### Biology 78 w16  Molecular Mysteries of Human Biology

**Lectures:** Monday, Wednesday & Friday 8:45-9:50  
**X-hour:** Thursday 9-9:50  
**Text/Reading:**

1. **Recommended text:** Any biochemistry text (e.g. Voet, Voet & Pratt, Berg, Tymoczko & Stryer, or Garrett & Grisham) may provide important background information. Copies on Dana Course Reserve.

2. **Course Reader:** 40 manuscripts that are required course reading. Available at Wheelock Books. Additional helpful reviews for each topic posted as .pdfs on web site, with .pdf files for most other manuscripts.

**Course Web Site:** [http://canvas.dartmouth.edu](http://canvas.dartmouth.edu)

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<tr>
<th>Date</th>
<th>Topic</th>
<th>Prob Set Posted</th>
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<tr>
<td>Monday, Jan 4</td>
<td>Atherosclerosis: The Loch Ness Monster and John Hunter’s Ossified Arteries</td>
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<td>Wed, Jan 6</td>
<td>Plasma Lipoproteins: The Legacies of Michel-Eugène Chevruel and Mona Lisa</td>
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<td>Thurs, Jan 7 X-hour</td>
<td>Video: The Hidden Epidemic: Heart Disease in America</td>
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<td>Fri, Jan 8</td>
<td>Readings: Schoenheimer Effect Explained: Cholesterol Regulates Itself</td>
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<td>Mon, Jan 11</td>
<td>Readings: PCSK9: Trafficking the LDL Receptor</td>
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<td>Wed, Jan 13</td>
<td>Otto Warburg and the Mysterians: Metabolism in Cancer Cells</td>
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<td>Thurs, Jan 14 X-hour</td>
<td>Dr. John Butterfly: A Patient with Atherosclerosis</td>
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<td>Fri, Jan 15</td>
<td>Readings: Pyruvate Kinase M2 Activators &amp; Tumorigenesis</td>
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<td>Mon, Jan 18</td>
<td>NO CLASS: MLK Day</td>
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<td>Wed, Jan 20</td>
<td>Readings: Targeting the Warburg Effect &amp; Lipogenesis</td>
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<td>Thurs, Jan 21 X-hour</td>
<td>Cachexia: Agostino Levanzin, the Irish Republican Army and Steve Jobs</td>
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<td>Fri, Jan 22</td>
<td>Readings: Lipolysis &amp; Early Cancer Cachexia</td>
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<td>Mon, Jan 25</td>
<td>Readings: The “Browning” of White Adipose Tissue in Cancer Cachexia</td>
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<td>Wed, Jan 27</td>
<td>Bathsheba’s Breast: Hendrickje Stoffels, Anne of Austria, Susan Sontag and Jill Ireland</td>
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<td>Thurs, Jan 28 X-hour</td>
<td>Dr. Peter Kaufman: A Patient with Breast Cancer</td>
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<td>Fri, Jan 29</td>
<td>Readings: Her2 (ERBB2), HIF-1 &amp; Anoikis</td>
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<td>Mon, Feb 1</td>
<td>Readings: Serine Biosynthesis &amp; Metabolism in Breast Cancer</td>
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<td>Wed, Feb 3</td>
<td>Exercise: Sled Dogs, Toadfish, Frogs, Geese, Bats &amp; Lance Armstrong</td>
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<td>Thurs, Feb 4 X-hour</td>
<td>NO CLASS</td>
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<td>Fri, Feb 5</td>
<td>Readings: Fatty Acid Translocase &amp; Exercise Performance</td>
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<td>Mon, Feb 8</td>
<td>Readings: Carnitine Acetyltransferase, Metabolic Inertia and Muscle Fatigue</td>
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<td>Thurs, Feb 11 X-hour</td>
<td>Pharmacologic Chaperones &amp; Phenylalanine Hydroxylase in Phenylketonuria</td>
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<td>Fri, Feb 12</td>
<td>NO CLASS: CARNIVAL</td>
<td>#5</td>
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<td>Mon, Feb 15</td>
<td>Readings: Homocystinuria: Heme Arginate as a Therapeutic Chaperone</td>
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<td>Wed, Feb 17</td>
<td>Diabetes Mellitus: Paul Cezanne’s Vision and Shirley Horn’s Feet</td>
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<td>Thurs, Feb 18 X-hour</td>
<td>Dr. Richard Comi: A Patient with Type 1 Diabetes Mellitus</td>
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<td>Fri, Feb 19</td>
<td>Readings: CaMKII, O-linked Glycosylation and Cardiac Disease</td>
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<td>Mon, Feb 22</td>
<td>Readings: Prevention of Diabetic Ulcers: Hif1α Transactivation with Deferoxamine</td>
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<td>Wed, Feb 24</td>
<td>Alois Alzheimer and Auguste D: Sailing Into Darkness</td>
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<td>Thurs, Feb 25 X-hour</td>
<td>Video: The Forgetting: Portrait of an Epidemic</td>
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<td>Fri, Feb 26</td>
<td>Readings: A Neural Cell Culture Model of Alzheimer’s Disease</td>
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<td>Mon, Feb 29</td>
<td>Readings: apoE-directed Therapeutics: Targeting the RXR Receptor</td>
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<td>Mon, Feb 29 evening</td>
<td>Movie/Dinner/Discussion with Dr. Robert Santulli: Iris: A Tale of Iris Murdoch</td>
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<td>Wed, Mar 2</td>
<td>Aging: In Vino Veritas: Luigi Cornaro &amp; Discorsi della Vita Sobria</td>
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<td>Thurs, Mar 3 X-hour</td>
<td>NO CLASS</td>
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<td>Fri, Mar 4</td>
<td>Readings: A Sirt1 Activator Extends Lifespan &amp; Healthspan</td>
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<td>Mon, Mar 7</td>
<td>Readings: Macronutrient Ratio (not Calories), Health, Aging &amp; Longevity</td>
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<td>Tues, Mar 15</td>
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**Problem set #8 covers both Alzheimer’s and Aging**
Readings for Biology 78

