

Mini-Courses, Spring 2009

Listed Alphabetically by Program

Program	MINI-COURSE	Module 1	Module 2	Module 3
		Mar 30-Apr 17	Apr 20-May 8	May 11-May 29
1	<p>Biophysics</p> <p>Title: Computational Structural Biology, and Applications to Membrane Proteins</p> <p>Description: This mini-course will focus on computational methods based on molecular mechanics, including molecular dynamics and related methods. The course will include both informal lectures covering theory and methods, and discussions of applications from the literature. This year the literature discussion will center on membranes and membrane proteins; computational methods have had a major impact in this area due to the challenges associated with obtaining direct structural information. Examples of applications we will study include selectivity and regulation of ion channels, mechanosensitive channels, properties of heterogeneous membranes, and membrane transport. Basic working knowledge of thermodynamics and structural biology will be assumed. Some basic concepts in quantum mechanics (electronic structure) will be presented as underpinnings of the computational methods.</p> <p>Director: Matt Jacobson</p> <p>Email: matt.jacobson@ucsf.edu</p> <p>Prereq: Basic knowledge of structural biology and thermodynamics</p> <p>Time, Location: AM time slot: 2 hours/day for 2 weeks, plus same time slot 3rd week for presentations from 4/13-4/15; MB</p> <p>Max class size: 8-10</p>	x		
2	<p>Biophysics</p> <p>Title: Protein Crystallography</p> <p>Description: A theoretical and practical course on the basis for understanding, and using protein crystallography, x-ray solution scattering, electron microscopy, and its products, depositions in the Protein Data Bank. The basis of scattering, and diffraction and recovery of the structural detail from scattered intensities and the basis for inverse transformation is accompanied by laboratory hands on experience in crystallizing your own, - or other protein, recording diffraction and calculating the maps that allow interpretation of structure. Cautions and experimental limitations, and recognition of problems, and the impact of accuracy on interpretation are illustrated with working examples. The Lab section will allow full refinement of a structure and a group discussion of the quality of the resulting structures in the closing sessions.</p> <p>Director: Bob Stroud and Chris Waddling</p> <p>Email: stroud@msg.ucsf.edu; waddling@msg.ucsf.edu</p> <p>Prereq: Desire to learn or use these methods, commitment to attend the course and participate in the discussions, Q and A. (The course will explain, introduce and use vector addition, complex numbers, and exponentials)</p> <p>Time, Location: MB; 2 weeks: May 11th – My 22nd; Lectures: 9.-10.30; and 11.00-12.00 Lab 1.30 – 3.30 pm daily (ie every day); (25 hrs classroom; 20 hours lab); A sponsored afternoon tea and cookies will be held at 3.30 pm -4.30 pm each Thursday for interaction and free exchange of questions. Student questions can be presented daily to the course teachers for a 15 minute 'daily rounds'.</p> <p>Max class size: No limit to the formal lecture and discussion section. The lab course section max is 10 (if it looked like more wanted this we would split up further).</p>			x
3	<p>Biophysics</p> <p>Title: NMR Theory</p> <p>Description: Theoretical and practical aspects of NMR experiments for monitoring dynamics of nucleic acid/protein complexes. Techniques to measure dynamics on fast (ns-ps) and slow (ms-s) time scale will be presented and applied to the REV/RRE RNA/Protein complex. These include the heteronuclear NOE, imino-protein exchange via selective inversion recovery and the contribution to linebroadening (Rex) from ms-usec motions.</p> <p>Director: John Gross</p> <p>Email: jdgross@cgl.ucsf.edu</p> <p>Prereq: Familiarity with basic aspects of NMR covered in the NMR Practicum mini-course is desirable.</p> <p>Time, Location: AM time slot, 1.5 hrs/day, M-F, 3 weeks total; MB: -Data processing and analysis with instructors and or Tas available to field questions Thu and Fri 3-5 in GH S516E; -The lab portion of the course will be held M,T,W from 3-5pm in NMR facility.</p> <p>Max class size: 9</p>			x

