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**MICROBIAL BIOCHEMISTRY**

 16:682:502  
 Index 18251  
 3 credits
 

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Time:	Fall Semester, 2013 Tue,Thu 3:55-5:15 p.m.	
Place:	Lipman Hall room 325, Cook campus	
Instructors:	T. Chase (Course Coordinator) 329 Lipman Hall, Cook campus email: chase_c@aesop.rutgers.edu	C. Dismukes 1014 Waksman Institute, Busch campus e-mail: dismukes@rci.rutgers.edu
	P. Kahn 120 Lipman Hall, Cook campus email: <a href="mailto:kahn@aesop.rutgers.edu">kahn@aesop.rutgers.edu</a>	G. Zylstra 322 Foran Hall, Cook campus email: zylstra@aesop.rutgers.edu
Office hrs:	By arrangement	

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**Format:** For each major topic, lectures and reading of review articles or from advanced texts will introduce the material. This will be followed by journal club/discussion of a contemporary publication from the primary research literature. This will lead to discussion of future applications and proposal ideas.

**Major Resources:**

White, D., Drummond, J., Fuqua, C.. 2012. The Physiology and Biochemistry of Prokaryotes. 4th ed. Oxford University Press, N.Y., 628 pp. (**3<sup>rd</sup> ed. on reserve in the Chang Library**; but you may wish to purchase it.) References are given for the 4<sup>th</sup> edition; chapter numbers after 2 are one lower in the 3<sup>rd</sup> edition. You may also review appropriate chapters in general biochemistry textbooks (Lehninger, etc.)

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<u>Date</u>	<u>Topic</u>	<u>Reading (chapters in White)</u>
Sept. 3	<b>all</b> Introductory. Course requirements. Pymol for structures.1.1, pp. 1-6	
Sept. 5	<b>TC</b> Cell walls	1.2.3, 12.1-2, pp. 18-32, 316-326
Sept. 10	<b>TC</b> Outer membrane of Gram-negative bacteria	1.2.4 pp. 32-34
Sept. 12	<b>TC</b> Cell membrane (cytoplasmic membrane)	1.2.5 pp. 34-39
Sept. 17	<b>CD</b> Bioenergetics 1 : Membrane bioenergetics, chemiosmotic theory, ATP production	White ch. 4, prepare study questions 3 & 4; Junge et al., <i>Science</i> <b>308</b> :642-644 (2005)
Sept. 19	<b>CD</b> Bioenergetics 2: Electron transport chains; diversity of respiratory enzymes. Scaling of metabolic capacity and fluxes with size.	White ch. 5 West & Brown, <i>J. Exp. Biol.</i> <b>208</b> : 1575-1592 (2005)
Sept. 24	<b>TC</b> Bioenergetics in cytosol; lipid synthesis & degradation	White ch. 8, 10.1, 10.4
Sept. 26	<b>CD</b> The logic of metabolic pathways	Bar-Even et al., <i>Nature Chemical Biology</i> <b>8</b> :509- (2012)
Oct. 1	<b>CD</b> Anaerobic nitrate respiration	White 13.1-2, 13.4; Arai, <i>Frontiers in Microbiology</i> <b>2011.2</b>
Oct. 3	<b>TC</b> Diversity of fermentations: glycolysis etc. <b>Take Home Exam #1 distributed</b>	White 9.1-6, 15.1-5