REQUIRED readings are indicated by inclusive dates we will be covering each subject area in class. EVERYONE is expected to have done the reading. Background reading on the physiology/pathophysiology, the molecular/biochemically-oriented research papers to be presented in class and optional, but helpful, review articles for each topic are included in this list. The background and research papers are available in the course reader; all papers, including the review articles (optional reading), which will be useful in preparing presentations, should be consulted on-line, especially for better image presentation and for any color pictures. In addition, there may be supplemental on-line material for many of the “molecular aspect” papers; students should link to the journal web site to access this information.

January 4-11: Atherosclerosis
The Loch Ness Monster and John Hunter’s Ossified Arteries
Plasma Lipoproteins: The Legacies of Michel-Eugène Chevruel and Mona Lisa

Physiologic/Pathophysiologic/Historical Background:
Goldstein, JL and Brown, MS (2015) A century of cholesterol and coronaries: from plaques to genes, Cell, 161, 161-172

Molecular Aspects:

OPTIONAL, BUT HELPFUL
Short Reviews on Course Web Site:
Brown, MS and Goldstein, JL (2009) Cholesterol feedback: from Schoenheimer’s bottle to Scap’s MELADL, J Lipid Res, April supplement, S15-S27
Dadu, RT & Balllantyne, Cm (2014) Lipid lowering with PCSK9 inhibitors, Nature Reviews Cardiology, 11, 563-575
January 13-20: Otto Warburg and the Mysterians: Metabolism in Cancer Cells

Physiologic/Pathophysiologic/Historical Background:

Ward, PS and Thompson, CB (2012) Metabolic reprogramming: a cancer hallmark even Warburg did not anticipate, Cancer Cell, 21, 297-308

Molecular Aspects:


OPTIONAL, BUT HELPFUL
Short Reviews on Course Web Site:
Cairns, RA, Harris, IS and Mak, TW (2011) Regulation of cancer cell metabolism, Nature Reviews Cancer, 11, 85-95


Van der Heiden, MG, Cantley, LC & Thompson, C (2009) Understanding the Warburg effect: the metabolic requirements of cell proliferation, Science, 324, 1029-1033

Mullen, AR and DeBarardinis, RJ (2012) Genetically-defined metabolic reprogramming in cancer, Trends Endo Metab, 23, 552-559


Steffensen, KR (2015) Are synthetic compounds that silence the liver-X-receptor the next generation of anti-cancer drugs, Cancer Cell, 28, 3-4

January 21-25: Cachexia: Agostino Levanzin, the Irish Republican Army & Steve Jobs

Physiologic/Pathophysiologic/Historical Background:

Fearon, K, Strasser, F, Anker, SD et al (2011), Definition and classification of cancer cachexia; an international consensus, Lancet Oncology, 12, 489-495.
Molecular Aspects:


**OPTIONAL, BUT HELPFUL**

**Short Reviews on Course Web Site:**


Argiles, Jm, Busquest, S, Stemmler, B & Lopez-Siriano, FJ (2014) Cancer cachexia: understanding the molecular basis, *Nature Reviews (Cancer)*, published online 10/9/14, doi:10.1038/nrc3829


January 27-February 1: Bathsheba's Breast: Hendrickje Stoffels, Anne of Austria, Susan Sontag and Jill Ireland

**Physiologic/Pathophysiologic/Historical Background:**


Molecular Aspects:

OPTIONAL, BUT HELPFUL
Short Reviews on Course Web Site:


Kalhan, SC and Hanson, RW (2012) Resurgence of serine: an often neglected but indispensable amino acid, J Biol Chem, 287, 19786-19791


February 3-8: Sled Dogs, Toadfish, Frogs, Geese, Bats & Lance Armstrong
Physiologic/Pathophysiologic/Historical Background:


Molecular Aspects:


OPTIONAL, BUT HELPFUL
Short Reviews on Course Web Site:


Physiologic/Pathophysiologic/Historical Background:


Penrose, LS (1935), Inheritance of phenylpyruvic amentia (phenylketonuria), *Lancet*, 2, 192-194


Molecular Aspects:


OPTIONAL, BUT HELPFUL

Short Reviews on Course Web Site:


February 17-22 Diabetes Mellitus: Paul Cezanne’s Vision and Shirley Horn’s Feet

Physiologic/Pathophysiologic/Historical Background:


Molecular Aspects:


OPTIONAL, BUT HELPFUL
*Short Reviews on Course Web Site:*


February 24-February 29: Alois Alzheimer and Auguste D: Sailing Into Darkness

*Physiologic/Pathophysiologic/Historical Background:*


*Molecular Aspects:*


OPTIONAL, BUT HELPFUL
*Short Reviews on Course Web Site:*


Musiek, ES & Holtzman, DM (2015) Three dimensions of the amyloid hypothesis; time, space and “wingmen”, *Nature Neuroscience*, 18, 800-806


March 2-7: Aging: In Vino Veritas-Luigi Cornaro & *Discorsi della Vita Sobria*

**Physiologic/Pathophysiologic/Historical Background:**


**Molecular Aspects:**


**OPTIONAL, BUT HELPFUL**

**Short Reviews on Course Web Site:**


Lamming, DW (2014) Diminished mTOR signaling; a common mode of action for endocrine longevity factors, *SpringPlusi*, 3, 735


Course Format & Expectations

Course Goals and Format:

Knowledge of molecular mechanisms allows new approaches to understanding human biology and disease. This course will explore the normal and abnormal biology of several human conditions relying on biochemistry, molecular genetics, and physiology as tools of inquiry. Examples will be drawn from the histories of Mona Lisa, Michel-Eugène Chevrel, Otto Warburg, Steve Jobs, Hendrickje Stöffels. Bobby Sands, Paul Cézanne, Lance Armstrong, Pearl Buck, Auguste D and Luigi Cornaro. among others.