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4 BMI	<p>Title: Statistical Methods for Array and Sequence Data</p> <p>Description: This course features three lectures and one lab per week aimed at detailing statistical methods and issues arising in the analysis of high dimensional, molecular biological data, with an emphasis on array platforms and sequence. Using a case studies approach, a range of statistical techniques that are frequently encountered in genomics settings are illustrated and evaluated. The lab provides introduction to the open source, widely used, and highly flexible statistical programming language, R, and the companion Bioconductor suite of bioinformatics packages developed for genomic analysis.</p> <p>Director: Mark Segal</p> <p>Email: mark@biostat.ucsf.edu</p> <p>Prereq: introductory statistics</p> <p>Time, Location: 2 hours daily, bet 1-5pm; 2 weeks total; MB, GHS204</p> <p>Max class size: 12</p>	x		
5 BMI	<p>Title: Statistical and Computational Methods in Genetics</p> <p>Description: The course will equip the students with analytic and computational skills to analyze genomewide association studies (GWAS). Using GWAS as a focal point the course will expose students to a wide array of statistical and computational topics in genetic analysis. Students will learn the fundamentals of important methods used in genetic analyses including hidden Markov models, the EM algorithm, multiple imputation, false discovery rate, penalized regression, and model selection. The course will use real data to confront practical issues in data analyses. Students will be provided hands-on experience with data analysis through computer labs.</p> <p>Director: Saunak Sen</p> <p>Email: sen@biostat.ucsf.edu</p> <p>Prereq: Familiarity with basic genetics, introductory statistics, and programming (or consent of course director).</p> <p>Time, Location: 3 hours daily (bet 10-3), 3 weeks total, MB GHS204</p> <p>Max class size: 10</p>		x	
6 BMI	<p>Title: Scientific Software Development</p> <p>Description: This course is an intensive introduction to basic software development practices for scientists and engineers. The goal is to provide scientists with the skills needed to create more reliable and maintainable programs while reducing the time spent on programming by 20-25%.</p> <p>Director: Tom Ferrin</p> <p>Email: tef@cgl.ucsf.edu</p> <p>Prereq: None</p> <p>Time, Location: 2 hours daily (bet 1-5pm), 3 weeks total; MB, GH S204</p> <p>Max class size: 10</p>			x
7 BMS	<p>Title: The Energy Problem: Obesity, Starvation & Diabetes</p> <p>Description:</p> <p>Director: Michael German & Allison Xu</p> <p>Email: michael.german@ucsf.edu; allison.xu@ucsf.edu</p> <p>Prereq:</p> <p>Time, Location: Parnassus; PM time slot</p> <p>Max class size: 10</p>	x		
8 BMS	<p>Title: Hematopoiesis and Luekemia Biology</p> <p>Description: The cellular and molceular mechanisms underlying how differentatiated progeny are derived from hematopoietic stem cells throughout life is understood in great depth relative to other mammalian tiusses. Many of the same genes and proteins that control these cell fate decisions are mutated in leukemia. Basic knowledge about hematopoiesis and the identification of mutant proteins that contribute to leukemic growth have fosterted the development of novel treatments. This course will address: (1) our current understanding of hematopoiesis; (2) how normal hematopoietic stem cells undergo malignant transformation; (3) experimental methodologies for interrogating normal and malignant hematopoetic cells; and (4) how this basic knowledge is informing the development of new treatments.</p> <p>Director: Kevin Shannon, Neil Shah and Emmanuelle Passegue</p>	x		

