

MIC 321 (45785) SYLLABUS SPRING 2000

Course: Microbiology 321, Biology of Fungi, ESB 333, TTH 12:30-2 p.m.

Instructor: Dr. Paul J. Szaniszlo, ESB 109A
(Office hours: Mon 4-5 p.m.; ESB 109A)

Grader/TA: Philip McIntosh (Office hours to be arranged)

Textbook: Moore-Landecker: Fundamentals of the Fungi, 1996. Fourth Edition: Prentice Hall, Inc., New Jersey (Optional, but assigned readings are highly recommended)

Supplemental Reading: Reserve reading articles (available in the Science Library or at Speedway Copy and Printing, Dobie Mall)

Prerequisites: Upper division standing and 8 hours of Biology, or consent of Instructor. Prior understanding of the relevance of mitosis and meiosis to eukaryotic biology is expected.

Course Description:

MIC 321 is presented as two one-hour and fifteen minute lectures per week. The lectures attempt to enumerate the general features of most fungi and fungal-like protists and to relate the broad trends in structure, function and behavior which can be discerned in the group. The aim of the lectures is to provide the student who may not anticipate becoming a professional mycologist (fungal biologist) with a perspective of mycology (study of fungi) as a whole. Topics such as fine structure, growth, development, reproduction and genetics of fungi are examined in detail. Also, general aspects of such topics as fungal classification, nutrition, metabolism, and the production of primary and secondary metabolites by fungi are introduced. An OPTIONAL laboratory, Mic 122K, which will be presented on Mondays from 7-10 p.m. by Dr. James L. Harris, can also be taken to help you with this course.

A "Course Outline" for the lectures is attached, as well as a "Reserve Readings List" and a "Reserve Book List". The reserve readings are also highly recommended and in some cases may provide flavor or historical notes on certain subjects, in other cases details about recent advances in subjects that may or may not be introduced in the course text, and in still other cases details of some of the organisms that might be studied in the laboratory. The reserve books represent a number of alternative source materials that can be used to supplement, clarify and expand upon the lectures, your primary textbook assignments, or the reserve reading materials. With respect to some topics these books may have better presentations of some topics than those of your primary text, and can serve as appropriate substitutes for certain assignments in that textbook.

Grading and Test Policy:

There will be three hourly examinations and a cumulative final. Each one hour exam will represent 20% of your final grade, whereas the final will account for 40%.

Examination Schedule:

The three one-hour exams will be scheduled during regular class periods. There will be no make-up exams unless there is a substantial, legitimate and documented medical excuse or a documented major personal tragedy associated with your absence from an examination. Failure to take an examination will result in a zero grade for that exam. Interviews for jobs or medical, dental or veterinary schools do not qualify as substantial excuses. The date each exam will be given and the approximate materials to be covered by each exam are as follows:

- Exam #1** - Thursday, February 17 (material through fungal thalli)
Exam #2 - Thursday, March 23 (material through yeast biology)
Exam #3 - Thursday, April 27 (material from yeast biology through secondary metabolism)
Final - Cumulative and comprehensive

Class Notes:

Lecture notes, which will mostly consist of only the printed overhead materials discussed in more detail during class, may be available online at:

<http://www.esb.utexas.edu/mycology/mic321/default.htm>.

These notes if available should be downloaded ahead of time so that you can listen more freely, and have ample time to take notes about material presented in other ways (lecture, pictures, graphs, etc) **However, be advised that these notes routinely will be subject to modifications that reflect new knowledge or concepts.**

Course Outline for MIC 321 - Lecture Topics

1. Introduction: What are fungi?
2. Outline of fungal classifications (emphasis on basic diagnostic characteristics of divisions, subdivisions and classes; with overviews of spores, sporangia, asci and basidia, basic life cycles)
3. The gross morphology of fungal thallus types.
4. Cytology of selected fungal structures (zoospores, hyphal tips, yeast cells, etc.)
5. Spores (mitospores, meiospores and karyospores; zoospores, conidia, aplanospores, ascospores and basidiospores)
6. General kinetics of fungal growth (emphasis on hyphal growth)
7. The fungal cell wall (ultrastructure, chemistry and function)
8. Patterns of hyphal growth (models for apical extension involving aspects of morphology, cytology and chemistry)
9. Patterns of yeast growth (architecture and models for budding and septum formation)
10. Basic biology of yeasts (discussions of taxonomy, sexual cycles, ultrastructure, mitosis and meiosis)
11. Yeast biology continued (regulation of the yeast cell cycle, growth cycle and sexual cycle)
12. Hyphal aggregates (overview of the various fungal structures formed as a consequence of hyphal aggregation; ascocarps, basidiocarps, synnemata, pycnidia, etc., and where relevant, discussions of the importance of these structures to fungal taxonomy)
13. Dormancy and spore germination.
14. Introduction to concepts of nonsexual fungal genetics (heteroplasmonosis, heterokaryosis, parasexuality)
15. Genetic regulating mechanisms controlling sexuality in fungi (homothallism, heterothallism, bipolarity and tetrapolarity)
16. Life cycle regulation caused by "hormones" (trisporic acids and the mucors, sirenin and *Allomyces*, antheridiol and oogoniols in *Achlya*, and the peptide hormones of *Saccharomyces* and kin)
17. Introduction to fungal primary metabolism.
18. Introduction to fungal secondary metabolism.
19. Introduction to fungal molecular biology and biotechnology.