The class topics are organized in blocks of approximately one week, the introduction of which will generally begin with a lecture by Professor Witters who will discuss an area of normal or abnormal human biology to be investigated. He will include information on the relevant basic biochemical & molecular issues to set the context for further discussions. In the following two classes, the assigned reading will be discussed. Students (in groups of 2) assigned to each topic/paper (see below) will analyse, critique and present the paper to which s/he is assigned (Professor Witters will do unassigned papers). For each of these discussions, **ALL students will be expected to have read the research papers AND to participate in the discussion.** Some short review papers on the course web site are also valuable in setting the context and will provide background information. For each of Professor Witters’ paper presentations, an additional group of 2-3 students will be assigned to critique the paper. Following the final presentation within each topic, students must complete a short to-be-graded written assignment based on a problem/issue raised by one/both of the papers/topic. These assignments will be due as indicated on the course schedule and can be completed in an open-book format with full consultation with any source of information, including others in the class (see below).

Throughout the course, it will be important to put a human face/context to the biochemical/molecular events we are studying, illustrating the “life” experience where biology is normal or abnormal. We will hope to achieve this aim in several ways. The background reading is a very important complement to the molecular details. In some class meetings, we will have a guest physician accompanied by a patient dealing with one of the topics under discussion. We will use some of the other class sessions for viewing of videos that will help introduce or amplify some of these topics. Lastly, we will also have one special evening dinner/discussion with a Geisel faculty member after viewing a movie relating to Alzheimer’s disease.

Expectations and Grading

Expectations for and grading of students consists of several elements. **Students are expected to attend class (arriving on time), to have done the reading and to complete all assignments on time unless the reasons for the lateness/absence have been discussed with Professor Witters in advance. In general, the only possible excuses for lateness will be illness or unavoidable absence from campus (e.g. job or grad school interview, athletic trip, etc with PRIOR approval from him). A 20% deduction in grade will be assigned for each day any assignment is late.**

It is possible to accumulate **100 points** in the course in 4 ways. A curve will be used to assign a final letter grade, **anticipating the median grade to be A-/B+.**
• (60% of grade; 10% for each submitted) Eight (8) problem assignments, each worth 10 points, will be distributed during the term. Each student must complete 6 (six) of these, excluding the problem on the topic of their assigned paper discussion and one other of their choosing (the latter declared in advance). Each problem will relate to an aspect of the assigned reading/topic; answers are limited to two typewritten pages. In 2015, grades ranged 8-10 points (for each set). The distribution and due dates are indicated on the right of the above schedule.

• (25% of grade; 25 points) Preparation and presentation of an assigned paper. Each student (in groups of 2) will be expected to prepare a scholarly presentation that provides some background on the topic, an exposition and review of the data and the methodology of the paper under review and a critique of the paper’s findings and conclusions. In addition, a short “hot topic” that extends the information beyond the assigned paper should be included. Each presentation should be accompanied by a PP set, including a bibliography. In 2015, grades ranged from 22-24 points. More details below.

• (5% of grade; 5 points) Preparation of a short critique of selected papers. For the paper presentations by Professor Witters, 2-3 students will be assigned to provide an additional critique of the paper to complement/extend the his remarks. This assignment will be the creation of a single Powerpoint slide (template to be provided). This is a new grading element not included in the 2015 course.

• (10% of grade; 10 points) Engagement of and participation in class discussions and analysis of reading through thoughtful questions and comment will be an important part of the grading. Participation is the key word, not whether the student is “right or wrong”. Evidence that student has read/prepared for each discussion will also be sought for. Other “evidence” of participation will include the use of office hours and use of the Piazza section on the course web site for thoughtful questions, comments or postings. In 2015, grades ranged from 6-10 points.

• There is no final exam in this course.

Course Materials

The REQUIRED course reader is available for purchase from the Wheelock Books. It will include all of the required readings. Most, but not all, of the course readings are also included on the web site, which should be consulted for supplemental data in many instances and for pertinent background review articles.

A biochemistry text, either Berg, Tymoczko & Stryer, Biochemistry or Voet, Voet & Pratt, Biochemistry or Garrett & Grisham will be very valuable in the review of material and preparation of presentations.

The course web site is on Canvas (http://canvas.dartmouth.edu) where readings, Powerpoint slides, lecture captures (see below), web links, discussion boards and other limited access materials will be maintained.
Technologic snafus aside, we will be doing lecture captures of class sessions using the Echo technology of our classroom this term. While I do NOT regard this as a substitute for class attendance, it might be helpful for several of you if you have an unavoidable absence from class or would simply like to review aspects of a lecture or discussion (you can start and stop me!). Historically, many students have found these useful as a course study adjunct. However, there are things we do in class that may not be easily captured with these technologies (especially classroom discussions).

