

## BIOL 3024 – General Genetics – Spring 2006

- Instructors: Dr. Ronald A. Van Den Bussche, Department of Zoology, 430 LSW; x49668; [ravdb@okstate.edu](mailto:ravdb@okstate.edu)  
 Dr. David Meinke, Department of Botany, 019 LSE, x46549; [meinke@okstate.edu](mailto:meinke@okstate.edu)
- Assistant: Deanna Martinez, Department of Zoology, 422 LSW; [deanna.martinez@okstate.edu](mailto:deanna.martinez@okstate.edu)  
 Office Hours: M, T, Th 10:30 – 11:30 or by appointment.
- Lectures: MTWThF 9:30 – 10:20 am; ES 317. Includes optional review and problems sessions
- Textbook: Concepts of Genetics, 8<sup>th</sup> Edition, by Klug and Cummings. Prentice Hall. 2006.  
 Optional Supplement to Textbook: Student Handbook by Harry Nickla. Prentice Hall. 2006.
- WebPage: [www.okstate.edu/artsci/zoology/ravdb/3024.htm](http://www.okstate.edu/artsci/zoology/ravdb/3024.htm) This webpage will be modified throughout the semester.
- Calendar: A tentative schedule is shown below. Lecture topics may vary slightly but exams will be given on the dates listed. Lectures are presented by Van Den Bussche (V) or Meinke (M).

Month	Date	Day	V/M	Chapter	General Topic
January	9	M	V/M	1	Introduction
	10	T	V	2	Mitosis & Meiosis
	11	W	V	3	Basic Mendelian Genetics
	12	Th	V	3	Basic Mendelian Genetics
	<b>13</b>	<b>F</b>	<b>V</b>	-	<b>Optional Review</b>
January	<b>16</b>	<b>M</b>	-	-	<b>University Holiday</b>
	17	T	V	4	Alleles, Gene Interactions
	18	W	V	4	Sex Linkage & Sex Influenced Traits
	19	Th	V	4	Gene Interactions
	<b>20</b>	<b>F</b>	<b>V</b>	-	<b>Problem Sessions 1 &amp; 2</b>
January	<b>23</b>	<b>M</b>	<b>V</b>	-	<b>Exam I</b>
	24	T	V	5	Linkage & Chromosome Mapping
	25	W	V	5	Linkage & Chromosome Mapping
	26	Th	V	5	Linkage & Chromosome Mapping
	27	F	V	5	Linkage & Chromosome Mapping
January	30	M	V	5	Linkage & Chromosome Mapping
	31	T	V	5	Linkage & Chromosome Mapping
February	1	W	V	5	Advanced Transmission Genetics
	<b>2</b>	<b>Th</b>	<b>V</b>	-	<b>Problem Session 3</b>
	<b>3</b>	<b>F</b>	<b>V</b>	-	<b>Exam II</b>
February	6	M	V	7	Sex Determination
	7	T	V	7	Dosage Compensation
	8	W	V	8	Aneuploidy, Polyploidy, Deletions, Duplications
	9	Th	V	8	Inversions & Translocations
	<b>10</b>	<b>F</b>	<b>V</b>	-	<b>Optional Review</b>
February	13	M	V	25	Population Genetics
	14	T	V	25	Population Genetics
	15	W	V	27	Conservation Genetics
	16	Th	V	27	Conservation Genetics
	17	F	V	27	Conservation Genetics
February	<b>20</b>	<b>M</b>	<b>V</b>	-	<b>Problem Sessions 4 &amp; 5</b>
	<b>21</b>	<b>T</b>	<b>V</b>	-	<b>Exam III</b>
	22	W	M	10	Chemical Nature of Genetic Material
	23	Th	M	10	Chemical Nature of Genetic Material
	24	F	M	10	Structure & Analysis of Nucleic Acids
February	27	M	M	10	Structure & Analysis of Nucleic Acids
	28	T	M	11	DNA Replication
March	1	W	M	11	DNA Replication
	2	Th	M	12	DNA Organization in Chromosomes
	3	F	M	12	DNA Organization in Chromosomes