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		Mar 30- Apr 17	Apr 20- May 8	May 11- May 29
9 BMS	Email: ShannonK@peds.ucsf.edu			
	Prereq: BMS Cell Biology and genetics or equivalent; first and second year medical students may also apply			
	Time, Location: Mon and Thurs afternoons from 2-5:30 pm; PH			
	Max class size: Minimum 6, Maximum 12			
	Title: Neuro-Oncology	x		
10 BMS	Description: Survey course covering a broad spectrum of basic, translational and clinical research topics associated with the study and treatment of brain tumors			
	Director: C. David James			
	Email: david.james@ucsf.edu			
	Prereq: None: must be enrolled in UCSF Graduate Program			
	Time, Location: M, W, F. PM time slot. Parnassus			
	Max class size: 10			
	Title: Introduction and Special Topics in Nucleic Acid		x	
11 BMS	Description: RNA			
	Director: Michael McManus			
	Email: mmcmanus@diabetes.ucsf.edu			
	Prereq:			
	Time, Location: Parnassus; PM time slot			
	Max class size: no limit			
	Title: Topics in Protein Structure/Function - blood, drugs, and diagnostics			x
12 CCB	Description: Understanding the relationship between protein function and protein structure at an atomic level is key to understanding the molecular pathogenesis of many diseases. In addition, protein function/structure relationships are the foundation for drug discovery and development, and the starting point for the development of new molecular diagnostics. This course will stress both fundamentals in protein structure and function highlighted by workshops in crystallography and proteomics, as well as discuss specific examples of disease pathogenesis, drug discovery, and diagnostic development directly related to structure function relationships.			
	Director: James Mckerrow			
	Director Email: James.McKerrow@ucsf.edu			
	Prereq: 1st year BMS student or consent of Course Director			
	Time, Location: 4:00-5:30 pm, Parnassus			
	Max class size: open			
	Title: Synthetic Chemistry	x		
13 CCB	Description: In this mini-course we will cover modern methods in organic synthesis, with a particular emphasis on the synthesis of biologically active natural products, drugs, and drug candidates.			
	Director: Jack Taunton			
	Email: taunton@cmp.ucsf.edu			
	Prereq: At a minimum, students should have thorough knowledge of basic organic reactions covered in (1) undergraduate organic chemistry and (2) CCB reaction mechanisms course (taught by Kevan Shokat).			
	Time, Location: 3 weeks: week 1-M,Tu,Th; week 2-M,Tu,Th,Fr; Week 3-M,Tu,Th; 10-noon; MB S271			
	Max class size: 20			
	Title: NMR Practical		x	
13 CCB	Description: The course reviews practical applications of NMR spectroscopy to chemical and biological studies of small molecules and macromolecules. Small group sessions will be conducted at a spectrometer console in which practical exercises are carried out, ultimately enabling students to independently run standard experiments.			
	Director: Mark Kelly			
	Email: mark.kelly@ucsf.edu			
	Prereq: none			
	Location: M,W,Th,F, 10-12 noon, 4/20-5/1; MB GH S271			
	Max class size: 8			

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14 CCB	Title: Mass Spec			x
	Description: Mass spectrometry is a key, enabling technology in the identification and characterization of proteins and their covalent modifications both chemical and posttranslational. This course will cover the fundamentals and applications of capillary chromatography and mass spectrometry in protein identification and peptide sequence analysis. Current instrument designs, their analytical properties and relative merits will be discussed, methods for sample preparation and mass spectral data acquisition will be reviewed, and then methods and software tools for data analysis will be presented. Examples of analyses of post-translational modifications (PTMs) including phosphorylation, acetylation, methylation, ubiquitinylation etc. and quantitative comparisons of protein composition will also be summarized.			
	Director: Al Burlingame			
	Email: alb@cgl.ucsf.edu			
	Prereq: Contact Robert Chalkley (chalkley@cgl.ucsf.edu) prior to the course			
	Time, Location: M, W, Th, F 5/11-5/15; M,W,Th 5/18-5/21; W,Th,F 5/26-5/29; Mission Bay GH S271			
	Max class size: No limit			
15 NS	Title: MicroRNAs in Neuronal Development and Function	x		
	Description: MicroRNAs are endogenous, noncoding small RNAs that regulate gene expression by destabilizing target mRNAs or suppressing their translation. Hundreds of miRNAs have been identified in worms, flies, and humans, and many are evolutionarily conserved at the nucleotide level. Some miRNAs are specifically expressed in developing and mature nervous systems, and their roles in neuronal development and function have begun to be unraveled. In this minicourse, Basic concepts relevant to the topic will be presented and active participation from students is expected to discuss the latest publications in this area.			
	Director: Michael McManus, Erik Ullian, Fen-Biao Gao			
	Email: mmcmanus@diabetes.ucsf.edu; ulliane@vision.ucsf.edu; fgao@gladstone.ucsf.edu			
	Prereq: no			
	Time, Location: 10am-12pm, M,W,F (1st & 3rd weeks are at PH; 2nd week is at MB) PH: S170 MB: Gladstone 101A and 101C, Wed. April 8 is from 2pm-4pm			
	Max class size: 8			
16 NS	Title: Fronto-Temporal Dementia		x	
	Description: This minicourse will explore the biology of frontotemporal dementia (FTD). FTD is the most common neurodegenerative disease in people under the age of 65, accounting for 15–20% of all dementia cases. This devastating disease is rapidly progressive and characterized by progressive neurodegeneration in the frontal and temporal lobes, often resulting in dramatic changes in behavior and personality. Insights into the molecular, cellular, and genetic bases of FTD are rapidly emerging. This course will cover broad aspects of FTD, ranging from the basic biology underlying the disease to clinical aspects, including ideas and approaches for therapies. The format will combine brief overview lectures, paper discussions, and the development of a brief and focused research plan.			
	Director: Bob Farese, Aimee Kao			
	Email: bfarese@gladstone.ucsf.edu; akao@memory.ucsf.edu			
	Prereq: none			
	Time, Location: 10am-12pm M,T,F (1-3pm on Wed. 4/22 and 4/29); MB, GH S261 on M,T,F; MB, GH S202 on Wed 4/22 and 4/29			
	Max class size: no limit			