**Other Course Issues**

**Office Hours:** Students are very much encouraged to utilize office hours for discussion and questions and to work on their assigned presentations; I enjoy getting to know you all well and to work with you on course material, “life after Dartmouth”, things you are up to, etc. **Discussing your topic/paper for your class presentation is especially encouraged.** A schedule of office hours for Professor Witters will be posted for each week. Students are also encouraged to utilize the Piazza section of the Canvas site. By posting questions (and having public answers), everyone in the class benefits. Students can also use this Piazza section to post interesting articles or web links to information they encounter during the course. **A map to his office in the Class of 1978 Life Sciences Center is included at end of this syllabus and posted on the Canvas site.**

**X-hours/Class Schedule:** We will use some of the X-hours as indicated on the course schedule for a lecture, video, or physician/patient visit. **There will be NO CLASS on MLK day (Monday, January 18) and on Friday, February 12 (Carnival) and NO X-HOUR on Thursday, February 4 and March 3.**

**Course Accommodations:** Students with disabilities, including chronic diseases, learning disabilities, and psychiatric disabilities are encouraged to discuss with me appropriate accommodations that might be helpful. Please do this EARLY in the course. I have worked closely with the Student Accessibility Services and Academic Skills Center in the past and can work with students to find study methods, tutoring needs, etc. for those eligible for same.

Some students may wish to take part in **religious observances** during the term. If you have such a conflict, please come and discuss with me, so we can make appropriate arrangements.

**Preparation of Assignments and the Dartmouth Academic Honor Principle:** The Dartmouth College Student Handbook states: "Fundamental to the principle of independent learning are the requirements of honesty and integrity in the performance of academic assignments, both in the classroom and outside. Dartmouth operates on the principle of academic honor, without proctoring of examinations. Students who submit work which is not their own or who commit other acts of academic dishonesty forfeit the opportunity to continue at Dartmouth." Students are responsible for the information concerning plagiarism and proper citation found in the Sources: Their Use and Acknowledgement, available in the Deans' Offices and online (http://www.dartmouth.edu/~sources/). Some specific issues about adherence to the Honor Principle for your assigned paper and the problem sets follows:

- **Assigned paper presentations** (more details below) For completion of this Biology 78 assignment, students are free to consult other sources of information, but ALL THESE SOURCES must be documented in a bibliography. Possible sources include classmates, other non-class students, textbooks and the biomedical literature. INTERNET RESOURCES (URLs) ARE NOT
ACCEPTABLE AS THE SOLE SOURCES OF INFORMATION; STUDENTS ARE
EXPECTED TO USE STANDARD TEXTBOOKS AND THE BIOMEDICAL LITERATURE (You
are free to use the Internet, of course, to identify these primary sources, but must consult them
directly). All presentation materials (PP, other documents) must be passed onto Professor Witters
for posting on the course web site the same day as the presentation.

• Problem sets (more details below) Eight (8) problem sets will be distributed, each on the final class
day of each of the 8 topics. Students must complete and submit six (6) of these. One is automatically
excluded for each student, namely the one on the topic they presented. Students should then choose
one other for exclusion, declared in advance of the distribution of the problem.

Class students are encouraged to work together in discussing and researching the
assignments, but everyone is expected to INDEPENDENTLY PREPARE their written answer.
You will be required to list the names of the students you worked with on the problem sets.
However, students MAY NOT consult with the students who prepared presentations for that
particular topic. The completed assignments by individuals who discuss the assignment may reflect
ideas developed by them together, but each student must phrase their assignment answer in their own
words and acknowledge the “helpful discussions” with their collaborators in the bibliography.
Therefore DO NOT share the computer files for your written answers (in draft or final form)!
For completion of this Biology 78 assignment, students are free to consult other sources of
information, but ALL THESE SOURCES must be documented in a bibliography. In general, the
problem sets can be answered entirely based on information that has been communicated in class and
outside references are not necessary (and, in some instances, could confuse).
Some Specifics Regarding the Paper & Critique Assignments and Problem Sets

Paper Assignment
During the first week, students will rank 8 of the course topics in order of preference (1-8) and will then be assigned to a specific paper based on these preferences. You will want to peruse the course schedule & the spreadsheet at end of this syllabus for the presentation dates (and the dates that problem sets are assigned and due (this might influence your choices)). Professor Witters will be doing the first three presentations to provide models of presentation format and will also do one of the papers in most topics. Choices are:

1. Metabolism in Cancer Cells
2. Cachexia
3. Breast Cancer
4. Exercise
5. Errors in Amino Acid Metabolism
6. Vascular Complications of Diabetes Mellitus
7. Alzheimer’s Disease
8. Aging

Every effort will be made to give students one of their top choices. After assignment, students will have 24 hours in which to “swap” with someone else, but must inform Professor Witters of the switch.

Students will be assigned in groups of two to one paper. Each student group is to prepare a scholarly 40 min (~20 min per student) presentation using Powerpoint (and a handout (optional)) and a bibliography of any additional readings beyond that provided in class. This time must be adhered to, leaving ~20 minutes for discussion/questions. For completion of all Biology 78 assignments (problem sets, class presentations), students are free to consult other sources of information, but ALL THESE SOURCES must be documented in a bibliography. Possible sources include classmates, other non-class students, Professor Witters/other faculty, textbooks and the biomedical literature. INTERNET RESOURCES (URLs) ARE NOT ACCEPTABLE AS SOLE SOURCES OF INFORMATION; STUDENTS ARE EXPECTED TO USE STANDARD TEXTBOOKS AND THE BIOMEDICAL LITERATURE (You are free to use the Internet, of course, to identify these primary sources, but must consult them directly). All presentation materials (PP, other documents) must be passed onto Professor Witters for posting on the course website the same day as the presentation.

