

II. ENVIRONMENTAL FATE AND BIODEGRADATION (S. SIMKINS).

<u>Dates</u>	<u>Lec</u>	<u>Title</u>
3/3	9	Neurotoxins of axonic transmission, e.g., tetrodotoxin and DDT.
3/8	10	Neurotoxins of synaptic transmission, e.g., parathion and sarin.
3/10	11	Environmental “absorption”: toxicant classes, sources, and routes of entry
(3/12 – 3/20)		<i>Spring Break</i>
3/22	12	Intro to environmental distribution and partitioning.
3/24	13	Environmental distribution of toxicants (part 2): partitioning, transport, and exposure.
3/29	14	Environmental distribution (part 3): ionization. Hysteresis in desorption.

3/31	EXAM 2 - Neurotoxins and Environmental Distribution, 1 h
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4/5	15	Partitioning and remediation: soil vapor extraction vs. “pump and treat”
4/7	16	Water-table lowering, aquifer sparging, off-gas treatment.
4/12	17	Biochemical “fates” of organic toxicants. Environmental analogues of Phase 1 reactions: important oxidases and peroxidase
4/14	18	Mineralization as Phase II: aerobic chain and ring catabolism
4/19	19	Bioventing and land farming
4/21	20	Anaerobic mineralization and reductive dehalogenation. Applications to remediation
4/26		Section Conclusions and Summary/ END-SESSION REVIEW

Final Exam Period	EXAM 3 -, 1 hour (to be scheduled)
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REQUIRED READINGS:**I. ENVIRONMENTAL TOXICOLOGY (J. CLARK).** (from PETC Notebook in Required Readings section on Moodle)

<u>Lecture</u>	<u>Reading</u>
1-2	Cellular Components are Bounded by Membranes
3	Proteins Consist of Chains of Amino Acids
3-4	Proteins Structures Extremely Versatile
4	How Do Proteins Fold Into the Correct Conformation?
5	Toxicant-Receptor Interactions: Fundamental Principles
6	The Typical Dose-Response Curve
6	The Probit and Similar Transformations
6	The Logit Transformation
6	Acute Toxicity and Chronic Toxicity
7	Absorption and Distribution
8	Metabolism of Toxicants: Phase I & II Reactions

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9	Intro Nerotox & Axonic... (in Neurotoxicology section)
10	Synaptic Transmission notes (Neurotoxicol. Section)
11-13	Environmentall Distribution 1 (in Environmental Distribution section)

14	Hysteretic Sorption (in Environ. Distribution)
15	Intro to remediation (in Distribution section)
16	Physical remediation (in Distribution)
17-18	Aerobic metabolism; Cometabolic TCE... (in Environ. Metab. & Elim. Section)
19	Anaerobic Metabolism
20	Anaerobic bioremediation

RECOMMENDED READINGS: Toxicological Chemistry (3rd Ed), S.E. Manahan

I. ENVIRONMENTAL TOXICOLOGY (J. CLARK).

<u>Lecture</u>	<u>Chapter</u>	<u>Pages</u>
1	1	1-38
2	3	59-61
3	3	61-69
4	3	69-78
5	6	124-138
6	6	115-119
7	7	161-164
7	8	167-180
8	6	120-124
8	7	141-157

II. ENVIRONMENTAL FATE AND BIODEGRADATION (S. SIMKINS).

No chapters in this text are terribly helpful for the second two-thirds of the course. Students are advised to devote their study time to the lecture notes available on Moodle.

ADDITIONAL READINGS:

Environmental Toxicology:

Goldstein, A., Aronow, L. and Kalman, S. 1974. Principles of Drug Action. 2nd Ed. John Wiley & Sons, New York.

Hodgson, E. and Gurhie, F.E. 1980. Introduction to Biochemical Toxicology. Elsevier North Holland, Inc., New York.

Doull, J., Klaassen, C.D. and Amdur, M.O. 1980. Cassarett and Doull's Toxicology: the basic science of poisons. 3rd Ed. Macmillan Publ. Co., Inc., New York.

Lehninger, A.L. 1975. Biochemistry. 2nd Ed. Worth Publ., Inc., New York. Chapters 3 and 11.

The following list of articles offer an overview of the history of this field.

Review Articles:

Alexander, M., and K.M. Scow. 1989. Kinetics of biodegradation in soil, p. 243-270. In B.L. Sawney and K. Brown (ed.) Reactions of movement of organic chemicals in soils. Soil Science Society of America, Madison, WI.

Bollag, J.-M., and S.-Y. Yiu. 1990. Biological transformation processes of pesticides, p. 169-212. In H.H. Cheng (ed.) Pesticides in the soil environment; Processes, impacts, and modeling. Soil Science Society of America, Madison, WI.

Kuhn, E.P., and J.M. Sufflita. 1989. Dehalogenation of pesticides by anaerobic microorganisms, p. 111-180. In B.L. Swaney and K. Brown (ed.) Reactions of movement of organic chemicals in soils. Soil Science Society of America, Madison, WI.

Thauer, R.K., K. Jungermann, and K. Decker. 1977. Energy conservation in chemotrophic anaerobic bacteria. *Bacteriol. Rev.* 41:100-180. (Only selected sections will be assigned.)

Original Research Articles: The following papers hold sufficiently important implications to merit assignment as readings for this course:

Dolfing, J. and J.M. Tiedje. 1987. Growth yield increase linked to reductive dechlorination in a defined 3-chlorobenzoate degrading methaogeni coculture. *Appl. Environ. Microbiol.* 49:102-105.

Grbic-Galic, D., and T.M. Vogel. 1987. Transformation of toluene and benzene by mixed methaogenic cultures. *Appl. Environ. Microbiol.* 53:254-260.

References to more recent articles are provided within the lecture notes on Moodle.