

Texas A&M University

Faculty of Genetics



2016 - 2017

Graduate Handbook

<http://genetics.tamu.edu>

Graduate Program Committee
Faculty of Genetics
Texas A&M University

*Please submit any suggestions or corrections to the Genetics Office
Room 109A Biochemistry/Biophysics Building
genesec@tamu.edu
(979) 458-2284*

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HOWDY!

We are pleased you have chosen the Genetics Program of Texas A&M University to pursue your graduate studies. This Graduate Handbook provides a description of the PhD program, processes and procedures, and all sorts of handy information about registration and forms. It is important to note, however, that the TAMU Graduate Catalog for the 2016-2017 academic year is the official document stating the rules and regulations under which your pursuit of a graduate degree at TAMU is to be conducted. We strongly suggest that you read the genetics section under Interdisciplinary Degree Programs.

Again, we speak for the whole Faculty of Genetics and current graduate students in extending our warmest welcome to you, our new students and colleagues. Have a good year!

Dorothy Shippen, PhD
Chair, Faculty of Genetics

Meghan Kinder
President, Genetics Graduate Student Association

TEXAS A&M UNIVERSITY

Texas A&M University is a public institution and flagship of the Texas A&M University System that is dedicated to the development and dissemination of knowledge in diverse academic and professional fields. The University is committed to assisting students in their search for knowledge, and to helping them understand themselves, their cultural and physical environment, and to develop in them the wisdom and skills needed to assume responsibility in a democratic society. The University assumes as its historic trust the maintenance and enhancement of an intellectual environment that encourages the development and expansion of the human mind and spirit. While continuing to fulfill its mission as a Land-Grant/Sea-Grant/Space-Grant institution, the University is evolving and expanding its role to meet the changing needs of state, national, and international communities as a member of the Association of American Universities, an international organization of pre-eminent research-intensive universities.

Established in 1876 as the first public college in the state, Texas A&M University today has become a world leader in teaching, research, and public service that is supported by the 7th largest endowment among US universities. Located in College Station, it is centrally situated among three of the country's 10 largest cities - Dallas, Houston, and San Antonio. Fall, 2015 enrollment was 58,920 which places Texas A&M among the nation's five largest university campuses. Students represent every state and 123 countries. Texas A&M University ranks tenth in number of new National Merit Scholars during Fall, 2014 with 583 of these high-achieving students enrolled. The Daily Beast recognized Texas A&M University as the happiest college in the country.

Research: Texas A&M's research budget for fiscal year 2013 was more than \$820 million. The university's research expenditures resulted in a ranking of 19th nationally -- and first in the South and Southwest -- by the National Science Foundation.

Facilities: Texas A&M's 5,200-acre campus, which includes a 434-acre research park, is one of the largest in the nation. In addition to the College Station campus, the university has branch

campuses in Galveston, Texas and Doha, Qatar, and operates the the Soltis Research and Education Center near the town of San Isidro, Costa Rica, the Santa Chiara Study Center in Castiglion Fiorentino, Italy, and the Texas A&M University Center in Mexico City.

Cores: Texas A&M supports an wide range of core facilities housing cutting-edge equipment and technological capabilities to support genetic, genomic, molecular biology and bioinformatics research and training. A list and links to core facilities supporting research in genetics can be found at (<https://genomics.tamu.edu/all-texas-am-cores>), and includes:

Computational Biology

Texas A&M Institute for Genome Sciences and Society Bioinformatics Workspace: Provides bioinformatics services and training. Services include a compute cluster with tailored for bioinformatics and computational biology applications. The cluster hosts a broad range of tools and software packages. The computer cluster is accessible by command line or a Galaxy interface. A free help desk is available, as well as project assistance and programming service and a BLAST server.

AgriLife Genomics and Bioinformatics Services: Provides bioinformatics services including consultation and experimental design, and bioinformatics analysis and processing.

Center for Translational Environmental Health Research Genomics and Bioinformatics Facility Core: Provides support for gene expression analysis using microarray and deep sequencing technology, including both basic and advanced analysis of expression data.

Laboratory for Molecular Simulation: Offers training in molecular modeling and computational chemistry. Advanced modeling software is available to perform quantum calculations on small molecular or solid systems and molecular mechanics/dynamics modeling for large systems such as proteins, DNA, nanomolecules, polymers, solids, and liquids. The LMS also provides training in Linux and support for faculty and students that wish to incorporate molecular modeling in their course material.

Protein Folding Server: Provides access to computational techniques to map a protein's potential landscape, and to generate transitional motions of a protein to the known native state from unstructured conformations or between user-specified conformations. Protein conformations can be submitted by PDB ids or structures can be uploaded in PDB format.

TAMU Supercomputing Facility: Provides access to high performance research computing resources and user support. Systems include Ada, a 17,500-core IBM NeXtScale Cluster, along with a variety of software and data storage systems.

Molecular Biology and Genomics

Texas A&M Institute for Genome Sciences and Society Genomics Workspace: Maintains shared equipment to support genomics-based research. Training and experimental support for library preparation and sequence generation including a Fluidigm Biomark HD system for high-throughput real-time or end-point PCR in nanoliter volumes, a Fluidigm C1 single-cell system for extraction and isolation of nucleic acids and template preparation for sequencing or qPCR from single cells, Bio-Rad QX200 AutoDG Droplet Digital PCR, and Illumina NextSeq 500 and MiSeq sequencers. Additional equipment available for use is an Illumina iScan, BioTek Cytation 3 Cell Imaging Microplate Reader, Bio-Rad Bio-Plex 200 for Luminex xMAP technologies, Eppendorf epMotion 5075 robot, Bio-Rad CHEF-DR II pulsed-field gel electrophoresis system, Promega Maxwell 16 for automated nucleic acids isolation, Bio-Rad CSX96 real-time PCR unit, Agilent Tape Station 2200 for nucleic acid and protein QC, Qiagen TissueLyser II, and a Miltenyi GentleMACS for tissue dissociation.