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17 NS	<p>Title: The Dopaminergic System</p> <p>Description: The dopaminergic system controls many important aspects of neural function. We have chosen this minicourse to provide an in-depth discussion of the molecular, cellular and physiological mechanisms of the dopaminergic system. The key questions are how molecular programs dictate the generation and maintenance of dopamine neurons, how does the dopaminergic system provides intricate controls on neural functions, and how perturbations to this pathway lead to diseases. We chose this topic because it is currently a question of intense study, and because comprehensive studies to the dopaminergic system represent an integration of multidisciplinary approaches involving molecular/cellular biology, genetics and electrophysiology.</p> <p>Director: Eric Huang</p> <p>Email: eric.huang2@ucsf.edu</p> <p>Prereq: Targeted for first years students in the NS program. Depending on the attendance, this mini-course may open to more senior students in the program.</p> <p>Time, Location: May 11-27, 9am-11am, weekdays, May 11, 12, 13, 15, 18, 19, 20, 22, 26 and 27. PH S172</p> <p>Max class size: 8</p>			x
18 NS	<p>Title: Addiction</p> <p>Description: This minicourse will examine molecular and cell biology, genetic, and systems approaches to the study of addiction. Lectures will cover brain circuits mediating reward and motivation, invertebrate models of addiction, drug-induced neuroplasticity, neurotransmitters and signaling pathways targeted by drugs of abuse, and pharmacotherapy of substance use disorders. Each class will begin with an overview lecture given by a faculty speaker and then students will discussed assigned papers.</p> <p>Director: Bob Messing</p> <p>Email: romes@gallo.ucsf.edu</p> <p>Prereq: 201A, 201B, NS222 Preferred, or permission of course director</p> <p>Time, Location: M-F, 5/11-5/22, 10am-12pm, MB GHS261</p> <p>Max class size: 10</p>			x
19 Systems Biology	<p>Title: Stochastic Cellular Processes</p> <p>Description: Variability is a fundamental issue that impacts many areas of biology. In populations of organisms and cells, phenotypic differences between individuals are thought to be caused by a combination of genetic and environmental factors. However, there is significant variability even between individuals of the same genotype in highly similar environments. A key source of this variability (noise) is the randomness that characterizes the motion of cellular constituents at the molecular level. In some instances, fluctuations are suppressed through intricate cellular dynamical networks that act as noise filters. Yet in other important instances, noise induced fluctuations are amplified and exploited to the cell's advantage. We are just now beginning to understand how the richness of stochastic phenomena in biology depends directly upon the mechanisms of interaction between dynamics and noise. In this mini-course, we discuss a number of approaches for the measurement and analysis of stochastic fluctuations in cellular networks. We explore: a) analytical and computational methods for the analysis of stochasticity in living cells; and b) examples of gene regulatory networks.</p> <p>Director: Hana El-samad</p> <p>Email: hana.el-samad@ucsf.edu</p> <p>Prereq: calculus, some knowledge of probability and statistics</p> <p>Time, Location: 3 weeks total, 10-12 daily, MB, Room TBA</p> <p>Max class size: 10</p>			x

