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**MICROBIAL BIOCHEMISTRY**

16:682:502

Index 10478

3 credits

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Time:	Fall Semester, 2017 Tuesday, Thursday 3:55-5:15 p.m.	
Place:	Lipman Hall room 325, Cook campus	
Instructors:	T. Chase (Course Coordinator) 333B Lipman Hall, Cook campus email: tchase@sebs.rutgers.edu	C. Dismukes 1014 Waksman Institute, Busch campus e-mail: dismukes@rutgers.edu
	P. Kahn 120 Lipman Hall, Cook campus email: pkahn@sebs.rutgers.edu	
Office hrs:	By arrangement	

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**Format:** References, in White (see below) or review articles, for reading **before** the lecture, are given below. The faculty will also direct you (via Sakai) to primary research papers, to be read after the class. At the next lecture. Q&A on primary readings based on assigned questions will be conducted.

**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 find it useful to 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. 5	<b>all</b> Introductory. Course requirements. .	1.1, pp. 1-6
Sept. 7	<b>PK</b> Pymol for viewing 3D structures of proteins ( <b>meet in Lipman 202</b> )	
Sept. 12	<b>TC</b> Cell membrane	White 1.2.5 pp. 34-39
Sept. 14	<b>TC</b> Bioenergetics in cytosol	White ch. 8
Sept. 19	<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. 21	<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. 26	<b>CD</b> Bioinorganic Chemistry:	Frausto da Silva & Williams: "The biological inorganic chemistry of the elements", ch. 2.1-2.5; Li, Saddler, & Sun, "Rationalization of the strength of metal binding to human serum transferrin." <i>FEBS Lett.</i> , 1996. 242: 387.
Sept. 28	<b>CD</b> Photosynthesis 1: Diversity and classification of photosynthetic metabolisms	White ch. 6; Kondratieva et al., The Phototrophic Prokaryotes: <i>The Prokaryotes</i> vol. I 312-330 (on line)
Oct. 3	<b>CD</b> Photosynthesis 2: CO <sub>2</sub> fixation pathways	Igamberdiev, A. U.; Kleczkowski, L. A. <a href="#">Biosystems Volume 103, Issue 2</a> , Feb. 2011, pp. 224-229. Tang, K.-H., Tang, Y.J., and R.E. Blankenship, <i>Front. Microb. Physiol. Metab.</i> , <b>2011</b> . 2(Aug.) p. 165.

<u>Date</u>	<u>Topic</u>	<u>Reading</u>
Oct. 5	<b>CD</b> Photosynthesis 3: Efficiency of oxygenic photosynthesis, water oxidation	Vinyard et al., <i>Ann. Rev. Biochem.</i> <b>82</b> :577 (2013) Blankenship et al., <i>Science</i> <b>332</b> : 805-9 (13 May 2011)
Oct. 10	<b>CD</b> The logic of metabolic pathways <b>Take-home Exam #1 distributed</b>	Bar-Even et al., <i>Nature Chemical Biology</i> <b>8</b> :509- (2012)
Oct. 12	<b>PK</b> Regulation of enzymes/metabolic control	White ch. 7
Oct. 17	<b>PK</b> Regulation of enzymes/metabolic control	
Oct. 19	<b>PK</b> Regulation of enzymes/metabolic control <b>Take Home Exam #1 due</b>	
Oct. 24	<b>PK</b> Regulation: phylogenetic diversity	
Oct. 26	<b>TC</b> Diversity of fermentations: glycolysis etc.	White 9.1-6, 15.1-5; Verhees et al., <i>Biochem. J.</i> <b>375</b> :231-246 (2003)
Oct. 31	<b>TC</b> Diversity of fermentations: pyruvate utilization	White 9.7-10, 15.6-11; Knappe & Sawers, <i>FEMS Microbiol. Rev.</i> <b>75</b> : 383-398 (1990); Sawers, <i>Biochem. Soc. Trans.</i> <b>33</b> :42-5 (2005)
Nov. 2	<b>TC</b> Diversity of fermentations: C <sub>1</sub> metabolism, acetogenesis	White 14.1.2-3, 15.8; Huang et al. <i>J. Bacteriol.</i> <b>194</b> :3689-99 (2012)
Nov. 7	<b>TC</b> Methanogenesis, electron bifurcation  <b>Proposal topics due to faculty for review/approval</b>	White 14.1.4-8; Thauer et al., <i>Nature Rev. Microbiol.</i> <b>6</b> :579-590 (2008); Wagner et al., <i>Science</i> <b>357</b> : 699-703 (2017)
Nov. 9	<b>TC</b> Methylotrophy, aerobic and anaerobic <b>Take home exam #2 distributed</b>	White 14.1.9, 14.2-3; Chistoserdova et al., <i>Ann. Rev. Microbiol.</i> <b>63</b> : 477-499 (2009); Cui et al., <i>MicrobiologyOpen</i> <b>4</b> (1):1-11 (2015)
Nov. 14	<b>TC</b> Sulfate reduction. Lithotrophy.	White 13.1, 13.2.2, 4; Grein et al., <i>Biochim. Biophys. Acta</i> <b>1827</b> :145-160 (2013)
Nov. 16	<b>Dr. Häggblom</b> Anaerobic dechlorination	Hug et al., <i>Phil. Trans. R. Soc. B</i> <b>368</b> : 20120322; Karl et al., <i>Nature</i> <b>517</b> :513-6 (2014); Bommer et al., <i>Science</i> <b>346</b> : 455-8 (2014)
Nov. 21	<b>TC</b> Cell walls <b>Take Home Exam #2 due</b>	White 1.2.3, 12.1-2; Vollmer & Seligman, <i>Trends in Microbiol.</i> <b>18</b> : 59-66; Cava & de Pedro, <i>Curr. Opin. Microbiol.</i> <b>18</b> :46-53. (2014)
Nov. 28	<b>TC</b> Outer membrane of Gram-negative bacteria	White 1.2.4 pp. 32-34; Ruiz et al., <i>Nature Rev. Microbiol.</i> <b>7</b> :677-83 (2009)
Nov. 30	<b>TC</b> Insertion of proteins into the cell membrane	White 18:1-5
Dec. 5	<b>Exam 3 (in-class)</b>	
Dec. 7	Student oral presentations <b>Research Proposal Reviews Due</b>	
Dec. 12	Student oral presentations <b>Research Proposal Reviews Due</b>	

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**Requirements:**

1. Two take-home exams, distributed on Oct. 10(due in class on Oct. 19) and Nov. 7 (due in class on Nov. 16). 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. 5). This exam will cover material from Nov. 9 – Nov. 30, inclusive. Worth 20 points.
3. A 10-page research proposal, in which students will propose a series of experiments to test a hypothesis on a topic related to the course content. Proposal topics must be approved by a course faculty member **no later than Nov. 7**. A one-page summary of what you expect to propose is suggested. The proposal is due on Nov. 30 and is worth 20 points.
4. A written peer review (worth 5 points) of one of the research proposals. The course faculty will select and assign the 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. 7 or Dec. 12(the dates for the in-class oral defense of the proposals). Students who make presentations on Dec. 7 will have their reviews due on Dec. 12, and vice versa.
5. An oral defense of the term paper/research proposal (cf. #3, above). Oral presentations will be made in class on Dec. 7 & 12 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, that it is well grounded in previous research, 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.