Syllabus for Molecular Medicine

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- Course Name: **Molecular Medicine**
- Course Number: **BB332**
- Course Credits: 3 Credits

Class 2:00 pm - 3:20 pm Wiegand Hall 132 Sep 24, 2015 - Dec 04, 2015
Tuesday and Thursday

Prerequisites: None

Course Content: Molecular Medicine covers a huge range of possibilities, and we can alter the topics depending upon interests. To start, I have picked a number of videos, movies and popular, highly readable books to cover a several concepts that provide a view of how modern medicine and biochemistry came into being.

Week 1
I will provide some background on what I plan to cover and why. We will start with an initial assessment exam that will help gauge your backgrounds and interests.

Many of you will not have a strong biological background, so you will need to do some reading and ask for help from your classmates. In fact, this will not be too far from what you will have to do for the rest of your lives and you, your friends, children and parents face various health issues.

My own research for the past 20 years has been on ALS (Lou Gehrig's Disease). I began to work on this disease because of a new mutation discovered in 1993 that causes the disease in maybe 2% of ALS patients. I will develop more of the story over the coming weeks to help you understand how intractable diseases can be understood.

For Week 2
View "*The Inter Life of a Cell*".
http://www.xvivo.net/animation/the-inner-life-of-the-cell/
I want you to understand the different structures and processes being illustrated. To understand the type of the cell being shown, look at the animation at:
http://multimedia.mcb.harvard.edu on *Extravasation of Neutrophils*. It is important for understanding the first video and this cell is a key player discussed later.

Then watch the other three videos on this website, particularly the one on protein folding. Think about why this one is so jumpy compared to the cell video. Which is more real?

Go to the Pauling Collection and read about Pauling and "*Sickle Cell Anemia*". Pauling arguably started Molecular Medicine and the best collection in the world on this is here

on campus. We will look at sickle cell anemia, which is a well-worn story that you most likely will have read about. But we will look at the edges where the story is not so clean. To understand sickling, you will need to know about actin, which well illustrated in "The Interlife..". We will discuss just a bit why is the disease still a terrible burden and the evolutionary pressures that have made it so prevalent.

So next think about the following question: *What killed the most people in the 20th century?* This will be on the initial assessment.

Read "*The Demon Under the Microscope*" by Thomas Hager. (Tom is based in Eugene and also wrote a great biography on Pauling.) I think you will be hooked after just reading the prologue. I want you to understand the founding of the modern pharmaceutical industry.

Week 3. We will discuss inflammation, sepsis, infection and wound healing and the importance of antibiotics. I will introduce the subject of oxidative stress, which still has not made an impact on modern medicine, but might yet.

By Week 4: Watch "*Lorenzo's Oil*". This is a well-made movie about adrenoleukodystrophy and closely follows the real story. I have a friend who started his research career working on this disease and he told me that one scene of the father falling asleep in the NIH library is so real that one of the journals was open to one of his research papers. It shows how medical researchers often think too naively about biochemistry and miss therapeutic opportunities.

In week 4, start reading "*The Billion Dollar Molecule*" by Barry Werth. This tells a lot about new views of drug development in the 1990's and reads like a novel. Our chair of Biochemistry was one of the co-authors of a paper at the heart of this novel. There is a follow up book called *Antidote*, which follows what happened to the company after twenty years. We will discuss the rise of antibodies as therapeutic agents and its implication for the future of medicine.

By week 5, watch "*Extraordinary Measures*" which was filmed mostly in Portland in 2010. It is about Pompe's disease, which is a glycogen storage disease. The movie is a bit schlocky (sugary sweet) and panned on Rotten Tomatoes. But how often do you get to see a biochemist played by Harrison Ford. But my friend Sharon Kreuger suffers from the disease and will come for one lecture to discuss the disease and show how the movie has simplified the disease.

Other readings will be assigned during the course. I have found two from the newest addition of *Scientific American*.

Finally, I welcome ideas from you all as to topics.

- *Learning Outcomes*.

Students will be expected to understand how medicine as evolved from being driven by empirical observation by understanding the molecular basis for disease. It is expected that students will become familiar with the functions of DNA, RNA, proteins and lipids as well as other basic biological processes. Insights will be gained on how the application of molecular medicine has transformed our society and understand the hard decisions ahead as new therapies are developed for orphan diseases. We will discuss why the price of AIDS drugs jumped 5000% in August and why cancer drugs are $50,000 more expensive than in Europe. Students will learn what the limitations are in developing new therapies and why many diseases remain untreatable. Concepts of risk will be explored with emphasis in understanding how to decipher the conflicting health reporting in the popular press. Finally, students will learn about the radical transition that is impending in medicine because of our new analytical abilities from *-omics* technologies to sequence DNA, RNA and proteins, while profiling metabolism. We are entering the realm of personalized medicine with so many possibilities that you all can influence and will certainly be affected by in the near future.

Evaluation of Student Performance: Grades will be based upon weekly quizzes, in class projects, a mid-term (probably given on Oct 29) and a final. The Quizzes will be to check that you are completing assignments. The grade of the lowest quiz will be dropped. I expect this class to involve a lot of discussion and we will use small groups to work on particular problems. This is subject to change and will be discussed in class. For many things we will cover, there may be no right answer and we will be seeking to explore alternatives.

Statement Regarding Students with Disabilities: Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 541-737-4098. *Disability Access Services, (6-4-15)*

Read the Link to Statement of Expectations for Student Conduct, i.e., cheating policies.
And Please, Please Don't.