MIC 321 RESERVE READINGS

The following readings are on reserve in the Science Library. If you wish to have a personal copy, you are urged to purchase the original journal or book reading. This will keep those copies on reserve in good condition. The journal citation numbers of each reading are listed below. These reserve articles can also be purchased at Speedway Copying, Dobie Mall.

<u>SZ reading</u>	<u>Author(s)</u>	<u>Title/Citation</u>
No. 1	Fulghum	Selected reading from "All I really need to know I learned in kindergarden"; uncommon thought on common things (Ivy Books, York, pp. 143-147)
No. 2	Bardell	The discovery of microorganisms by Robert Hooke (ASM News <u>54</u> :195, 1988)
No. 3	Whitaker	New concepts of the kingdom of organisms (Science <u>163</u> :150-160, 1969)
No. 4	Katz	The tangled web: Gene genealogies and the origin of eukaryotes (Am. <u>154</u> :S137-S145, 1999)
No. 5	Taylor	Ultrastructure as a control for Protistan molecular phylogeny (Am. <u>154</u> :S125-S136, 1999)
No. 6	Baldauf	A search for the origins of animals and fungi (Am. Nat. <u>154</u> : S178-199, 1999)
No. 7	Barr	Chytridiomycota (Mycota VII; 2000 sample chapter - in press)
No. 8	Berbee and Taylor	Ascomycete relationships: dating the origin of asexual lineages with ribosomal RNA gene sequence data. <u>In</u> Reynolds and Taylor, ed. Fungal Holomorph, pp. 67-78. CAB International, UK, 1993.
No. 9	Sutton	Mitosporic fungi (Deutermycetes) in the <u>Dictionary of the Fungi</u> . Reynolds and Taylor, ed. The Fungal Holomorph, pp. 27-55. CAB International, UK, 1993.
No. 10	Taylor and Reynolds	What are the consequences of abandoning the Deuteromycetes? Reynolds and Taylor, ed. The Fungal Holomorph, pp. 105-106. CAB International, UK 1993.
No. 11	Gow	Tip growth and polarity. <u>In</u> Gow and Gadd, ed. The Growing Fungus no. QK603, G76, 1995, Chapman Hall, London, pp. 277-299.
No. 12	Gooday	Cell walls. <u>In</u> Gow and Gadd, ed. The Growing Fungus, QK603, 1995, Chapman Hall, London, pp. 43-62.
No. 13	Wessels	Fungi in their own right (Fungal Genetics and Biology <u>27</u> :134-145, 1999. Article 1D fgbi. 1999.1125)
No. 14	Angur	A stupid cell with all the answers (<u>Discovery</u> , Nov. 1986, 71-83)

- No. 15 Murray and Hunt Genetic analysis of the cell cycle. In The Cell Cycle: An Introduction call no. QH605, M95; 1993, W. H. Freeman and Co., NY, pp. 28-41.
- No. 16 Forsburg The best yeast (Trends in Genetics 15:340-344, 1999)
- No. 17 Chant Cell polarity in yeast (Trends in Genetics 10:328-333, 1994)
- No. 18 Field et al. Septings: cytoskeletal polymers or signalling GTPases (Trends in Biology 9:387-395, 1999).
- No. 19 Jazwinski Molecular mechanisms of yeast longevity (Trends in Microbiology 7:253, 1999)
- No. 20 Sawin Some thoughts about microtubules and cell polarity (Fungal Genetic Biology 27:224-230, 1999; Article 10fgbi.199.1137)
- No. 21 Hirsch and Cross Pheromone response in yeast (BioEssays 14:367-373, 1992)
- No. 22 Koepp et al. How the cyclin became a cyclin: regulated proteolysis in the cell (Cell 97:431-434, 1999)
- No. 23 Roberts Evolving ideas about cyclins (Cell 98:129-132, 1999)
- No. 24 Heinisch et al. The protein kinase C-mediated MAP kinase pathway involve maintenance of cellular integrity in *Saccharomyces cerevisiae* (Mol Microbiology 32:671-680, 1999)
- No. 25 Harris The duplication cycle in *Aspergillus nidulans* (Fungal Genetics Biology 22:1-12, 1997; Article No. FG970990)
- No. 26 Moore Tissue Formation (In The Growing Fungus, call no. QK603, G76, Chapman Hall, London, pp. 423-466)
- No. 27 Perkins *Neurospora*: The organism behind the molecular revolution (Genetics 130:687-701, 1992)
- No. 28 Glass and Lorimer Ascomycete mating types (on reserve – In Bennett and Lasure, ed.; call no. QK602, M602, M67, pp. 193-216, Academic Press, 1991)
- No. 29 Litten The most poisonous mushrooms (Sci. Am. 232:90-101, 1975)
- No. 30 Kothe Mating types and pheromone recognition in the Homobasidium *Schizophyllum commune* (Fungal Genetics and Biology 27:146-152, Article 1Dfgbi.1999.1129)
- No. 31 Banuett *Utilago maydis*, the delightful blight (Trends in Genetics 8(5):174-192, 1992)
- No. 32 Silar and Daboussi Non-conventional infectious elements in filamentous fungi (Trends in Genetics 15(5):141-145, 1999)
- No. 33 McCabe et al. The influence of dsRNA viruses on the biology of plant pathogenic fungi (Trends in Microbiology 7(9):377-381, 1999)
- No. 34 Perkins In praise of diversity (on reserve – In Bennett and lasure, ed.; call no. QK602, M67, pp. 3-26, Academic Press, 1991)