Mini-Courses, Spring 2009

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20	<p>Systems Biology</p> <p>Title: Modeling Biological Systems</p> <p>Description: Mathematical modeling is playing an increasingly important role in understanding and engineering biological systems. This mini-course will introduce to the students some basic concepts and techniques of modeling at proper scales. Emphasis will be placed on how to simplify the details and to construct models at proper scales and complexity suitable to the system and the questions being addressed. Examples of Boolean network models and simple differential equation models will be analyzed in detail; their utilities and limitations will be discussed. Finally, through case studies the class will get hands-on experience and learn how to build and analyze models in real world situations.</p> <p>Director: Chao Tang Email: chao.tang@ucsf.edu Prereq: Linear algebra, simple ordinary differential equations Time, Location: M, W, F (3 hrs/day: 10:30am-12:00pm lecture; 1:30-3pm lab), 2 weeks total, MB Max class size: 10 (or smaller?)</p>		x	
21	<p>Tetrad</p> <p>Title: Control of Growth: Cell and Organism Size</p> <p>Description: We plan a focus that takes advantage of both of our areas of expertise and will cover things that will range from why are your arms both the same size, to how do cells know how big they are. We will cover papers ranging from those that illuminate the phenomena at a descriptive level to papers that address mechanism.</p> <p>Our topics include:</p> <ul style="list-style-type: none"> - The distinction between proliferation and growth - Cell size thresholds and when does a cell "choose" to divide - Size control in metazoans - Proliferation and growth contributions to cancer <p>We expect that we will cover the following mechanisms/pathways:</p> <ul style="list-style-type: none"> - The HIPPO and TOR pathways – inputs into metazoan cell and organ size - Dependence of growth on developmental patterning signals - Cell size set mechanisms and Cln3 - Nutritional modification of cell size, growth and division <p>Director: Patrick O'Farrell and Dave Toczyski Email: ofarrell@cgl.ucsf.edu; toczyski@cc.ucsf.edu Prereq: Interest and energy Time, Location: 9:30-2:30, N-114 (MB) Max class size: 8</p>	x		
22	<p>Tetrad</p> <p>Title: Modern Approaches to Studying Evolution</p> <p>Description: With this year being the 200th anniversary of Darwin's birth and the 150th anniversary of the publication of "On the Origin of Species," it seems an especially appropriate time to consider how cells evolve. We will begin with selections from Darwin but will focus on a series of recent papers examining molecular mechanisms of evolution. We will discuss the contention that "nothing in biology makes sense except in the light of evolution" by considering specific examples where evolutionary studies have provided insight into the workings of modern cells. Topics will include how gene duplication and divergence work, how changes in gene regulation can provide evolutionary novelty ('evo-devo'), how the re-creation and study of extinct molecules in the lab can be used to test specific hypotheses, and how genome-wide studies have deepened our understanding of evolution.</p> <p>Director: Sandy Johnson and Hao Li Email: ajohnson@cgl.ucsf.edu; haoli@genome.ucsf.edu Prereq: basic knowledge of molecular biology and genetics Time, Location: 2:00 – 5:00 pm, S-201 (MB) Max class size: 10</p>	x		

Mini-Courses, Spring 2009

Listed Alphabetically by Program

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23 Tetrad	Title: The role of autophagy in the innate immune response to pathogens.		x	
	Description: This course will focus on the interface between microbial pathogens and the host innate immune response. The innate immune system, which provides immediate defense against invading microbes, is an evolutionarily conserved response found in all classes of plant and animal life. We will start by studying which host cells, molecules and pathways are required for innate immunity. We will focus on the innate immune response to intracellular pathogens--i.e. those microbes that set up shop within mammalian cells. We will then concentrate on the role of a specific host process, autophagy, in the innate immune response to intracellular pathogens. Autophagy is a highly conserved host pathway that allows the cell to sequester long-lived cellular proteins and organelles in a membrane-bound compartment that then fuses with the lysosome, thereby promoting degradation of the contents. In addition to its roles in stress response, tumor suppression, and development, autophagy plays a critical role in the innate immune defense to intracellular pathogens. The goal of this course will be an in-depth investigation of this role and the mechanisms used by pathogens. Director: Jeff Cox and Anita Sil Email: Jeffery.Cox@ucsf.edu; sil@cgl.ucsf.edu Prereq: Non Tetrad and non BMS students must talk to instructor in advance Genetics 200A or BMS 255 Time, Location: 1:00-3:00, room BH-215 except May 1 -> BH 211 (MB) and except Thurs 4/23 and 4/30 --> GH-S261 April 20 - May 1 Max class size: 10			
24 Tetrad	Title: Cell Polarity		x	
	Description: Cellular asymmetry or polarity is central to virtually all eukaryotic cells. We will start by considering symmetry breaking in vitro and in single cell systems, such as yeast. We will then examine more complex systems, such as asymmetric cell division and stem cells, migrating cells, epithelia, neurons and planar cell polarity. We will use both computational and experimental approaches. Director: Keith Mostov, Didier Stainier Email: keith.mostov@ucsf.edu; didier.stainier@ucsf.edu Prereq: Non Tetrad and non BMS students should please talk to one of the instructors. We encourage students of all backgrounds, especially systems, engineering and computation. Time, Location: April 27 – May 8; 10:00 – 12:00 noon, room BH 212; except May 7 ->GH-S201 (MB) Max class size: 8			
25 Tetrad	Title: Self-Assembly and Self-Organization in Biology		x	
	Description: Like the black hole at the center of the galaxy; like Kaiser Soze in the midst of an international conspiracy; like the Tootsie Roll® center of a Tootsie Pop® - self-assembly lies at the very heart of biology. Lone biological molecules can associate to form complexes or polymers. These higher-order structures can then interact to form networks capable of carrying out remarkably complex tasks. This class will focus on how information (especially three-dimensional information) about the assembly and function of complex macromolecular systems is encoded in the properties of the individual components. We will study a variety of self-assembling and self-organizing biological structures, including: (1) cytoskeletal systems that control cell shape and establish order in the cytoplasm; (2) extracellular polymer networks that organize tissues and repair them when they are damaged; (3) amyloids and prions that mediate pathological processes; and (4) viruses and other (more-or-less) self-replicating objects. Coursework will consist of reading and discussing original research papers; writing mini-proposals on outstanding questions; arguing about the d Director: Wallace Marshall and Dyché Mullins Email: wmarshall@biochem.ucsf.edu; dyché@mullinslab.ucsf.edu Prereq: Curious and not math-phobic Time, Location: 10-12 noon N-114 (MB) Max class size: 8			

