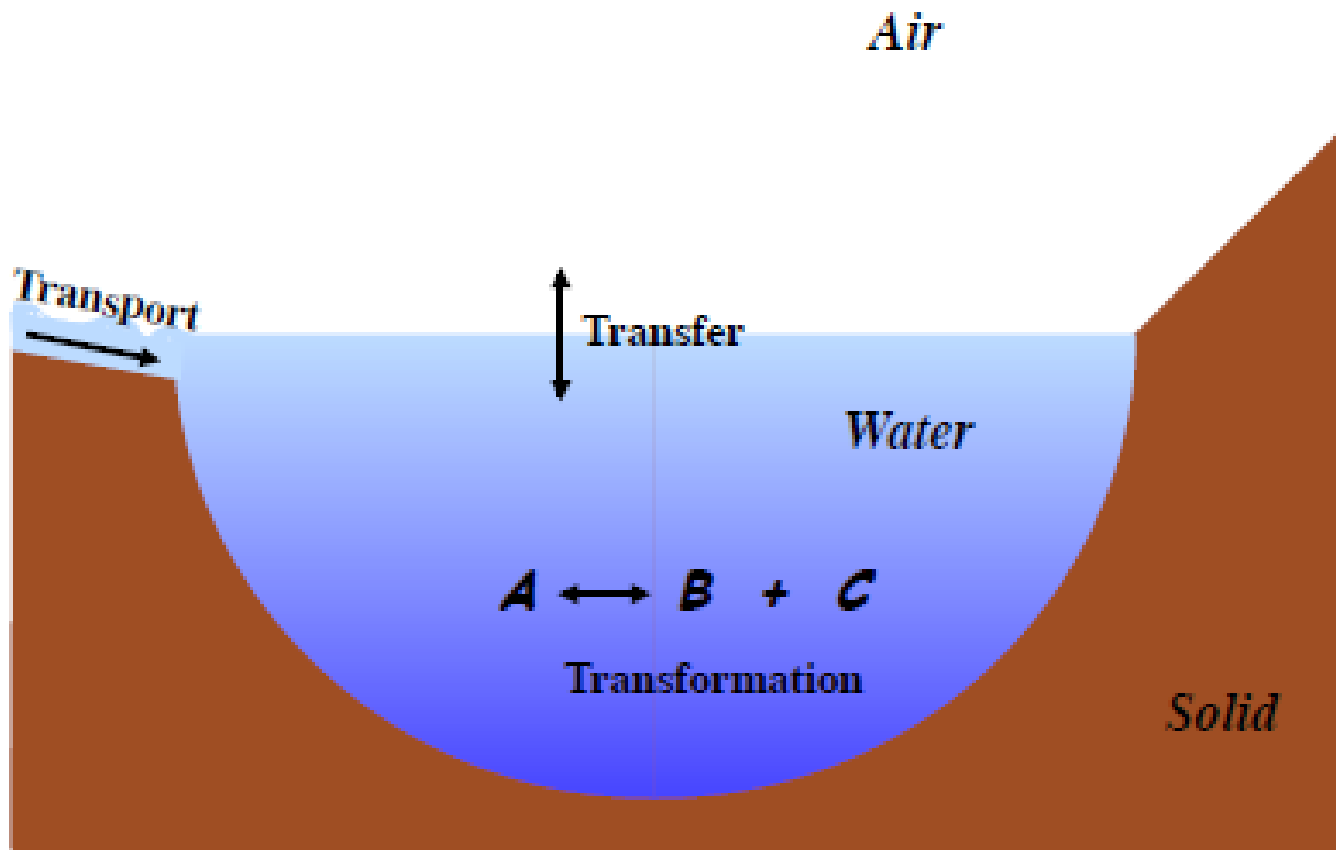
Student presentation & paper discussion

- Only one exam for this class? But...
- One of students leads ½ class
- Topic & paper selection & posting
 - Select a topic & a paper (relevant to the class!) and submit a brief presentation plan at least **3 business days prior to the class assigned**
(Tue class → Thu; Thu class → Mon)
 - Post the paper link to eTL at least **2 business days prior to the class assigned**
(Tue class → Fri; Thu class → Tue)

Student presentation & paper discussion

- Contents
 - General background on the selected topic
 - **CRITICAL** review of the selected paper
 - Presentation (15 min) + Discussion (20 min)
- Construct your presentation in a way that can promote student discussion
 - e.g., throw out questions to your colleagues
 - Note that **YOU** are the discussion leader for your presentation

Transport, phases, interphases



Contaminant fate and transport?



