

BIOL365 Genetics (basic syllabus)

"We wish to suggest a structure for the salt of DNA. This structure has novel features which are of considerable biological interest. ..."

Jim Watson & Francis Crick
Nature 171:737-738 (1953)

"The fundamental problem of chemical physiology and of embryology is to understand why tissue cells do not all express, all the time, all the potentialities inherent in their genome [that is, in the totality of their genes]. ..."

Francois Jacob & Jacques Monod
Journal of Molecular Biology 3:318-356 (1961)

"[The Human Genome Project] is like sending a man to the moon. When you think about it, sending a man to the moon is easy, its getting him back that's difficult. So I think we now need to get the human genome to return to work."

Sydney Brenner
[attributed quote in Cell 104:465-467 (2001)]

"When I hear back from my 'academic offspring', they tell me how their undergraduate research experience gave them the confidence, inspiration, and problem-solving skills to succeed at the next level. I would argue that undergraduate involvement can and should also transform the research itself."

Brad Goodner
K-BRIN Newsletter 2:6-8 (2004)

"Toto, we are not in Kansas anymore!"

Dorothy, Wizard of Oz

"...and as my mind begins to spread its wings, there's no stopping curiosity. I want to turn the whole thing upside down. I'll find the things they say just can't be found. ..."

from "Upside Down" on the Curious George soundtrack
by Jack Johnson & friends

Course Description:

BIOL365 is a problems-based introduction to molecular and classical genetics. Key sections of the course are what genes are, how they work and how they change, how gene expression is regulated, and how genes are transmitted between generations. Lab will provide hands-on experience with experimental approaches to many of these same questions.

Goals and Objectives:

The goals of this course are: (1) to introduce you to our current level of understanding of how genes are structured, how they change, what they do and don't do, how they are regulated, and how they are transmitted between generations; (2) to further develop your ability to think experimentally; (3) to help you learn to use genetics as a toolbox to dissect how cells and organisms work; and (4) to help you further develop the skills necessary to take new information, get to the central point, and bring together what is necessary for proper analysis of that information. Reaching these goals will allow you to begin a career as a geneticist (if you

choose that path) and even more importantly, help develop curiosity and life-long learning that are the foundations of a liberal arts education. To get there, we will tackle problems, specifically the problems that geneticists see everyday. Pre-class preparation and the discussion format of class will help you build a foundation of facts and experimental approaches. Dedicating some time each class to problem-solving and spending time out-of-class on problem-solving will allow you to directly practice and hone that craft. Exams will evaluate your growing problem-solving abilities. Labs are structured along similar lines. The experiences in lab will help you develop some hands-on skills and learn some basic genetic techniques. You will then use those skills and techniques to handle several multi-week novel projects in genetics that are directly related to ongoing research projects.

How This Course is Different:

1. You will be immersed into the incredible field of genetics and you will learn much factual information, but how that information was gathered and how we can use it to solve today's problems are just as important.
2. Geneticists tackle problems all the time and you will too, both this semester and for the rest of your life (not always related to genetics). Problem-solving is rarely an epiphany, but rather something to be practiced and honed. We will practice in class and out, and hopefully you will benefit now and in the future.
3. Class will focus on what you think are the most important or confusing points of the material for that day. This will require that you prepare beforehand just as we do.
4. Understanding genetics will require you to use some of your previously acquired knowledge in chemistry, molecular/cell biology, and algebra (genetics is very quantitative), your bountiful supply of common sense, and your untapped creativity.
5. You will be immersed in not only what we know now, but also what we don't know. What we know now will come up routinely in class, in problems, and in readings from the primary literature. As for what we don't know, those are your problems to solve in the future. Who knows, you may solve one right here at Hiram.
6. It is important to see genetics within a larger biological context and with respect to society. We will try to point out those connections whenever possible.
7. The five keys to success on exams are (1) get the most out of every class, (2) seek out help when you need it, (3) work problems, (4) work problems, and (5) work problems. We cannot stress the importance of continually honing your problem solving skills. We encourage you to form problem-solving groups outside of class – they do not have to be the same as your in-class group. Work all the problems you can, from problem sets, the textbook, and old exams.
8. Science is a human endeavor and as such is graced by our abilities and creativity, but it is also influenced by our biases, frailties, and errors. While we each must work on aspects of the latter, the one error that we must not tolerate is academic dishonesty.