AgriLife Genomics and Bioinformatics Services: Provides next generation sequencing and library preparation. Equipment includes Illumina HiSeq 2000, HiSeq 2500v4, and MiSeq.

Center for Translational Environmental Health Research Genomics and Bioinformatics Facility Core: Provides support for gene expression experiments using microarray and deep sequencing technology, realtime RT-PCR training and access to an ABI 7900 HT, RNA quality assessment on an Agilent Bioanalyzer, and microRNA quantification by PCR array.

AgriGenomics Core: Provides genomics methods and expertise to faculty and students in the soil and crop community. Capabilities and equipment available include QIAzol, and AATI, ABI3130 capillary electrophoresis systems, Kbiosciences Lite Pipeline for KASAP SNP assays, and an Accuri flow cytometer with autoloader.

DNA Technologies Core: Provides Sanger sequencing and a Sigma oligo distribution Center. The core focuses on DNA testing, fragment analysis and microorganism ID.

Gene Technologies Laboratory: Provides Sanger sequencing of unique DNAs, oligonucleotides, and an AutoGen 850 Alpha for DNA purification. Specialized reagents and supplies for DNA analysis are also available.

Laboratory for Genome Technology: Offers Sanger sequencing services on an ABI 3130xl and DNA fragment analysis on an ABI 377 and two LICOR instruments.

Molecular Cytogenetics and Genomics Laboratory: Performs a wide range of cytogenetic, molecular, and DNA-based testing. Services include chromosome analysis by karyotyping and FISH.

Bioseparation Lab: Provides an environment for bioprocess engineering with an emphasis in recombinant protein recovery from plant and microalgae systems. Can assist with develop novel and effective strategies for extraction and purification of recombinant and native biomolecules from plants.

Cell and Chemical Biology

Flow Cytometry Core: Provides capabilities for flow cytometry and cell sorting. Supports immunofluorescence assays, assays for DNA and cell cycle content analysis, apoptosis, cell proliferation, phagocytosis and functional expression of p-glycoprotein. Equipment includes Beckman Coulter MoFlo® Astrios™ High-Speed Cell Sorter and a Becton Dickinson FACSCalibur™ Analyzer.

Histology Laboratory: Provides paraffin and frozen sample processing, sectioning, and staining services. Many common and special histology stains are available.

Center for Translational Environmental Health Research Genomics and Bioinformatics Facility Core: Provides analysis of cellular bioenergetics with a Seahorse Biosciences XF 24 Analyzer.

Laboratory for Biological Mass Spectrometry: Provides expertise in mass spectrometry methodology, instrumentation, and informatics including Electron Ionization (EI), Chemical Ionization (CI), Atmospheric Pressure Chemical Ionization (APCI), Electrospray Ionization (ESI), Matrix Assisted Laser Desorption Ionization (MALDI) and MS/MS analysis of peaks in ESI, APCI, and MALDI spectra. The services cover proteomics as well molecular-level research in various "omics" related researches, i.e., petroleomics, metabolomics, lipidomics, and glycomics. This includes analyses of compounds from small organic molecules to

macromolecules including proteins, oligonucleotides, polymers and dendrimers. Instruments include Applied Biosystems Voyager-DE STR, Applied Biosystems PE SCIEX QSTAR, Thermo Scientific DSQ II GCMS, Thermo Scientific LCQ-DECA, Applied Biosystems 4700 Proteomics Analyzer, Applied Biosystems 4800 TOF Analyzer, Applied Biosystems MDS-Sciex 4000 QTRAP, Bruker Daltonics solariX Qq- FTMS, and Waters Synapt G2 HDMS.

Biomolecular NMR Laboratory: Provides access to spectrometers suited for solution-state NMR studies on biological macromolecules like proteins and nucleic acids. Instruments include a Bruker AVANCE III 800 MHz equipped with 5mm TCI cryoprobe, two Bruker AVANCE III HD spectrometers (600 MHz and a 500 MHz) and a Varian 600 MHz.

NMR Facility: Provides a broad array of NMR services including X-Ray Crystallography, Mass Spectrometry, and Elemental Analysis. The facility provides equipment maintenance support, user training, and spectroscopic service. Instruments include Avance 500 (500 MHz Cryoprobe system with high sensitivity for small ^1H , $^1\text{H}\{^{13}\text{C}\}$ and $^1\text{H}\{^{15}\text{N}\}$ samples), NMRS 500RM (500 MHz system with 4 channels and H/F/P/C quad probe for $^1\text{H}\{^{31}\text{P}\}\{^{19}\text{F}\}$), Inova 500 (500 MHz H/C system), Inova 500B (500 MHz system with 2 RF channels, Indirect Detection probe and H/F/P/C quad probe), NMRS 500, Avance III 400 (400 MHz broadband spectrometer with sample changer), Avance 400 (400 MHz Solid State NMR with 2.5, 4, and 7 mm CP/MAS probes), Inova 400 (400 MHz system with ^{31}P - ^{15}N broadband probe), Inova 300 (300 MHz instrument with H/F/P/C quad probe), and Mercury 300 (300 MHz H/C system).

X-Ray Diffraction Laboratory: Provides full service X-ray Diffraction laboratory offering state of the art instrumentation for the analysis of solid materials. Services include single-crystal and powder diffraction for chemistry, material sciences and pharmaceuticals. Equipment includes three Bruker single-crystal APEXii CCD Diffractometers, one Bruker GADDS/Histar diffractometer, and two Bruker powder diffractometers.

Protein Chemistry Lab: Provides support for advanced protein chemistry and proteomics research through state-of-the-art instrumentation, systems, software, technical expertise and training. Instruments include automated Edman protein sequence analysis, amino acid analysis, protein gel electrophoresis and electroblotting, DALTSix for large-scale 2D gels, Typhoon trio fluorescent imager, Ettan robotic systems for high-throughout picking,

digesting and spotting, high pressure liquid chromatography, MALDI-TOF MS, and electrospray MS.