<http://www.virginmedia.com/science-nature/wildlife>



<http://www.heraldsun.com.au>

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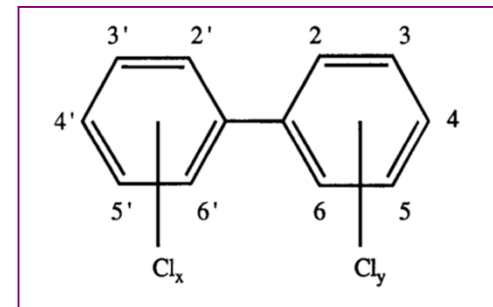
- Sediment PCB conc. proportional to # salmon spawning/km²
- PCB congener distribution in salmon lakes' sediments similar to distribution in salmon; different from distribution in no-salmon lakes' sediments
- Pacific salmon
 - Anadromous: move from salt to freshwater to breed or spawn
 - Semelparous: die after spawning

Krummel et al., 2003, Nature, 425:255-256

Transport against hydraulic gradient



- Salmons concentrate PCBs (biovectors)



PCB molecular structure

Bioconcentration of PCBs in Lake Ontario

PCB congener	microgram PCB per *		
	52	66	153
MW	291.97	291.97	360.71
dissolved	6.3E-0.5	3.1E-0.5	5.0E-0.5
bottom sediment	25	46	25
suspended sediment	15	27	23
plankton	2.4	1.6	2.2
mysids	3.5	15	30
amphipods	22	30	45
oligochaetes	6.3	8.3	7.5
small smelt	7.6	2.7	64
large smelt	18	72	130
trout/salmon	62	160	430