March	<b>6</b>	<b>M</b>	<b>M</b>	-	<b>Problem Session 6</b>
	<b>7</b>	<b>T</b>	<b>M</b>	-	<b>Exam IV</b>
	8	W	M	13	Transcription: RNA Synthesis
	9	Th	M	13	Transcription: RNA Synthesis
March	<b>10</b>	<b>F</b>	<b>M</b>	-	<b>No Class</b>
	<b>13</b>	<b>M</b>	-	-	<b>Spring Break</b>
	<b>14</b>	<b>T</b>	-	-	<b>Spring Break</b>
	<b>15</b>	<b>W</b>	-	-	<b>Spring Break</b>
	<b>16</b>	<b>Th</b>	-	-	<b>Spring Break</b>
March	<b>17</b>	<b>F</b>	-	-	<b>Spring Break</b>
	20	M	M	13	Overview of Genetic Code
	21	T	M	13	Overview of Genetic Code
	22	W	M	14	Translation
	23	Th	M	14	Genes & Proteins
March	<b>24</b>	<b>F</b>	<b>M</b>	-	<b>Optional Review</b>
	27	M	M	14	Genes & Proteins
	28	T	M	-	Mutations & Mutant Alleles
	<b>29</b>	<b>W</b>	<b>M</b>	-	<b>Problem Session 7</b>
	<b>30</b>	<b>Th</b>	<b>M</b>	-	<b>Exam V</b>
	31	F	M	6	Bacterial Genetics
April	3	M	M	6	Bacterial Genetics
	4	T	M	6	Bacterial Genetics
	5	W	M	6	Bacterial Genetics
	6	Th	M	6	Phage Genetics
April	<b>7</b>	<b>F</b>	<b>M</b>	6	<b>Optional Review</b>
	10	M	M	16	Gene Regulation in Prokaryotes
	11	T	M	16	Gene Regulation in Prokaryotes
	12	W	M	16	Gene Regulation in Prokaryotes
	13	Th	M	16	Gene Regulation in Prokaryotes
	<b>14</b>	<b>F</b>	<b>M</b>	-	<b>Problem Sessions 8 &amp; 9</b>
	<b>17</b>	<b>M</b>	<b>M</b>	-	<b>Exam VI</b>
April	18	T	M	19	DNA Cloning and Manipulation
	19	W	M	19	DNA Cloning and Manipulation
	20	Th	M	19	DNA Cloning and Manipulation
	21	F	M	19	DNA Cloning and Manipulation
	24	M	M	19	DNA Cloning and Manipulation
April	<b>25</b>	<b>T</b>	<b>M</b>	-	<b>Problem Session 10</b>
	26	W	V	22	Applications & Ethics of Genetic Technology
	27	Th	V	22	Applications & Ethics of Genetic Technology
	28	F	V	22	Applications & Ethics of Genetic Technology
May	<b>1</b>	<b>M</b>	<b>V/M</b>	-	<b>Comprehensive Final Exam 8:00 – 9:50 am</b>

**IMPORTANT DATES:**

**Tuesday January 17 – Last day to drop a course with no grade and no fees**

**Friday January 20 – Last day to add a course (restrictive – requires instructors signature)**

**Friday April 7 – Last day to drop a course (Grade of “W”)**

**Friday April 21 – Last day to withdraw from ALL courses with “W” or “F”**

## BIOL 3024 - GENERAL GENETICS - COURSE INFORMATION

### INTRODUCTION:

The purpose of this course is to introduce biological science majors to the principles of classical and molecular genetics. Topics of discussion include: the molecular structure and function of the genetic material, the nature of gene interactions, methods of linkage assignment and gene mapping, variation in chromosome number and structure, RNA and protein synthesis, the nature of mutations, the regulation of gene expression, the manipulation of recombinant DNA molecules, and the genetics of populations.

Genetics is one of the most fascinating but demanding disciplines in modern biology. Over the past 50 years, we have learned much about how information stored within a gene is used to control a wide range of cell functions. In order to understand and appreciate these remarkable advances and their impact on human societies, students must be prepared to dedicate considerable time and effort to mastering the basic principles, underlying logic, and detailed terminology of modern genetics. Students willing to make this investment of time and effort will have the opportunity to gain a unique perspective on the molecular basis of life.

### OVERVIEW OF COURSE:

This class has traditionally been taught by two professors, one from Botany and one from Zoology. Your instructors are Dr. Ronald Van Den Bussche (Zoology) and Dr. David Meinke (Botany). Dr. Van Den Bussche is a molecular systematist/ conservation geneticist with research interests in mammalian evolution and wildlife biology. Dr. Meinke is a plant molecular geneticist with research interests in seed development and embryo-defective mutants of *Arabidopsis*. Grading is based on six hourly exams (100 points each), assigned homework problems (100 points), and a comprehensive final exam (150 points). Exams will definitely be given on the dates shown on the attached schedule. The final exam percentage can replace the lowest score on the six hourly exams. The final exam score may therefore be counted twice. A curve may be used to adjust grades slightly at the end of the term.

### BASIC EXPECTATIONS:

Students are expected to attend class regularly, read assigned chapters in the text book, review lecture notes well in advance of scheduled examinations, turn in homework problems on time, ask questions when they do not understand the material, and be enthusiastic about learning the basic principles of genetics.