The presentation should be modeled after Professor Witters’ paper presentations and should include the following FIVE elements:

1. A brief background of the relevant topic addressed by the paper
2. Presentation of the important data displayed in the paper (it is not necessary to present ALL the data; attention should be paid to the data which supports the major experimental conclusions). Indeed, your ability to identify which are the key data is part of your grade! When presenting the data, the figure from the text should be shown where applicable and the experimental technique(s) used to generate the data briefly explained. The data presentation should include any critique about the techniques used or conclusions drawn about any of the data sets. Each student group will be given a CD with all the figures and tables (as .jpg, .gif or .pdf files) from the assigned paper to assist in their preparation.
3. A summary and critique of the major conclusions of the paper and the ramifications of the study in terms of future research and comment about the “mystery” solved!
4. A brief highlighting of a 2nd recent paper the group finds on the same topic. This ‘hot topic’ paper should add an extra dimension to the specific area under discussion in the primary paper (Professor Witters may suggest some ideas to you, but you are expected to look on your own (e.g. PubMed) to find a “hot and
recent” addition to the literature on the specific biochemical topic you are reporting on in your primary paper).

5. **Engagement of the rest of the class** through provocative or interesting questions. This is a crucial (and “graded”) element of the presentation. The questions should be analytical and thought-provoking, not just regurgitative of what everyone has read or can see (i.e. not “soft-ball”). Asking classmates to interpret data, to provide alternative explanations for conclusions, to critique the information presented and to synthesize different pieces of data are all examples of the kinds of engagement that should be elicited by the presenters.

**Other important points about presentations:**

1. The time limit of 40 minutes will be strictly enforced, so rehearsal of the presentation is **STRONGLY ENCOURAGED**.
2. Students will be informed of their grade shortly after the class presentation. Twenty (25) course points are assigned to this presentation. For simple completion of the assignment, 20 points would be the expected grade; more (or fewer) points will be awarded depending on the quality of the presentation and the effort of the presenters to engage the rest of the class.
3. Powerpoint slides are a useful way to illustrate key points, and these sets will be distributed to all class members via the web site after the presentation. Professor Witters will give each student group a CD with the figures/tables from the paper already assembled. There are several guidelines regarding the use and preparation of PP slides in your presentation.

   a. **Plan on no more than 15-20 total slides.** Your “hot topic” should only occupy a slide or two.
   b. **PP slides are best used to display images and to “bullet” key points.** Keep font size **large** and avoid putting too much text on one slide. Large figures with many panels should be “broken up” and presented in parts of clarity and readability. AVOID reading your slides to the class. REHEARSE!! Use your presentation to amplify your bullet points and to review an image, figure, graph or table. **Highlighting** (by animation, arrows, boxes, call-outs, etc) key points in the data helps draw focus. The best slides have a declarative title at the top that states succinctly what the slide is trying to illustrate (example: “PCSK9 Diminishes Expression of the LDL receptor” is the title on a slide that has a graph containing these data). Adding questions (unanswered) for the class is a good way to initiate discussion. **A summary slide is always a good way to end (and to start)!**
   c. Some students will want to use their own laptops. Check with me in advance to make sure you have the correct attachments or settings. Alternatively, the **desktop computer in our classroom is a Mac with Microsoft Office 2011 installed**; you should preview your slides on a similar computer/application if you plan to use the desktop. Some students groups create their PP set as a Google document. PP sets can be reformatted in moving between different versions of Powerpoint and between PCs and Macs. If you want to include sound or movie files, you will not be able to simply blitz the file to yourself. See Professor Witters for help with this in advance of your presentation.
   d. All slide sets should contain one slide as your critique and one with your bibliography.
   e. Each student group should blitz their PP set to Professor Witters after completion of the presentation for posting on the web site.
I really want to work with all students to help you in the construction of a high-quality presentation. In the past, this has generally involved two (2) meetings, one to go over any questions you have about your paper after an initial reading and for me to review a few presentation points and a second meeting (often the day before a presentation) to preview your PP slides, so I can offer suggestions. Contact me at an early date to arrange.

Critique Assignment

In addition, for the paper presentations by Professor Witters, 2-3 students will be assigned to provide an additional critique of the paper to complement/extend the his remarks. This assignment will be the creation of a single Powerpoint slide (template to be provided) and is due the evening prior to the presentation date.
Written Problem sets

Eight (8) problem sets requiring submission of a written answer will be distributed during the term. They will be posted on-line at the end of each course topic and are due by 10 AM on the dates indicated (see the course schedule indicating the distribution and due dates). They must be submitted in two formats. First, a print version should be submitted in class or at Professor Witters’ office (there is a ‘Biology 78 Drop Box’ adjacent to his office). Second, an electronic version is to be submitted through the Canvas web site.

Students must complete and submit six (6) of these. One is automatically excluded for each student, namely the one on the topic they presented. The second to be excluded should be made known to Professor Witters in advance of the distribution of the problem.

Students are encouraged to work together in discussing and researching the assignments, but everyone is expected to INDEPENDENTLY PREPARE their written answer. You will be required to list the names of the students you worked with on the problem sets. However, students MAY NOT consult with the students who prepared a presentation for that particular topic. The completed assignments by two or more individuals who had discussed the assignment may reflect ideas developed by together, but each student must phrase their assignment in their own words and acknowledge the "helpful discussions" with their collaborators in the bibliography. Therefore DO NOT share the computer files for your written answers (in draft or final form)!