Microscopy

Image Analysis Lab: Provides state-of-the-art microscopy technologies including UV laser cutting/LCM, fluorescence imaging, transmitted light imaging, live-cell imaging, FRAP, FLIP, photo activation/conversion, FRET, FLIM, transmission electron microscopy, and image processing, analysis and quantification. Equipment includes Zeiss ELYRA S.1 (SR-SIM) Super resolution Microscope, Zeiss LSM 780 NLO Multiphoton Microscope, Zeiss TIRF3, Zeiss 510 META Confocal Microscope, Zeiss Stallion Digital Imaging Workstation, Zeiss Digital Imaging Workstation, FEI Transmission Electron Microscope, Veritas Microdissection System, and BioTek Synergy 4 Microplate Reader.

Microscopy and Imaging Center: Provides access and training in microscopy and imaging technologies such as deconvolution of wide-field fluorescence images and correlative LM-EM. Instruments for light microscopy include Olympus FV1000 confocal microscope, Multiphoton Non-linear Optical Microscope (NLOM), Zeiss Axiophot, and Nikon Stereo Photomicroscope; for scanning electron microscopy FEI Quanta 600 FE-SEM, Tescan Vega SEM, and a Zyvex S100 Nanomanipulator; and for transmission electron microscopy FEI Tecnai G2 F20 FE-TEM, FEI Tecnai G2 F20 ST FE-TEM Materials, JOEL 1200 EX TEM, and JOEL JEM-2010 TEM.

Organismal Facilities

Texas Institute for Genomic Medicine: Provides services for transgenic, knockout and embryonic stem (ES) cell manipulation in mice. Services include pronuclear injection, blastocyst injection, sperm cryopreservation, embryo cryopreservation, rederivation via IVF, embryo transfer, colony maintenance, gene targeting and access to ES-cell based gene trap libraries.

BioAquatics Facility: Provides aquatic animal facility for diverse species (fish, reptiles, amphibians, crustaceans, mollusks, and cnidarians). The Facility comprises animal holding space, laboratories, feed and storage area, and recirculating air and water supply systems.

Plant Growth Facilities: Provides twenty-two growth chambers and 12,000 sq ft of greenhouses space for transgenic and non-transgenic plants. A greenhouse annex has an additional

25,232 ssq ft of greenhouse space and a 16,473 sq ft headhouse. A variety of lighting controls are available to simulate different growth conditions.

Instrumentation

Biology Instrumentation Shop: Provides research and teaching equipment repair needs. Maintains generic parts and hardware and catalog of manufacturer parts. Personnel have over 60 years combined experience on most research instrumentation including electronics, spectrophotometric, electro mechanical, vacuum, environmental control systems, refrigeration, robotics, sterilization, custom plexiglas fabrication, as well as a myriad of other basic design, repair, consulting, and planned maintenance operations.

Chemistry Electronic Shop: This facility will coordinate the electronics design, construction, and repairs of major instrumentation. Fuses, wire, switches and small electronic parts are available. Experience with HP printer repairs.

Physics Electronic Shop and Parts Store: Provides services for the engineering, design, construction, calibration, testing, and repair of a wide range of scientific & technical electronic equipment. In addition, the Electronics Shop provides a "self-service store" of over 7000 parts commonly used in scientific equipment.

Chemistry Glass Shop: Fabrication and repair of instructional/research glassware. Stock sizes of glass tubing, rod, ground glass joints, stopcocks, glass-metal seals, etc., are available.

Chemistry Metal Shop: Fabrication of instructional/research instruments and equipment; also metal bar, screws, tube and pipefittings and brass and stainless steel are available.

Physics Machine Shop: Provides fabrication of prototype scientific instruments, as well as on-site inspection, estimates, consulting, machining, welding, and repairs. The Machine Shop personnel will work from a spectrum of rough sketches to CAD designs to create machined products.

BRYAN/COLLEGE STATION

Bryan/College Station is located in Brazos County in east-central Texas, about 140 miles from the Gulf of Mexico. It lies in an area known as the Post Oak Belt, and there is a prevalence of post oak, blackjack oak, elm and hickory trees. The terrain is characterized by gently rolling hills. Bryan/College Station are "sister cities" located in Brazos County with a combined population of almost 250,000.

The climate is classified as humid sub-tropical with hot summers. The average annual temperature is 68 degrees with average humidity at 71%. Winters are mild, with short spells of cold weather, lasting two to three days. Occasionally, the temperature can drop as much as 30 degrees in one hour; these are caused by polar Canadian air currents and are termed "Blue Northers." Snow is rare. Spring weather is variable with many thunderstorms. Summer is essentially invariable, with an average maximum temperature of 92 degrees and high humidity (it gets hot and stays hot!).

Housing: Housing in Bryan/College Station is plentiful, but it is important to start looking early for accommodations that are satisfactory and affordable. There are several services that can help you find a place to live. Do not forget that it will get hot, and air conditioning is almost a must!!!

The Off Campus Student Housing Office (<http://studentlife.tamu.edu/agoss.offcampushousing>) is on main campus. You can call them at (979) 845-1741 during the hours of 8am - 5pm, Monday through Friday. In addition to publishing The Off Campus Survival Manual, this department has a number of useful services such as Adult and Graduate Student Services, Women's Programs, and the Housing Vacancy Listing through AggieSearch (<https://aggierearch.tamu.edu>), which is a listing of houses, apartments, duplexes, rooms in houses, mobile homes and condominiums. This office also has roommate referral services and tenant/landlord rights and responsibilities information. In addition, the Off Campus Student Housing Office conducts surveys of apartment prices around town and has useful maps and other information for you.