Mini-Courses, Spring 2009

Listed Alphabetically by Program

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		Mar 30- Apr 17	Apr 20- May 8	May 11- May 29
26	Tetrad	Title: ER Quality Control		
	Description:	The course will cover cellular mechanisms that ensure quality of protein folding in the endoplasmic reticulum. We will cover protein targeting and translocation, the actions of molecular chaperons, ERAD, the UPR and ER to Golgi transport. We will read and discuss impacting papers in the recent literature.		
	Director:	Peter Walter, Jonathan Weissman		
	Email:	peter.walter@ucsf.edu; weissman@cmp.ucsf.edu		
	Prereq:	Cell biology (CB245 or equivalent)		
	Time, Location:	GH-S201; 1:00-4:00 (MB)		
	Max class size:	8		
27	Tetrad	Title: RNAi-Dependent Heterochromatin Formation		
	Description:	This literature-based minicourse will be similar to one taught the last two years and will take a critical look at the questions of how RNAi-dependent heterochromatic domains are formed and how they function to carry out their biological tasks. A wide spectrum of approaches to these questions will be considered.		
	Director:	Hiten Madhani, Geeta Narlikar		
	Email:	hiten.madhani@ucsf.edu; geeta.narlikar@ucsf.edu		
	Prereq:	Genetics, Macromolecules, and Bioreg		
	Time, Location:	2:00-4:00, room BH-215 (MB); except Thursdays --> GH-S261 (May 14 and 21)		
	Max class size:	8		
28	Tetrad	Title: Understanding the Basis of Monoallelic Expression		
	Description:	Although mammals are diploid and express both copies of most genes, there are important exceptions to this generality. Nearly 15% of mammalian genes are expressed from only one of two alleles. X-linked genes in females, and odorant receptor, immunoglobulin, T-cell receptor, interleukin, natural killer-cell receptor, and pheromone receptor genes all exhibit random, monoallelic expression, in which each cell randomly selects one allele as the expressed copy. This indicates that cells have the ability to treat identical sequences within the same nucleus differently. In this minicourse we will discuss recent findings that provide clues about the molecular mechanisms that underlie random, monoallelic expression.		
	Director:	Stavros Lomvardas and Barbara Panning		
	Email:	stavros.lomvardas@ucsf.edu; barbara.panning@ucsf.edu		
	Prereq:	Genetics 200A and Biochem 201A		
	Time, Location:	2:00-4:00, room GH-S201 (MB)		
	Max class size:	6		
29	Tetrad	Title: Mechanisms that Control the Rate of Aging		
	Description:	How do we age? This minicourse course will explore the biology of aging in model systems and humans, and the basis of current ideas on the mechanisms and effects of aging. The course will focus on two major themes and their potential interactions. We will discuss hormonal pathways that have been shown genetically to determine aging in animals. We will also explore genetic and non-genetic influences on the factors that determine self-renewal of cells including genomic wear and tear and telomere maintenance. We will ask how much biology is destiny (genetic influences) and conversely, how much other non-genetic factors can influence aging in humans. The course will consist of student-led discussions centered around key papers, interspersed with faculty-led presentations on the major themes that will help orient the discussions.		
	Director:	Elizabeth Blackburn and Cynthia Kenyon		
	Email:	Elizabeth.Blackburn@ucsf.edu; ckenyon@biochem.ucsf.edu		
	Prereq:	A genetics course; undergraduate is sufficient		
	Time, Location:	1:00-3:00, room GH-S202 (MB)		
	Max class size:	12		