

Integrative Biology 118: Host-pathogen interactions: a trans-discipline outlook

Instructor: Michael Shapira

Updated to ~~Fa'12~~ Fa'13

Course material will be partially covered by the following books:

Immunobiology / Janeway (required; 8th edition preferred, 5th edition available online)

Biology of microorganisms, 13th edition (required)

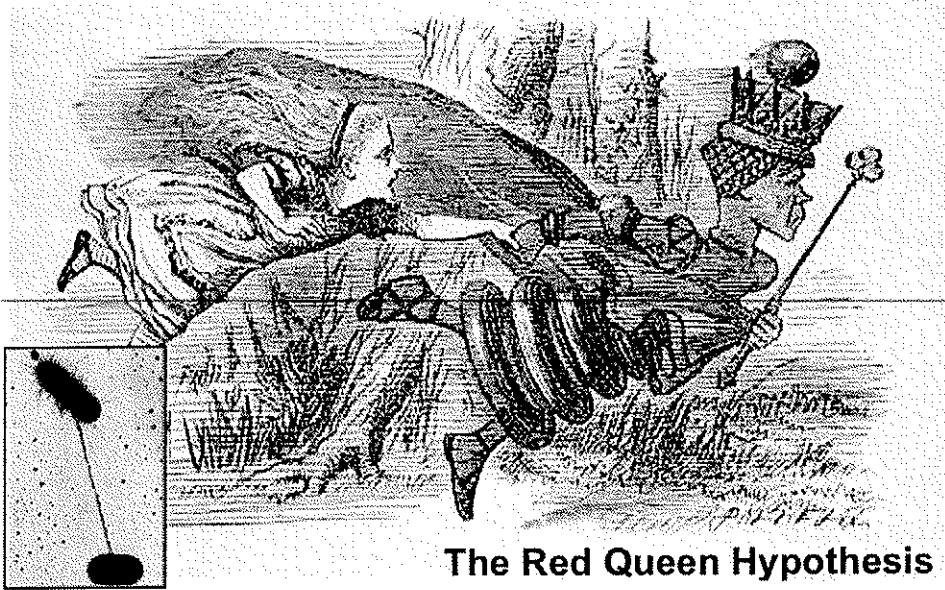
The remaining material will be covered by more than a few Journal articles, mainly reviews.

Pre-requisites: Bio 1A/Bio 1B (students with Bio11 should talk first with Michael Shapira)

Students lacking basic background in molecular and cell biology (via UCB's Bio1A or equivalent) will have to make up for that in order to keep up with course material. All students are urged to freshen up on their Bio1A material.

The second half of the 20th century has been marked by great strides in the battle against infectious diseases. However, the forces that drive bacterial evolution are not dormant and continue to pose new challenges for science and medicine. In this course we will cover various aspects relating to host-pathogen interactions in animals (and possibly also relating to plants), learning about viral pathogens, fungi, parasitic nematodes, but mainly focusing on bacterial pathogens. We will examine the ecological context in which such interactions take place and how these interactions are shaped by evolution. We will further focus on prominent molecular mechanisms that participate in both pathogen and host in this warfare and learn how ancient mechanisms are used and reused in diverse organisms spanning hundreds of millions of years of evolution and how they integrate with more recently evolved mechanisms. The course will examine how such mechanisms contribute to disease, but also how the understanding of these mechanisms could suggest new strategies for fighting infectious diseases.

The course will cover topics from the fields of immunology, microbiology, evolution and cell biology.



“Now, here, you see, it takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!”

The Red Queen Hypothesis

Host pathogen interactions - syllabus

	Instructor	topic
1	25-Aug Michael Shapira	Infectious diseases – a brief history
2	30-Aug Michael Shapira	Survey of pathogens
3	1-Sep Michael Shapira	ecology, inter-species interactions
4	6-Sep Michael Shapira	evolution of host-pathogen interactions
5	8-Sep Ellen Simms	The continuum between mutualism and parasitism vvv
6	13-Sep Michael Shapira	The Bacterial cell
7	15-Sep Michael Shapira	Antibiotics and antibiotic resistance
8	20-Sep Michael Shapira	Lateral gene transfer
9	22-Sep Michael Shapira	comparative genomics and pathogenicity islands
10	27-Sep Michael Shapira	review
11	29-Sep	
11	4-Oct Midterm I	Midterm I
12	6-Oct Michael Shapira	pathogenesis and virulence factors I
13	11-Oct Michael Shapira	pathogenesis and virulence factors II
14	13-Oct Matt Welch	The host cell - actin and actin modulations
15	18-Oct Michael Shapira	Innate immunity and its origins
16	20-Oct Michael Shapira	Innate immunity I
17	25-Oct Michael Shapira	Innate immunity II and origins of adaptive immunity
18	27-Oct Michael Shapira	Acquired immunity – the central paradigm
19	1-Nov Michael Shapira	Acquired immunity and its origins
20	3-Nov Michael Shapira	review
20	8-Nov Michael Shapira	Midterm II
21	10-Nov Michael Shapira	Bacterial evasion - complement
22	15-Nov Michael Shapira	Bacterial evasion - antigenic variation
23	17-Nov Michael Shapira	Bacterial evasion - evasion of pattern recognition & TTSS
24	22-Nov Michael Shapira	Bacterial evasion - TTSS
25	29-Nov Michael Shapira	Bacterial evasion
26	1-Dec Eva Harris	Evolution of a vector-borne disease and its pathogenesis
27	6-Dec Michael Shapira	review
28	8-Dec Michael Shapira	review

Finals

reading

- Guns Germs and Steel (ch.11).
Brock Microbiology Ch.10.1-10.11, Ch.18(protists), Taylor 2010 (filaria)
Campbell 8th ed. Ch. 54 (8th Ed. C. 53). Pounds JA Nature 2006, McLaughlin NEJM 2005.
Campbell 8th ed. Ch. 23.4, 26.3
- Brock ch.4, 5.1-3, Ch. 6.5-7, 6.10-11, breeze through: 6.12-end of chapter
Brock ch. 27, Alekshun 2007
Brock Ch. 11
Hacker&Carniel 2001, Galmor&Finlay 2006
- Brock Ch. 28
- Janway's Ch. 1,2, Chen et al., 2007
Janway's Ch. 2
Janway's Ch. 2, Pancer 2004
Janway's Ch. 3,4
Janway's Ch. 8,9
- Lambris 2008, Barondess 1990; for general review of evasion mechanisms, see Finlay 2006
Bacterial Pathogenesis/Salyers, A. (2nd edition): 437-449; Davidsen 2006
Bacterial Pathogenesis/Salyers, A. (2nd edition): 202-213; Galan 2006
Shao 2008