Transportation: The Bryan/College Station area is serviced by Easterwood Airport (CLL) on the TAMU campus. Daily flights are available on American Airlines from Dallas-Fort Worth International Airport (DFW) and United Airlines from George Bush Intercontinental Airport (IAH) in Houston. A variety of shuttle services are also available to and from Houston. Like most moderate sized cities in the US, public transportation is available in Bryan/College Station. However a car, or access to a car, is still very helpful. Uber and commercial taxi services are available throughout the area. Area transportation provides can be found at the Bryan/College Station Convention and Visitor Bureau site <<http://www.visitaggieland.com>>.

Texas A&M provides an extensive on- and off-campus bus systems that is free for all students. Maps, with real-time tracking of buses, and information on campus parking are available at the Transportation Services website <<http://transport.tamu.edu>>. The TAMUMobile app available for smart phones provides real-time bus tracking, route maps, virtual campus tours, event calendar and a variety of other useful information.

The Brazos Transit District (The District) provides hourly fixed bus routes throughout Bryan/College Station that is also free for all students. Unlike the TAMU bus system focused on the TAMU campus, The District provides transportation to shopping and other destinations. Maps and timetables are available at The District website <<http://www.btd.org>>.

GRADUATE PROGRAM IN GENETICS

The Doctor of Philosophy (PhD) graduate program in Genetics provides students with specialized training through course work, research, and teaching. The program has established requirements in these areas that must be satisfied by all students. The program requirements exist so that graduate students will receive a thorough understanding of their area of specialization as well as intensive experience in their particular field of research.

Additional requirements for graduate degrees are established by the Office of Graduate and Professional Studies (OGAPS). In most cases, the Genetics requirements are more explicit than the OGAPS requirements.

It is your responsibility as a graduate student to insure that you have met all program, graduate, and university requirements for your degree. The purpose of this handbook is to describe both the programs and the University requirements so that you have a single, accessible reference. Please keep this book handy and refer to it as you progress through pursuit of your degree. Additional information can be obtained from the Graduate advising office for Genetics located in Bio/Bio, Room 109A; E-mail: genesec@tamu.edu; Tel: 979-458-2284.

Faculty of Genetics Executive Committee:

| | |
|---|--------------|
| Dorothy Shippen, PhD, Chair | 979-862-2342 |
| dshippen@tamu.edu , Office: Bio/Bio 413A | |
| Hubert Amrein, PhD | 979-436-0766 |
| amrein@medicine.tamhsc.edu , Office: Reynolds 242 | |
| David Threadgill, PhD | 979-436-0850 |
| thradgill@medicine.tamhsc.edu , Office: Reynolds 428 | |
| Raquel Sitcheran, PhD | 979-436-0749 |
| sitcheran@medicine.tamhsc.edu , Office: Reynolds 105 | |
| Deborah Bell-Pedersen, PhD | 979-847-9237 |
| dpedersen@bio.tamu.edu , Office: BSBW 210A | |
| Jerome Menet, PhD | 979-458-5696 |
| menet@bio.tamu.edu , Office: ILSB 3141A | |
| Loren Skow, PhD | 979-845-3194 |
| lskow@cvm.tamu.edu , Office: VMRB1197, rm 305 | |
| David Stelly, PhD | 979-845-2745 |
| stelly@tamu.edu , Office: New Beasley Laboratory | |
| Marty Dickman, PhD | 979-862-7488 |
| mbdickman@tamu.edu , Office: Borlaug 107 | |
| Sarah Bondos, PhD (Ex-officio) | 979-436-0807 |
| sebondos@medicine.tamhsc.edu , Office: Reynolds 258 | |
| Genetics Program Office | 979-458-2284 |
| genesec@tamu.edu , Office: Bio/Bio 109A | |
| Meghan Kinder (DS Threadgill Lab), GGSA President, student representative | |
| meghan.kinder@tamu.edu | |

Graduate Recruiting and Admissions Committee:

| | |
|---|--------------|
| Raquel Sitcheran, PhD, Chair | 979-436-0749 |
| sitcheran@medicine.tamhsc.edu , Office: Reynolds 105 | |
| Paul Straight, PhD | 979-845-2994 |
| paul_straight@tamu.edu , Office: Bio/Bio435A | |
| Terje Raudsepp, PhD | 979-862-2879 |
| Traudsepp@cvm.tamu.edu , Office: VMRB 310 | |

Richard Gomer, PhD.....979-458-5745
 rgomer@bio.tamu.edu, Office: ILSB 2121B

Paul Hardin, PhD979-458-4478
phardin@bio.tamu.edu, Office: 308A BSBW

Mike Criscitiello, PhD.....979-845-4207
MCriscitiello@cvm.tamu.edu, Office: VTPB

Christine Merlin, PhD.....979-845-3655
cmerlin@bio.tamu.edu, Office: 102 BSBE

David Forgacs (Derr Lab), student representative
 dforgacs@cvm.tamu.edu

Samantha Peeler-Fletcher (DS Threadgill Lab), student representative
 peeler1@tamu.edu

First Year Advising Committee:

Sarah Bondos, PhD (Ex-officio).....979-436-0807
sebondos@medicine.tamhsc.edu, Office: Reynolds 258

Vytas Bankaitis, PhD979-436-0758
 vytas@tamhsc.edu, Office: Reynolds 108

Gary Kunkel, PhD.....979-845-6257
 g-kunkel@tamu.edu, Office: Bio/Bio 406A

Seth Murray, PhD979-845-3469
 sethmurray@tamu.edu, Office: Agronomy Field Lab

Bruce Riley, PhD979-845-6494
 briley@bio.tamu.edu, Office: BSBE 118A

Jon Skare, PhD.....979-845-1376
 jskare@medicine.tamhsc.edu, Office: Reynolds 407