*liter for dissolved; kg dry wt. for sediments; kg wet wt. for organisms

Oliver & Nilmi, 1988, ES&T, 22:388-397

Dermal exposure of chemicals bound to soil and sediment

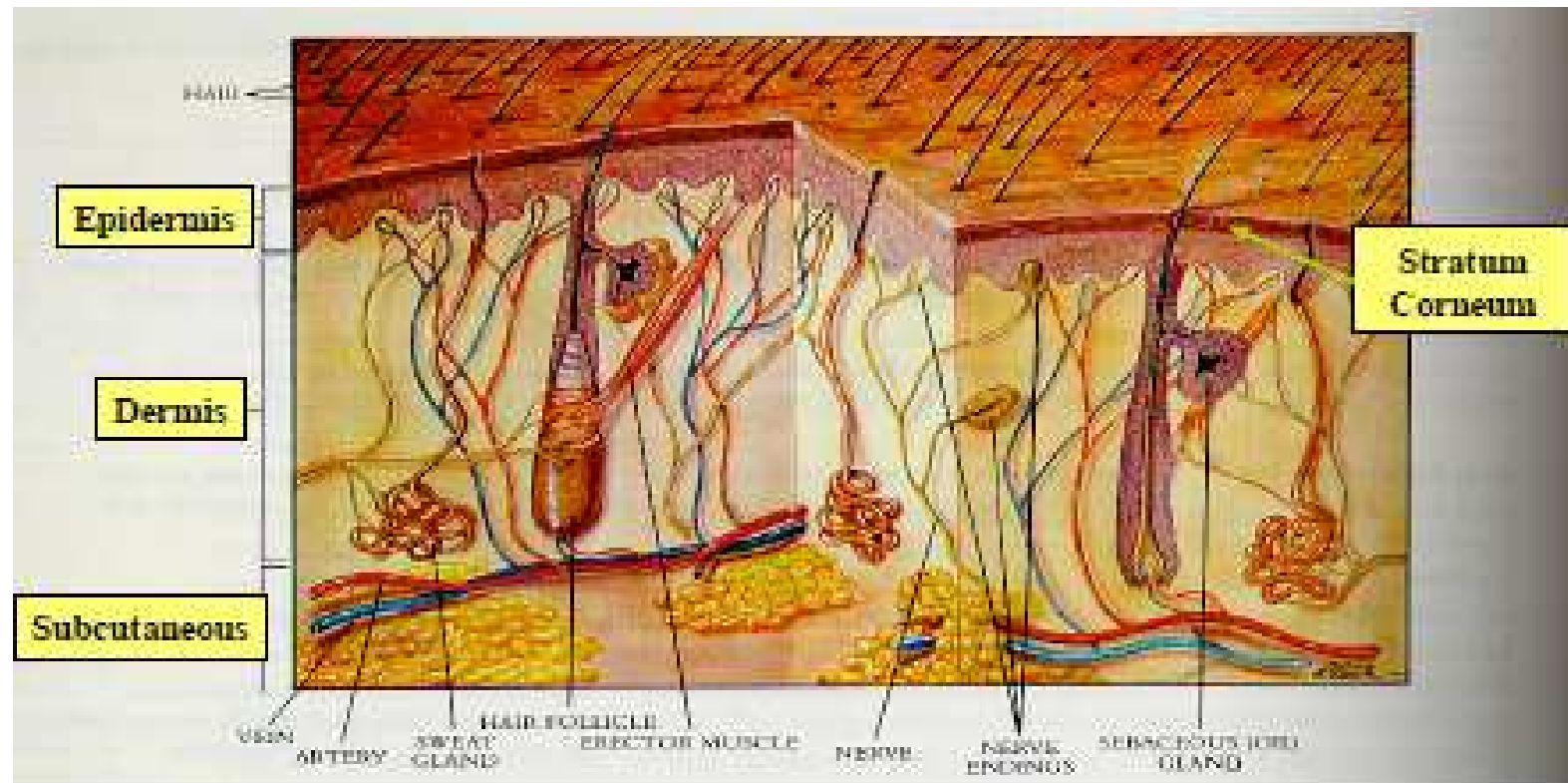


<http://www.heraldsun.com.au>



<http://news.naver.com/main/read.nhn?mode=LSD&mid=sec&sid1=106&oid=144&aid=0000273454>

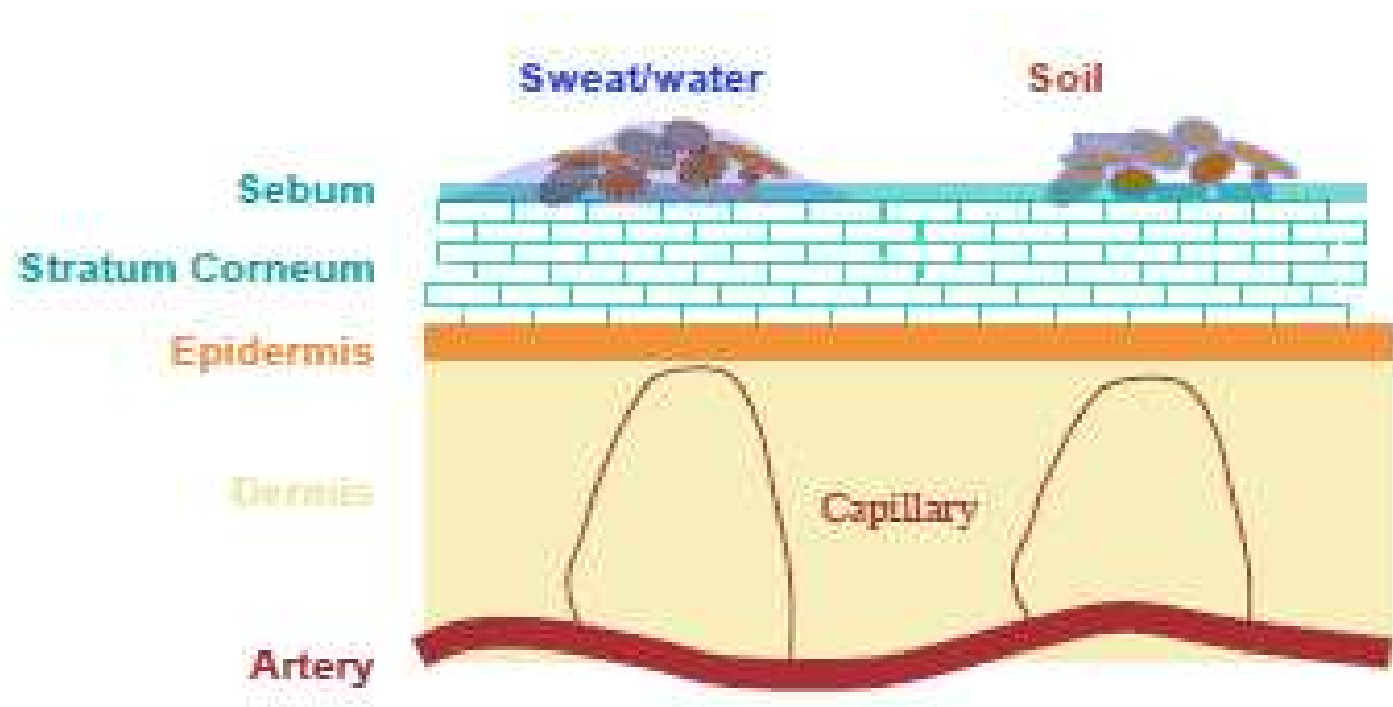
Human skin



Functions

metabolism, sensory organ, prevent water loss or uptake, regulate temperature, breakdown drugs, resist damage, insulate, exchange air & fluids

Dermal exposure of chemicals bound to soil and sediment



Sebum – oily secretion of the sebaceous gland

Stratum corneum – dead cells; hydrophobic

Epidermis, dermis - hydrophilic

Dermal exposure - considerations

- **Mass transfer/equilibria between**
 - Soil & sweat/sebum
 - Sweat/sebum & *stratum corneum*
 - *Stratum corneum* & epidermis
 - Epidermis & dermis
 - Dermis & blood
- **Transport in:**
 - *Stratum corneum*
 - Epidermis
 - Dermis
- **Soil coverage, residence time on skin**
- **Air to skin; water to skin; ...**