- No. 35 Gooday Hormones and sexuality in fungi (In Bennett and Ciegler, ed., ca QK601, S43; 1983, Secondary Metabolism and Differentiation in . Marcel Dekker, Inc., NY)
- No. 36 Judelson The genetics and biology of *Phytophthora infestans*: Modern approach a historical challenge (Fungal Genetics and Biology 22:65-76, Article No. FG971006)
- No. 37 Corrochano and Cerda-Olmeda Sex, light and carotenes: the development of *Phycomyces* (Trends in Genetics 8:268-274, 1992)
- No. 38 Johnston Feasting, fasting and fermenting (Trends in Genetics 15(1):29-33, 1999)
- No. 39 Zahner et al Evolution and secondary pathways (In Bennett and Ciegler, ed.; ca QK601, S43; 1983, Secondary Metabolism and Differentiation in . Marcel Dekker, Inc., New York)
- No. 40 Raper The penicillin saga remembered (ASM News 44:645-653, 1978)
- No. 41 Penalva et al. The optimization of penicillin biosynthesis in fungi (TIBTECH 16:488, 1998)
- No. 42 Randez-Gil et al. Engineering baker's yeast: room for improvement (TIBTECH 17:237-247, 1999)
- No. 43 Lomascolo et al. Basidiomycetes as new biotechnological tools to generate natural aromatic flavors for the food industry (TIBTECH 17:282-289, 1999)

RESERVE BOOK LIST - MIC 321 - Biology of the Fungi

Call number of each reference is to the left of each title. All these references can be found on the MIC 321 reserve shelf in the Science Library.

- QK603
M62, 1996 Moore-Landecker: Fundamentals of Fungi (4th ed)
- QK603
A55, 1996 Alexopoulos, Mims and Blackwell: Introductory Mycology (4th ed)
- QK603
A5, 1995 Hawksworth, Kirk, Sutton and Pegler: Ainsworth & Bisby's Dictionary of the Fungi (8th ed.)
- QK603
G76, 1995 Gow and Gadd (eds): The Growing Fungus
- QK603
C257, 1994 Carlile and Watkinson: The Fungi
- QK603
K46, 1992 Kendrick: The Fifth Kingdom (2nd ed.)
- QH83
M36, 1987 Margulis and Schwartz: Five Kingdoms: an Illustrated Guide to The Phylum of Life on Earth (2nd. ed.)
- QK603.2
F86, 1993 Reynolds and Taylor, ed.: The Fungal Holomorph
- QK603
D4, 1984 Deacon: Introduction to Modern Mycology (2nd ed.)
- QK601
G76, 1993 Griffin: Fungal Physiology (2nd ed.)
- QK601
G27, 1984 Garraway and Evans: Fungal Nutrition and Physiology
- QR245
K86, 1992 Kwon-Chung and Bennett: Medical Mycology
- QK602
F5, 1979b Fincham, Day and Radford: Fungal Genetics (4th ed.)
- QK623
S23
M64, 1997
Vol. 3 Pringle, Broach and Jones: The Molecular and Cellular Biology of the Yeast *Saccharomyces*; Vol. 3, Cell Cycle and Cell Biology
- QK623
S23 M6
1991, Vol. 1 Broach, Jones and Pringle: THE MOLECULAR AND CELLULAR BIOLOGY OF THE YEAST *Saccharomyces*, Vol. 1, Genome dynamics protein synthesis, and energetics, Cold Spring Harbor Laboratory Press, NY
- TP248.27
Y43 W35
1998 Walker: Yeast: Physiology and Biotechnology