Deborah Threadgill, PhD979-458-5673
 dsthreadgill@tamu.edu, Office: VMRA 280

Rodolfo Aramayo, PhD979-862-4354
 raramayo@mail.bio.tamu.edu, Office: BSBW 412A

Penny Riggs, PhD979-845-2616
 riggs@tamu.edu, Office: Kleberg 432D

Christine Merlin, PhD979-845-3655
 cmerlin@bio.tamu.edu, Office: BSBE 118D

Rene Garcia, PhD.....979-845-2989
 rgarcia@bio.tamu.edu, Office: BSBW 353

Hilary Scott (Panin Lab), student representative
 witz04@tamu.edu

Jessica Elswood (Porter Lab), student representative
 JElswood@cvm.tamu.edu

Curriculum Committee:

David Threadgill, PhD, Chair979-436-0850
 dwt@tamu.edu, Office: Reynolds 428

Craig Coates, PhD.....979-458-1219
 ccoates@tamu.edu, Office: HEEP 319

Andy Herring, PhD979-845-9284
 a-herring@tamu.edu, Office: Kleberg 432

Spencer Johnston, PhD979-845-8295
 spencerj@tamu.edu, Office: HEEP

Geoffrey Kapler, PhD979-847-8690
 gkapler@medicine.tamhsc.edu, Office: Reynolds 440

Chris Seabury, PhD.....979-845-8810
 cseabury@cvm.tamu.edu, Office: VMRB 313

Deborah Siegle, PhD979-862-4022
 siegle@bio.tamu.edu, Office: BSBW 233A

David Stelly, PhD979-845-2745
 stelly@tamu.edu, Office: New Beasley Lab Bldg 965

Hong-bin Zhang, PhD979-862-2244
 hbz7049@tamu.edu, Office: HEEP 427A

Paul Hardin, PhD979-458-4478
 phardin@mail.bio.tamu.edu, Office: BSBW 308A

Allyssa Miller (Herman Lab), student representative
 miller_allyssa@tamu.edu

Alexandra Trott (Menet Lab), student representative
 st_alexandra.trott@tamu.edu

Jade Benjamin (Dindot Lab), student representative
 JElswood@cvm.tamu.edu

GENETICS GRADUATE STUDENT ASSOCIATION (GGSA)

The Genetics Graduate Student Association (GGSA) is an advocacy and social group for graduate students with research interest in Genetics. A member of the GGSA must be enrolled with graduate classification at Texas A&M University, classified as a Genetics major and in good standing with the University. The organization meets each month to socialize, to address any academic issues they may have within the program, and issues within the University. The GGSA has representatives on the Recruiting, Curriculum, and First Year Advising Committees of the Faculty of Genetics so that they can report their issues within the program, which are then passed on to the Executive Committee of the Genetics Faculty. University issues are passed on to the Graduate Student Council (GSC). The GGSA also has organized events throughout the year such as Fall Picnic, Tailgate Party, volleyball, and games, and presents travel awards to members.

GGSA Officers:

Meghan Kinder, President
DS Threadgill Lab
meghan.kinder@tamu.edu

David Forgacs, Vice-President
Derr Lab
forgacs1@tamu.edu

Jessica Elswood, Secretary
Porter Lab
jelswood@cvm.tamu.edu

Carolina Mantilla-Rojas, Treasurer
DW Threadgill Lab
cmantillar@tamu.edu

Samantha Peeler-Fletcher, Recruitment
DS Threadgill Lab
peeler1@tamu.edu

Alexandra Trott, GPSC Representative
Menet Lab
st_alexandra.trott@tamu.edu

Allyssa Miller, GPSC Alternate I
Herman Lab
akmiller0625@gmail.com

Adam Salazar, GPSC Alternate II
Sacchettini Lab
isayni2u@gmail.com

Caitlin Curry, GGSA website curator
Derr Lab
cjcurry@tamu.edu

PHD DEGREE PROGRAM

To ensure that all students are making adequate progress towards their degree, the Faculty of Genetics has established a schedule for meeting specific requirements. This schedule allows students to make reasonable progress toward a degree while assuring that all major requirements are met in a timely fashion. Additionally, it enables the Faculty of Genetics executive committee to identify and correct unexpected delays experienced by students.

Timeline of Milestones: The following time schedule should be met for all Genetics PhD graduate students (semester refers to a regular 17-week semester and does not include summer terms):

| | |
|--|---------------------------|
| Choice of Faculty Advisor | End of First Semester |
| Degree Plan Filed with OGAPS | By End of Third Semester |
| Proposal/Preliminary Examination | By End of Fourth Semester |
| Final Defense | By End of Fifth Year |

It is expected that all students will adhere to this schedule. Students who do not meet deadlines will be contacted by the Chair of the Faculty of Genetics to insure that adequate progress is being

made. In most cases, a letter from the student's Faculty Advisor to the Chair of the Faculty of Genetics, explaining why the schedule was not met, will be sufficient for continuation. If students experience recurring problems in meeting the schedule, registration may be blocked. In these cases, the Chair of the Faculty of Genetics and the student's Faculty Advisor will meet.

Rotations: Although some students may enter with a specific Faculty Advisor identified, all students must complete three laboratory rotations during their first semester. Rotations acquaint new students with the research programs in their area of interest in genetics from across campus, providing a perspective on approaches and procedures used in modern genetics, as well as useful contacts in other labs. Rotations are also important to ensure students obtain a feel for the work environments of labs they may consider joining. Upon arrival, students receive written information about the research program in each professor's laboratory, and have the opportunity to interact with faculty during short faculty presentations scheduled during orientation. Following the new student orientation, students submit names of three laboratories (to the Genetics Administrator and/or the Chair of the First Year Advising Committee) in which they would like to perform the first rotation. Requests for the second and third rotations will be due approximately one week before these are scheduled to begin. Rotating students may enroll for up to 2 hours of credit in Genetics 685. Students also have the option to begin rotations during the summer before the fall semester, if desired. The professor, in whose lab the student is rotating, will assign A-F grades along with a written evaluation of the student's work in that lab. You will find a schedule of rotation due dates for your first year included in Appendix II and preference form in Appendix IV of this handbook.