### EXAMS:

All exams will consist of a mixture of short answers, short essays, and problem solving questions. Make-up tests will not be given. Students with an excused absence from an exam can replace that score with the score on their final exam. Extra credit questions may be included on some exams.

### GRADING POLICY:

The total number of points earned by each student will be calculated at the end of the semester. The maximal number of points will be 850 (600: hourly exams; 150 final exam; 100 homework). A percent score of 90 - 100 = A, 80 - 89 = B, 70 - 79 = C, 60 - 69 = D, and below 60 = F. Scores may be curved up slightly at the end of the semester (i.e., 89% may turn out to be an A) but never will they be curved down (i.e., 90% will always be an A). *If attendance and enthusiasm remain high throughout the semester, we may drop the C/D boundary down to 65% to encourage more students to remain in the class and graduate with a final grade of C rather than be forced to repeat the class after receiving a D.* Each professor will utilize a system of partial credit for answers to exam questions that attempts to be fair to all students in the class. Answers must be accurate, complete, and clearly stated in order to receive full credit.

**HOMEWORK PROBLEMS:**

Each professor will hand out selected problems at different times throughout the semester. Answers to these problems must be turned in by the deadline. Late papers will not be given credit. Students can work together to solve these problems, but the answers must be written by each individual. Each answer will typically be worth 1 point. The cumulative score on homework problems cannot be replaced by the score on the final exam.

**PROBLEM/REVIEW SESSIONS:**

The optional sessions are designed to assist students with problems and questions. The format will be informal and run by the teaching assistant. New lecture material will not be presented. Assigned problems will be solved in class after they have been turned in for grading. Some sessions will include a review of topics for the next exam. Please come prepared to ask questions and remember that these optional sessions have been added to the schedule to provide assistance, not simply to increase the number of lecture periods.

**GENERAL POLICY:**

This is an upper division course for biological science majors. Students are expected to attend class regularly except in case of illness or family crisis. The University policy and deadlines for dropping this class are summarized on the attached schedule. Academic dishonesty of any type will not be tolerated. Students suspected of cheating on exams may receive either a "0" for that exam (and not be given the option to replace that score with the final exam), or in the most blatant cases, be given an "F" for the course. Students who repeatedly glance at their neighbor's exam in class will first be warned with a note and then given a "0" for the exam if the pattern continues. Please remember that your neighbor is an unreliable source of information during examinations.

**DIFFICULTIES:**

The professors of this course really do want you to master the fundamentals of genetics. Please find the courage to ask questions when you do not understand the material. But also remember that the best way to succeed in this class is to keep up with the lecture notes, reading, and homework problems.

Genetics is a beautifully logical discipline of science. Your challenge this semester is to understand and appreciate the logic. Our job as professors is to be your guide on this journey. Good Luck!

**AUTOBIOGRAPHIES:**

One thing that often happens in large universities is that instruction tends to become depersonalized. With relatively large classes, professors find it difficult to know each of their students personally, and students have little appreciation for what their professors do outside of class. In an attempt to minimize this problem, we have included some autobiographical materials on the following page to tell you a little about ourselves, our educational history, personal interests, and research expertise. In return, we ask that you fill in the information requested on the last page and write a brief autobiography telling us about your background, interests, goals, and aspirations.

## **AUTOBIOGRAPHICAL INFORMATION**

### **RONALD A. VAN DEN BUSSCHE:**

I was born in 1958 in Chicago, Illinois and am the second oldest of six children. After graduating from high school in 1977, I attended Northern Illinois University for two years after which I transferred to Eastern Kentucky University. I received a B.S. degree in Wildlife Management in 1982. I then enrolled in graduate school at Memphis State University (now the University of Memphis), where my Masters thesis research was concerned with the internal parasites of coyotes. While at Memphis State University, I met another Masters student, Meredith Hamilton, whom I would marry 8 years later.

After completing our M.S. degrees, Meredith and I enrolled in the Ph.D. program at Texas Tech University. My primary interests were in mammalian molecular systematics whereas Meredith focused on mammalian chromosomal evolution. After completing our Ph.D. degrees, I accepted a post-doc position at the University of Idaho and Meredith accepted a post-doc position at Los Alamos National Laboratory to work on the human genome project. After the first year in Idaho, Meredith and I married in Lubbock, Texas and Meredith accepted a post-doc position at the University of Idaho. After three years, Meredith and I moved back to Lubbock Texas where I became a Research Associate and Meredith first worked as an administrator for a Howard Hughes grant to the Biology Department and then a Research Associate.