For completion of all Biology 78 problem sets, students are free to consult other sources of information, but ALL THESE SOURCES must be documented in a bibliography. Possible sources include classmates (see exception in above paragraph), other non-class students, textbooks and the biomedical literature. INTERNET RESOURCES (URLs) ARE NOT ACCEPTABLE AS THE SOLE SOURCES OF INFORMATION; STUDENTS ARE EXPECTED TO USE STANDARD TEXTBOOKS AND THE BIOMEDICAL LITERATURE (You are free to use the Internet (e.g. PubMed), of course, to identify these primary sources, but must consult them directly).

The assignment is limited to 2 pages (12 font), exclusive of a bibliography, which will constitute a 3rd page (and should also list the names of the other students you consulted with about the problem). Problem sets will be graded not only on the “correctness” of the answer, but the clarity of the explanation and the perceived effort in creating a first-class scholarly document. I will also be grading these answers for the quality of the expository writing, including spelling, syntax, sentence structure, punctuation and organization.
Course Resources

Dana Reserve Textbooks


Garrett, RH & Grishham, CM, Biochemistry, Brooks Cole, Cengage Learning, 2013

E-Books

An extensive list of E-books that includes basic textbooks in many of the medical disciplines can be viewed at:

http://www.dartmouth.edu/~library/biomed/resources/ebooks.html

There is a link to this site on the ‘Web Links’ page of the Canvas site

Course Web Site

Course materials (schedules, Powerpoint slides, all readings, Echo recordings, problem sets) will all be posted on the course Canvas web site. The web site also contains a link to Piazza for questions, comments and postings, as well as a number of helpful web site links.

http://canvas.dartmouth.edu

We will review some of the features early in the term. I think you will find it has some wonderful features that will expedite your learning, will help you in scheduling and serve as a great platform to communicate with each other.
Bio78 Course Format & Expectations

Course Goals and Format:

Knowledge of molecular mechanisms allows new approaches to understanding human biology and disease. This course will explore the normal and abnormal biology of several human conditions relying on biochemistry, molecular genetics, and physiology as tools of inquiry. Examples will be drawn from the histories of Mona Lisa, Michel-Eugène Chevruel, Otto Warburg, Steve Jobs, Hendrickje Stöffels. Bobby Sands, Paul Cézanne, Lance Armstrong, Pearl Buck, Auguste D and Luigi Cornaro, among others.

The class topics are organized in blocks of approximately one week, the introduction of which will generally begin with a lecture by Professor Witters who will discuss an area of normal or abnormal human biology to be investigated. He will include information on the relevant basic biochemical & molecular issues to set the context for further discussions. In the following two classes, the assigned reading will be discussed. Students (in groups of 2) assigned to each topic/paper (see below) will analyse, critique and present the paper to which s/he is assigned (Professor Witters will do unassigned papers). For each of these discussions, ALL students will be expected to have read the research papers AND to participate in the discussion. Some short review papers on the course web site are also valuable in setting the context and will provide background information. For each of Professor Witters’ paper presentations, an additional group of 2-3 students will be assigned to critique the paper. Following the final presentation within each topic, students must complete a short to-be-graded written assignment based on a problem/issue raised by one/both of the papers/topic. These assignments will be due as indicated on the course schedule and can be completed in an open-book format with full consultation with any source of information, including others in the class (see below).

Throughout the course, it will be important to put a human face/context to the biochemical/molecular events we are studying, illustrating the “life” experience where biology is normal or abnormal. We will hope to achieve this aim in several ways. The background reading is a very important complement to the molecular details. In some class meetings, we will have a guest physician accompanied by a patient dealing with one of the topics under discussion. We will use some of the other class sessions for viewing of videos that will help introduce or amplify some of these topics. Lastly, we will also have one special evening dinner/discussion with a Geisel faculty member after viewing a movie relating to Alzheimer’s disease.

Expectations and Grading

Expectations for and grading of students consists of several elements. Students are expected to attend class (arriving on time), to have done the reading and to complete all assignments on time unless the reasons for the lateness/absence have been discussed with Professor Witters in advance. In general, the only possible excuses for lateness will be illness or unavoidable absence from campus (e.g. job or grad school interview, athletic trip, etc with PRIOR approval from him). A 20% deduction in grade will be assigned for each day any assignment is late.

It is possible to accumulate 100 points in the course in 4 ways. A curve will be used to assign a final letter grade, anticipating the median grade to be A-/B+

- (60% of grade; 10% for each submitted) Eight (8) problem assignments, each worth 10 points, will be distributed during the term. Each student must complete 6 (six) of these.
excluding the problem on the topic of their assigned paper discussion and one other of their choosing (the latter declared in advance). Each problem will relate to an aspect of the assigned reading/topic; answers are limited to two typewritten pages. In 2015, grades ranged 8-10 points (for each set). The distribution and due dates are indicated on the right of the above schedule.

• (25% of grade; 25 points) Preparations and presentation of an assigned paper. Each student (in groups of 2) will be expected to prepare a scholarly presentation that provides some background on the topic, an exposition and review of the data and the methodology of the paper under review and a critique of the paper’s findings and conclusions. In addition, a short “hot topic” that extends the information beyond the assigned paper should be included. Each presentation should be accompanied by a PP set, including a bibliography. In 2015, grades ranged from 22-24 points. More details below.

• (5% of grade; 5 points) Preparations of a short critique of selected papers. For the paper presentations by Professor Witters, 2-3 students will be assigned to provide an additional critique of the paper to complement/extend the his remarks. This assignment will be the creation of a single PowerPoint slide (template to be provided). This is a new grading element not included in the 2015 course.

• (10% of grade; 10 points) Engagement of and participation in class discussions and analysis of readings through thoughtful questions and comment will be an important part of the grading. Participation is the key word, not whether the student is “right or wrong”. Evidence that student has read/prepared for each discussion will also be sought for. Other “evidence” of participation will include the use of office hours and use of the Piazza section on the course website for thoughtful questions, comments or postings. In 2015, grades ranged from 6-10 points.