Choice of Faculty Advisor: Students will identify a Faculty Advisor by the end of their first full semester, which will allow you to begin research in earnest toward the PhD degree in the second semester. All students will provide the Genetics Administrator and/or the Chair of the First Year Advising Committee a rank order of their choice for Faculty Advisor after discussing opportunities with their rotation professors. The First Year Advising Committee will match students with a Faculty Advisor base upon both the student and professor's preferences. If additional rotations are needed to find an appropriate lab, students can perform these in the

spring semester. Occasionally, working equally under the direction of two faculty members can enhance a student's graduate program.

Advisory Committee: An Advisory Committee supervises a student's coursework and research, ensures research progress of the student, and approves all documents required for the PhD degree. The Advisory Committee, chaired by the Faculty Advisor, is the primary source of direction and support for a student's research and academic program. The Advisory Committee should be constituted soon after the choice of Faculty Advisor to provide the student with maximum input on course choices. The Advisory Committee must have at least three members in addition to the Faculty Advisor. At least one member must come from a department outside your "home" department. Your Faculty Advisor must be a full member of the Faculty of Genetics. Students should familiarize themselves with the members of their Advisory Committee as soon as possible as these individuals also become excellent sources for references. This Advisory Committee will approve the degree plan, read and critique the proposal and dissertation, and administer the preliminary exam and oral defense. Committee selection must therefore be completed before the degree plan is filed.

Committee Meetings: All graduate students are required to have at least one committee meeting each year. An "Advisory Committee Annual Report" form must be submitted* to the Genetics Graduate Program Office no later than July of each year. You will find this form in the beginning of the Appendix IV of this handbook. **Failure to do so may result in a registration block for the fall semester.**

Annual Progress Report: All graduate students are required to fill-out an electronic annual progress report that describes information on publications, meetings, and presentations that you have participated in.

Degree Plan: The Degree Plan establishes course work and research hours to be completed by a student during graduate study. The courses that constitute the degree plan are decided upon by the student in consultation with the Faculty Advisor and Advisory Committee. The minimum total number of hours required on a PhD degree plan is 64 for students entering with a MS

degree awarded in the US (or its equivalent as determined by the Office of International Admissions). Students entering without a MS degree or with an MS degree that is not the equivalent of one awarded in the US should have 96 hours on their degree plan. Course requirements are listed in Appendix I of this handbook.

Limitations on the use of undergraduate, seminar, and transfer courses are detailed in the Graduate catalog. The degree plan is filed through an on-line submission process, signed electronically by all members of the Advisory Committee, and submitted to the Chair of the Faculty of Genetics for Department Head signature. Student must file a degree plan by the end of their third full semester. **Students failing to meet these deadlines will be blocked from registration.**

Proposal: The proposal describes the research that a student intends to undertake. The proposal provides a student with the opportunity to plan his/her graduate research project and to become familiar with the literature in that area. Proposals serve to launch a student into a research project, and are thus only effective if completed early in the graduate career. For this reason, proposals should be completed and submitted prior to the end of the fourth full semester. In the proposal, the student describes the rationale for the research project, the objectives of the research to be performed, and outlines the techniques to be used. Proposals must include a standard cover sheet available from the OGAPS website. The proposal is evaluated by the student's Advisory Committee, signed by all members, and submitted with the cover sheet to the Chair of the Faculty of Genetics for Department Head signature. Proposals that include research with vertebrate animals (including antibody generation in rabbits or mice) must enclose a copy of an approved Animal Use Protocol cover page. The proposal is not a contract to perform the described research, and significant research progress need not be completed at the time of proposal submission. It is instead a mechanism to assist students in clarifying research goals early in their graduate program, to encourage students to become familiar with the primary literature in their field, to provide students with experience in technical writing, and facilitate research interactions between students and members of their Advisory Committee.

Preliminary Examination: The preliminary examination includes both a written and an oral examination in which a PhD student's mastery of his or her field of specialization is tested by the student's Advisory Committee. You must have current cumulative and degree plan GPR's (grade point ratio) of at least 3.00 to be eligible for the exam.

The exam is given no earlier than a date when you are within six credit hours of completion of the formal course work (i.e., all course work on the degree plan except 681, 684, 690, 691, and 692 courses) or no later than the semester following the completion of the formal course work on the degree plan. The preliminary examination checklist can be found on the OGAPS website.

Once all portions of the examination are completed, the Faculty Advisor will report the results of the examination in writing using the proper form within ten working days of the scheduled examination date to OGAPS. Note that this form requires the signatures of all Advisory Committee members. Upon receiving the form OGAPS will verify that all eligibility requirements were met and, if so, record the results of the preliminary exam. If post-review of the exam by OGAPS reveals that eligibility requirements were not met, then the student and the Faculty Advisor will be notified of necessary actions (such as repeating the exam) required to rectify any deficiencies. Upon acceptance of a passing preliminary exam by OGAPS, you will be considered a candidate for the PhD degree. **After passing the required preliminary examination, you must complete all remaining requirements for the degree within four calendar years. Otherwise, you must repeat the examination.**

If you fail the preliminary examination, there is no obligation for a re-examination. At their discretion, the Advisory Committee (with no more than one member dissenting) may allow one re-examination when adequate time has passed to allow you to address inadequacies emerging from the first examination (normally six months).

Eligibility requirements that cannot be waived:

1. You must be registered for the semester during which you plan to take either the preliminary or final examination (or in which any portion of the exam may fall).
2. You must have an approved degree plan on file with OGAPS.

3. You must have cumulative GPR of 3.00 or above.
4. You must have a degree plan GPR of 3.00 or above.
5. You must have satisfied English language proficiency requirements (non-native English speakers).
6. All committee members have scheduled or waived the written portion and agreed to attend the oral portion of the exam or have found a substitute. Only one substitute is allowed and it cannot be the Faculty Advisor.