<u>Date</u>	<u>TC Topic</u>	<u>White Reading (in White)</u>
Oct. 8	TC Diversity of fermentations: pyruvate utilization	White 9.7-10. 15.6--11
Oct. 10	TC Diversity of fermentations: C <sub>1</sub> metabolism, acetogenesis	14.1.2-3, 15.8
Oct. 15	TC Methanogenesis <b>Take Home Exam #1 due</b>	14.1.4-8
Oct. 17	TC CO <sub>2</sub> fixation, methylotrophy	14.1.9, 14.2-3
Oct. 22	CD Photosynthesis 1: Diversity and classification of photosynthetic metabolisms	6; Kondratieva et al., The Phototrophic Prokaryotes. <i>The Prokaryotes</i> vol. I 312-330 (on line)
Oct. 24	CD Photosynthesis 2: CO <sub>2</sub> fixation pathways	14.1.1; Forseth, <i>Nature Education Knowledge</i> 3(10)4 Tcherkez et al., <i>Biochemistry (Moscow)</i> 52:869-877 (2013)
Oct. 29	CD Photosynthesis 3: Efficiency of oxygenic photosynthesis, water oxidation	Vinyard et al., <i>Ann. Rev. Biochem.</i> 82:577 (2013) Blankenship et al., <i>Science</i> 332: 805-9 (13 May 2011)
Oct. 31	PK Regulation of enzymes/metabolic control <b>Take Home Exam #2 distributed</b>	7
Nov. 5	PK Regulation of enzymes/metabolic control	
Nov. 7	PK Regulation of enzymes/metabolic control <b>Proposal topics due to faculty for review/approval</b>	
Nov. 12	PK Regulation: phylogenetic diversity <b>Take Home Exam #2 due</b>	
Nov. 14	GZ DNA Replication and Repair	3.1.1-10, 16.4-16.5.2 pp. 77-104, 415-423
Nov. 19	GZ Transcription	11.1.1-5 pp. 281-289
Nov. 21	GZ Transcription Regulation	11.1.6-8 pp. 289-296
Nov. 26	GZ Translation <b>Term Paper/Research Proposal Due</b>	11.2.1-13 pp. 296-312
Dec. 3	<b>Exam 3 (in-class)</b>	
Dec. 5	Student oral presentations <b>Term Paper/Research Proposal Reviews Due</b>	
Dec. 10	Student oral presentations <b>Term Paper/Research Proposal Reviews Due</b>	

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**Requirements:**

1. Two take-home exams, distributed on Oct. 3 (due in class on Oct. 15) and Oct. 31 (due in class on Nov. 12). For each exam, students will receive one or more journal articles and 10 questions about the article(s). Each exam is worth 20 points.

2. One in-class exam (Dec. 3). This exam will cover material from Oct. 31 – Nov. 26, inclusive. Worth 20 points.
3. A 10-page term paper (in the form of a research proposal) in which students will propose a series of experiments to test a hypothesis on a topic related to the course content. Term paper topics must be approved by a course faculty member **no later than Nov. 7**. The term paper is due on Nov. 26 and is worth 20 points.
4. A written peer review (worth 5 points) of one of the term papers/research proposals. The course faculty will select and assign the term paper/research proposal that each student will review. A rubric for the review (per NIH guidelines) will be given to the students in class. Written reviews are due on Dec. 5 or Dec. 10 (the dates for the in-class oral defense of the proposals). Students who make presentations on Dec. 5 will have their reviews due on Dec. 10, and vice versa.
5. An oral defense of the term paper/research proposal (cf. #2, above). Oral presentations will be made in class on Dec. 5 & 10 and are worth 10 points.
6. Class participation, worth 5 points. "It is better to speak up and risk being thought uninformed, than remain silent and confirm it."

**Attribution/Plagiarism:**

**When information for a paper (data, text, figures, tables) is copied from another document, it must be referenced appropriately.** If it is directly quoted as text, it needs to be identified with quotation marks as well. Figures or tables may be copied from source material, but they must be properly referenced.

**Copyright note:**

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**Internet resources:**

It is easy to use search engines on the Internet to obtain information for your research paper. Information found on the Internet, however, is of varying quality. The only acceptable reference in a scientific article is that which is subject to "peer review." In this process, experts have reviewed it and recommended to the journal editor that the paper is well written, and that it contributes interesting new findings. This process usually requires several revisions, in which the author responds and makes changes to clarify points brought up by the reviewers. In this manner, quality and impact of publications is maintained. Most web pages are not subject to such a process and anyone can post any information. Therefore web pages, in general, are not acceptable as references. The exception to this rule would be web pages maintained by a community of scholars, for example a website maintained by one of the Institutes of the NIH, or the NCBI, or the Ribosomal Database Project, or the Protein Data Base (to name just a few) where peer reviewed internal technical reports can often be found. Citing resources from these websites is acceptable. If you have a question about the acceptability of a website, please contact a course faculty member.