• There is no final exam in this course.

Course Materials

The REQUIRED course reader is available for purchase from the Wheelock Books. It will include all of the required readings. Most, but not all, of the course readings are also included on the website, which should be consulted for supplemental data in many instances and for pertinent background review articles.

A biochemistry text, either Berg, Tymoczko & Stryer, Biochemistry or Voet, Voet & Pratt, Biochemistry or Garrett & Grisham will be very valuable in the review of material and preparation of presentations.

The course web site is on Canvas (http://canvas.dartmouth.edu) where readings, Powerpoint slides, lecture captures (see below), web links, discussion boards and other limited access materials will be maintained.

Technologic snafus aside, we will be doing lecture captures of class sessions using the Echo technology of our classroom this term. While I do NOT regard this as a substitute for class attendance, it might be helpful for several of you if you have an unavoidable absence from class or would simply like

to review aspects of a lecture or discussion (you can start and stop me!). Historically, many students have found these useful as a course study adjunct. However, there are things we do in class that may not be easily captured with these technologies (especially classroom discussions).

**Other Course Issues**

**Office Hours:** Students are very much encouraged to utilize office hours for discussion and questions and to work on their assigned presentations; I enjoy getting to know you all well and to work with you on course material, “life after Dartmouth”, things you are up to, etc. **Discussing your topic/paper for your class presentation is especially encouraged.** A schedule of office hours for Professor Witters will be posted for each week. Students are also encouraged to utilize the Piazza section of the Canvas site. By posting questions (and having public answers), everyone in the class benefits. Students can also use this Piazza section to post interesting articles or web links to information they encounter during the course. **A map to his office in the Class of 1978 Life Sciences Center is included at end of this syllabus and posted on the Canvas site.**

**X-hours/Class Schedule:** We will use some of the X-hours as indicated on the course schedule for a lecture, video, or physician/patient visit. **There will be NO CLASS on MLK day (Monday, January 18) and on Friday, February 12 (Carnival) and NO X-HOUR on Thursday, February 4 and March 3.**

**Course Accommodations:** Students with **disabilities**, including chronic diseases, learning disabilities, and psychiatric disabilities are encouraged to discuss with me appropriate accommodations that might be helpful. Please do this **EARLY** in the course. I have worked closely with the Student Accessibility Services and Academic Skills Center in the past and can work with students to find study methods, tutoring needs, etc. for those eligible for same.

Some students may wish to take part in **religious observances** during the term. If you have such a conflict, please come and discuss with me, so we can make appropriate arrangements.

**Preparation of Assignments and the Dartmouth Academic Honor Principle:** The Dartmouth College Student Handbook states: "Fundamental to the principle of independent learning are the requirements of honesty and integrity in the performance of academic assignments, both in the classroom and outside. Dartmouth operates on the principle of academic honor, without proctoring of examinations. Students who submit work which is not their own or who commit other acts of academic dishonesty forfeit the opportunity to continue at Dartmouth." Students are responsible for the information concerning plagiarism and proper citation found in the Sources: Their Use and Acknowledgement, available in the Deans' Offices and online (http://www.dartmouth.edu/~sources/). Some specific issues about adherence to the Honor Principle for your assigned paper and the problem sets follows:

- **Assigned paper presentations** (more details below) For completion of this Biology 78 assignment, students are free to consult other sources of information, but **ALL THESE SOURCES must be documented in a bibliography**. Possible sources include classmates, other non-class students, textbooks and the biomedical literature. INTERNET RESOURCES (URLs) ARE NOT ACCEPTABLE AS THE SOLE SOURCES OF INFORMATION; STUDENTS ARE EXPECTED TO USE STANDARD TEXTBOOKS AND THE BIOMEDICAL LITERATURE (You are free to use the Internet, of course, to identify these primary sources, but must consult them directly).
presentation materials (PP, other documents) must be passed onto Professor Witters for posting on the course web site the same day as the presentation.

- **Problem sets** *(more details below)* Eight (8) problem sets will be distributed, each on the final class day of each of the 8 topics. Students must complete and submit six (6) of these. One is automatically excluded for each student, namely the one on the topic they presented. Students should then choose one other for exclusion, declared in advance of the distribution of the problem.

Class students are encouraged to work together in discussing and researching the assignments, but everyone is expected to INDEPENDENTLY PREPARE their written answer. You will be required to list the names of the students you worked with on the problem sets. However, students MAY NOT consult with the students who prepared presentations for that particular topic. The completed assignments by individuals who discuss the assignment may reflect ideas developed by them together, but each student must phrase their assignment answer in their own words and acknowledge the “helpful discussions” with their collaborators in the bibliography. Therefore DO NOT share the computer files for your written answers (in draft or final form)! For completion of this Biology 78 assignment, students are free to consult other sources of information, but ALL THESE SOURCES must be documented in a bibliography. In general, the problem sets can be answered entirely based on information that has been communicated in class and outside references are not necessary (and, in some instances, could confuse).
Some Specifics Regarding the Paper & Critique Assignments and Problem Sets

Paper Assignment
During the first week, students will rank 8 of the course topics in order of preference (1-8) and will then be assigned to a specific paper based on these preferences. You will want to peruse the course schedule & the spreadsheet at end of this syllabus for the presentation dates (and the dates that problem sets are assigned and due (this might influence your choices)). Professor Witters will be doing the first three presentations to provide models of presentation format and will also do one of the papers in most topics. Choices are:

1. Metabolism in Cancer Cells
2. Cachexia
3. Breast Cancer
4. Exercise
5. Errors in Amino Acid Metabolism
6. Vascular Complications of Diabetes Mellitus
7. Alzheimer’s Disease
8. Aging

Every effort will be made to give students one of their top choices. After assignment, students will have 24 hours in which to “swap” with someone else, but must inform Professor Witters of the switch.