Dissertation: Graduate study culminates in the dissertation, which describes a student's research and outlines the unique contribution a student has made to expand the frontiers of knowledge. The dissertation describes the research undertaken by a student during graduate study. It is approved by the student's Advisory Committee. The format of the dissertation is very precisely controlled by OGAPS. Students must refer to the Thesis Manual and follow it exactly, or risk having their manuscript rejected by the Thesis Clerk. The Thesis Manual is available at the OGAPS website. The content of the dissertation is established by the student in consultation with the Advisory committee. The dissertation should be submitted to the student's Advisory Committee at least two weeks prior to the Final Defense. It is important that you NOT WAIT until the last minute to take care of this.

An original dissertation must be submitted, after final corrections, to the Chair of the Faculty of Genetics for signature a minimum of two weeks prior to the OGAPS deadline. Deadlines for submission of the dissertation to OGAPS are published each semester on the OGAPS calendar.

Final Defense: The final defense provides the student's Advisory Committee with the opportunity to evaluate a student's understanding of his or her research. The final defense consists of a formal public seminar of results presented by the student announced two weeks in advance. The presentation is followed by an oral examination of the candidate by the Advisory Committee. Final changes to the Dissertation are discussed at this time. The final defense must be held within four years of advancement to PhD candidacy. If not successfully completed within four years of candidacy, then the preliminary examination must be repeated. For all students, the defense should be scheduled at least four weeks prior to the OGAPS deadline for

submission of manuscripts to the Thesis Clerk. This will allow adequate time for revisions and two weeks for the Chair of the Faculty of Genetics signature.

REQUIREMENTS FOR THE PHD DEGREE

Peer-Reviewed Publication Requirement: Students are required to have at least one first-author peer-reviewed publication accepted before scheduling the Final Defense. The PhD degree is awarded based upon the generation of new knowledge, which in the field of genetics is demonstrated by publication in the peer-reviewed literature. If a paper is under revision, an exception to schedule the Final Defense can be requested from the Chair of the Faculty of Genetics.

Minimum Credit Hours: All students must remain in continuous enrollment throughout their graduate careers. This means that you must enroll for at least one credit hour during every regular semester (Fall and Spring) while you are working towards your degree. Continuous enrollment is required regardless of a student's source of support. All students using university facilities are required to enroll for a minimum of one credit hour.

Spring and Fall

All graduate students receiving Assistantships are required to register for a minimum of 9 credit hours during the Fall and Spring semesters throughout your graduate career.

Summer

All graduate students receiving Assistantships are required to enroll for a minimum of 6 credit hours during the summer. The requirement is 3 credit hours during any one Summer session in which you are enrolled or 6 credit hours during two Summer sessions in which you are employed.

If you are unsure about the GENE 691 (research) section in which you should register (for any semester), please contact the Genetics office at 979-458-2284. For the summer session, the

maximum number of GENE 691 credit hours in each 5-week term is 6, and in each ten week term is 10. So, in order to register for twelve hours, you may register for two 6 credit hour, 5-week terms.

Minimum GPR: OGAPS calculates two GPRs: a Graduate GPR comprising all courses taken and a Degree Plan GPR comprising just courses on your degree plan. It is expected that both GPR will remain at or above 3.00 during his or her graduate career. When either GPR drops below 3.00, a student will be given a one semester probationary period to bring it back to 3.00. If this is not achieved, the student must meet with the Faculty Advisor and Chair of the Faculty of Genetics to determine whether the student should remain in the Genetics Graduate Program. If the student has not chosen a Faculty Advisor at this point, the Chair of the Faculty of Genetics will consider scholastic probation (see below) based on evaluations from "rotation" professors and grades at that point. A student will not be allow to take the Preliminary Exam, advance to candidacy or give the Final Defense if either GPR is below 3.00.

Scholastic Probation: A conditional permission for a student to continue in the degree program can be given after the student has become scholastically deficient. For Genetics graduate students, this permission is granted by the Chair of the Faculty of Genetics. The record made by a student while on probation determines whether the student shall be cleared to register as a regular student, be granted a continuation on probation or be suspended, dismissed or terminated from the university for scholastic deficiency. The graduate student will be informed in writing of the terms of probation and may be required by the Advisory Committee or the Chair of the Faculty of Genetics to register for a prescribed schedule of courses. Hour and GPR requirements shall be made consistent with the student's progress toward graduation. The specified hours and grade points are considered to be a minimum only. In addition to, or in lieu of, course work, a graduate student may be required to demonstrate progress toward completion of the degree by completing specified examinations and/or specified milestones in research or other independent study leading to completion of the dissertation. A graduate student will remain on probation until the terms of the probation are accomplished and the Advisory Committee and Chair of the Faculty of Genetics recommends that the probation be lifted. A

graduate student blocked or suspended for deficient scholarship may appeal such a decision through the Graduate Appeals Panel, following the procedures at the OGAPS website.

Teaching Requirement: All students are required to participate as a Teaching Assistant (TA) for two semesters, typically during the second and third semesters. All students regardless of source of funding must complete this requirement, as it is an important aspect of professional training. Previous teaching experience at the University level can be used to fulfill this requirement, at the discretion of the Chair of the Faculty of Genetics. Students with this type of experience should submit a written description of the course(s) they taught, what duties were required, and the name and telephone number of the faculty member in charge of the course.

All incoming graduate students must complete TA training. Texas A&M University provides a mandatory TA training called Teaching Assistant Training and Evaluation Program (TATEP). All new graduate students will be registered during orientation and must attend. Additionally, Genetics TA's must register for one credit of GENE 697 (Teaching Genetics Labs) every semester they TA.