We moved to Stillwater in August 1995 after I accepted a position in the Department of Zoology where I am currently a Professor and Interim Department Head. My research interests include molecular systematics, phylogeography, and conservation genetics. Due to my research interests, I have been fortunate enough to be able to conduct fieldwork throughout North America, Puerto Rico, Mexico, Honduras, Peru, Argentina, Ukraine, and Russia. Additionally, due to my research on bats, I have been fortunate enough to attend International Bat Meetings in Poland and Ireland. Moreover, during January 2005 I spent three weeks in Warsaw Poland at the Museum and Institute of Zoology, Polish Academy of Sciences helping a collaborator establish an ancient DNA laboratory. I am planning on returning to Warsaw Poland this spring to continue my collaborative research. If you would like to learn more about my research program, you can look at my web page at [www.okstate.edu/artsci/zoology/ravdb](http://www.okstate.edu/artsci/zoology/ravdb).

My interests outside of science include training and competing with my golden retrievers GMHR RockErin's Private Dancer MH ("Tina") and DFR RockErin's Bodacious Cowgirl\*\* ("Boadie") in field trials, field tests, and bird hunting. Meredith also has a golden retriever named "Skeeter" and an Irish Setter named "Gypsy". In addition to our dogs, Meredith and I have 7 cats, a cockatiel, and lots of chickens.

I was born in 1952 in Ann Arbor, Michigan, where my father was a professor in the Department of Chemistry at the University of Michigan. I left Ann Arbor in 1963 and moved to Bethesda, Maryland, a suburb of Washington, D.C. Much of my spare time in high school was spent pursuing my interests in music. I became a serious clarinet player and spent two memorable summers at the National Music Camp in Interlochen, Michigan.

I received my undergraduate education from the College of Wooster, a liberal arts school in Ohio with a strong tradition in music and science. I majored in chemistry and graduated in June 1974. Along the way I met a geology major named Deborah, and we were married in the fall of 1973. Together we moved to Connecticut in 1974 to pursue graduate careers at Yale University. I settled in the laboratory of Ian Sussex, a plant developmental biologist. Deborah worked with Keith Thomson, an evolutionary biologist. We both received Ph.Ds. from Yale in 1979. We then moved to Washington University in St. Louis, where I worked for three years as a postdoctoral scientist in plant molecular biology.

We moved to Stillwater in 1982 after I accepted a faculty position at OSU. I am currently a Regents Professor in the Department of Botany. During the 1998-99 academic year, I served as a Program Director for Plant Genome Research at the National Science Foundation in Arlington, VA. I have traveled extensively to present talks at scientific meetings throughout Europe and Asia. Deborah worked for a number of years as an instructor and academic advisor for the College of Arts and Sciences. Two years ago she completed a career change and received a Masters of Divinity from Phillips Theological Seminary in Tulsa. She is currently the pastor of a small Presbyterian church in Grove, OK, located on Grand Lake in northeastern Oklahoma. Together we attempt to educate people outside the university on the relationship between science and religion, particularly with respect to evolution and stem cell research. We have two grown children. Laura is a senior at Macalester College in St. Paul, MN. Scott is a sophomore at American University in Washington, D.C. Neither of them decided to major in biology. Laura is pursuing a degree in geography and Scott has expressed an interest in art history.

The purpose of my research program is to identify large numbers of genes with essential functions during plant embryo development. Many years ago I chose to work with a simple plant in the mustard family known as *Arabidopsis*. My approach was to isolate embryo-defective mutants, characterize the abnormal pattern of seed development in these mutants, and use this information to learn more about the genetic control of embryogenesis. Over the past 15 years, *Arabidopsis* has become the model system of choice for research in plant biology, particularly after publication of the complete genome sequence in December, 2000. More than 10,000 scientists worldwide are now using *Arabidopsis* in their research efforts. Thus I currently find myself in the middle of a large and exciting multinational effort to isolate and characterize every gene from this model plant. If you would like to assist in this effort, I am always looking for talented new students who are genuinely interested in basic research in a laboratory environment. To learn more about *Arabidopsis*, please check out the international database at [www.arabidopsis.org](http://www.arabidopsis.org). My research web page ([www.SeedGenes.org](http://www.SeedGenes.org)) presents additional details on my current research program.

**STUDENT INFORMATION -- BIOL 3024 – SPRING 2006**

Name: \_\_\_\_\_

Age: \_\_\_\_\_

Hometown and State: \_\_\_\_\_

Classification (Senior, etc.): \_\_\_\_\_

College Major: \_\_\_\_\_

Career Goal: \_\_\_\_\_

Previous College Biology Courses:

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Why are you taking this course?

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Are you currently working in a research laboratory on campus? If so, which one and on what topic?

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On the back of this page, please write a brief autobiography that includes a description of your background, interests, and aspirations.