Students will be assigned in groups of two to one paper. Each student group is to prepare a scholarly 40 min (~20 min per student) presentation using Powerpoint (and a handout (optional)) and a bibliography of any additional readings beyond that provided in class. This time must be adhered to, leaving ~20 minutes for discussion/questions. For completion of all Biology 78 assignments (problem sets, class presentations), students are free to consult other sources of information, but ALL THESE SOURCES must be documented in a bibliography. Possible sources include classmates, other non-class students, Professor Witters/other faculty, textbooks and the biomedical literature. INTERNET RESOURCES (URLs) ARE NOT ACCEPTABLE AS SOLE SOURCES OF INFORMATION; STUDENTS ARE EXPECTED TO USE STANDARD TEXTBOOKS AND THE BIOMEDICAL LITERATURE (You are free to use the Internet, of course, to identify these primary sources, but must consult them directly). All presentation materials (PP, other documents) must be passed onto Professor Witters for posting on the course web site the same day as the presentation.

The presentation should be modeled after Professor Witters’ paper presentations and should include the following FIVE elements:
1. A brief background of the relevant topic addressed by the paper
2. Presentation of the important data displayed in the paper (it is not necessary to present ALL the data; attention should be paid to the data which supports the major experimental conclusions). Indeed, your ability to identify which are the key data is part of your grade! When presenting the data, the figure from the text should be shown where applicable and the experimental technique(s) used to generate the data briefly explained. The data presentation should include any critique about the techniques used or conclusions drawn about any of the data sets. Each student group will be given a CD with all the figures and tables (as .jpg, .gif or .pdf files) from the assigned paper to assist in their preparation.
3. A summary and critique of the major conclusions of the paper and the ramifications of the study in terms of future research and comment about the “mystery” solved!
4. A brief highlighting of a 2nd recent paper the group finds on the same topic. This ‘hot topic’ paper should add an extra dimension to the specific area under discussion in the primary paper (Professor Witters may suggest some ideas to you, but you are expected to look on your own (e.g. PubMed) to find a “hot and
recent” addition to the literature on the specific biochemical topic you are reporting on in your primary paper).

5. **Engagement of the rest of the class** through provocative or interesting questions. This is a crucial (and “graded”) element of the presentation. The questions should be analytical and thought-provoking, not just regurgitative of what everyone has read or can see (i.e. not “soft-ball”). Asking classmates to interpret data, to provide alternative explanations for conclusions, to critique the information presented and to synthesize different pieces of data are all examples of the kinds of engagement that should be elicited by the presenters.

Other important points about presentations:

1. The time limit of 40 minutes will be strictly enforced, so rehearsal of the presentation is STRONGLY ENCOURAGED.

2. Students will be informed of their grade shortly after the class presentation. Twenty (25) course points are assigned to this presentation. For simple completion of the assignment, 20 points would be the expected grade; more (or fewer) points will be awarded depending on the quality of the presentation and the effort of the presenters to engage the rest of the class.

3. Powerpoint slides are a useful way to illustrate key points, and these sets will be distributed to all class members via the web site after the presentation. Professor Witters will give each student group a CD with the figures/tables from the paper already assembled. There are several guidelines regarding the use and preparation of PP slides in your presentation.

   a. **Plan on no more than 15-20 total slides.** Your “hot topic” should only occupy a slide or two.

   b. PP slides are best used to display images and to “bullet” key points. Keep font size large and avoid putting too much text on one slide. Large figures with many panels should be “broken up” and presented in parts of clarity and readability. AVOID reading your slides to the class. REHEARSE!! Use your presentation to amplify your bullet points and to review an image, figure, graph or table. Highlighting (by animation, arrows, boxes, call-outs, etc) key points in the data helps draw focus. The best slides have a declarative title at the top that states succinctly what the slide is trying to illustrate (example: “PCSK9 Diminishes Expression of the LDL receptor” is the title on a slide that has a graph containing these data). Adding questions (unanswered) for the class is a good way to initiate discussion. A summary slide is always a good way to end (and to start)!

   c. Some students will want to use **their own laptops.** Check with me in advance to make sure you have the correct attachments or settings. Alternatively, the **desktop computer in our classroom is a Mac with Microsoft Office 2011 installed;** you should preview your slides on a similar computer/application if you plan to use the desktop. Some students groups create their PP set as a Google document. PP sets can be reformatted in moving between different versions of Powerpoint and between PCs and Macs. If you want to include sound or movie files, you will not be able to simply blitz the file to yourself. See Professor Witters for help with this in advance of your presentation.

   d. All slide sets should contain one slide as your critique and one with your bibliography.

   e. Each student group should blitz their PP set to Professor Witters after completion of the presentation for posting on the web site.
I really want to work with all students to help you in the construction of a high-quality presentation. In the past, this has generally involved two (2) meetings, one to go over any questions you have about your paper after an initial reading and for me to review a few presentation points and a second meeting (often the day before a presentation) to preview your PP slides, so I can offer suggestions. Contact me at an early date to arrange.

**Critique Assignment**

In addition, for the paper presentations by Professor Witters, 2-3 students will be assigned to provide an additional critique of the paper to complement/extend the his remarks. This assignment will be the creation of a single Powerpoint slide (template to be provided) and is due the evening prior to the presentation date.
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