Department Assignment: When hired as a teaching assistant or when offered a Regents Fellowship through the Faculty of Genetics, you will at this time be considered a Genetics major through the Department of Biochemistry and Biophysics. After completing your rotations and choosing a Faculty Advisor, you will need to file the petition form on the OGAPS website. You will complete the petition for change of department, keeping Genetics as your major, but changing your department to that of your Faculty Advisor. Your Faculty Advisor, and the Chair of the Faculty of Genetics need to sign this document. You will submit a copy to the Genetics Office and then submit the original and any required copies to OGAPS.

Deadlines: Proposals and dissertations with Advisory Committee signatures must be submitted to the your Faculty Advisor or Chair of the Faculty of Genetics for approval at least two weeks prior to submission to OGAPS. It is important not to wait until the last possible minute to take care of this -- consider that faculty members may be out-of-town or unavailable, and these are extremely important documents in conjunction with your career.

FINANCIAL SUPPORT

Formally, there are three forms of support for graduate students in our program: Graduate Assistant Teaching (GAT), Graduate Assistant Non-Teaching (GANT), and Graduate Assistant Research (GAR). Some students are also on Fellowships. GAT and GANT support is provided from state-appropriated teaching funds. GAR support is provided by individual faculty and is funded by research grants. Fellowship support may be provided by the University, Federal or other sources and is awarded on a competitive basis.

In order to receive support, students must register for a minimum of 9 credit hours for the Fall and Spring semesters. For Summer support, registration in a minimum of 3 credit hours per five-week summer session, or 6 credit hours for the 10-week session is required.

APPENDIX I

COURSE REQUIREMENTS FOR PHD DEGREE IN GENETICS

Required Courses (17 CR)

- GENE 603 Genetics (4 CR)
- GENE 608 Model Genetic Systems (2 CR)
- Computational genetics (3 CR)*
 - CSCE 601 Programming with C and Java
 - BIOL 651 Bioinformatics
 - STAT 604 Special Problems in Statistics Computations and Analysis
 - STAT 646 Statistical Bioinformatics
 - STAT 657 Advanced Programming using SAS
 - VIBS 613 Evolutionary Bioinformatics
- GENE 681 Seminar (2 CR)
- GENE 682 Seminar Presentation (2 CR)
- GENE 685 Research Rotations (1 CR)
- GENE 697 Teaching Genetics Labs (2 CR)
- Scientific presentation skills (1 CR)
- Research ethics (1 CR)

Elective Courses (9 CR, spread across at least three competency areas*)

- *Molecular genetics*
 - BIOL 609 Molecular Tools in Biology
 - BIOL 635 Plant Molecular Biology
 - GENE 626 Analysis of Gene Expression
 - GENE 631 Biochemical Genetics
 - GENE 648 Molecular Evolution
 - GENE 662 Eukaryotic Transcription
 - GENE 673 Gene Expression
- *Quantitative and population genetics*
 - ANSC 628 Animal Breeding
 - ANSC 689 Advanced Quantitative Genetics
 - EEBL 605 Population and Quantitative Genetics
 - EEBL 606 Phylogenetics and Comparative Biology
 - ESSM 689 Quantitative Methods in Ecology, Evolution and Biogeography
 - GENE 606 Quantitative Phylogenetics
 - GENE 612 Population Genetics
 - GENE 613 Quantitative Genetics
 - GENE 614 Maximum Likelihood Estimation of Genetic Parameters
 - GENE 638 Prediction of Genetic Merit
 - GENE 643 Quantitative Genetics and Plant Breeding
 - SCSC 641 Plant Breeding
 - SCSC 642 Plant Breeding II
 - WFSC 624 Dynamics of Populations

- *Organismal genetics*
 - ANSC 624 Mammalian Developmental Genetics
 - BIOL 601 Biological Clocks
 - BIOL 606 Microbial Genetics
 - BIOL 610 Evolution
 - BIOL 611 Developmental Genetics
 - BIOL 652 Epigenetic Mechanisms
 - BIOL 698 Behavior, Genes, Evolution
 - GENE 633 Conservation Genetics
 - GENE 677 Genes and Diseases
 - MARB 668 Evolutionary Biology
 - MSCI 630 Pathogenesis of Human Disease
- *Genomics and bioinformatics*
 - BIOL 650 Genomics
 - EEBL 607 Evolutionary Genomics
 - GENE 620 Cytogenetics
 - GENE 629 Applied Animal Genomics
 - GENE 654 Analysis of Complex Genomes
 - GENE 655 Analysis of Complex Genomes-Lab
 - VTPP 638 Analysis of Genomic Signals
 - VTMI 664 Mammalian Genome Modification for Biomedical Research

*Approved courses meeting requirements in each competency area. Alternative courses must be approved by the Genetics Executive Committee per Appendix III.

Typical Curriculum

1st Year

Fall (9 CR)

GENE 603 (4 CR) Genetics
 GENE 608 (2 CR) Model Genetics Systems
 GENE 681 (1 CR) Seminar
 GENE 685 (1 CR) Research Rotations
 Scientific presentation skills (1 CR)

Spring (9 CR)

Computational genetics (3 CR)
 Genetics elective (3 CR)
 Research ethics (1 CR)
 GENE 681 (1 CR) Seminar
 GENE 697 (1 CR) Teaching Genetics Labs

Summer (6 CR)

GENE 691 (6 CR) Research

2nd Year

Fall (9 CR)

Genetics elective (3 CR)

Genetics elective (3 CR)

GENE 691 (2 CR) Research

GENE 697 (1 CR) Teaching Genetics Labs

Submit Degree Plan

Spring (9 CR)

GENE 682 (1 CR) Seminar Presentation

GENE 691 (8 CR) Research

Proposal and Preliminary Examination

Summer (6 CR)

GENE 691 (6 CR) Research

3rd Year

Fall (9 CR)

GENE 691 (9 CR) Research

Spring (9 CR)

GENE 691 (9 CR) Research

Summer (6 CR)

GENE 691 (6 CR) Research

4th Year

Fall (9 CR)

GENE 682 (1 CR) Seminar Presentation

GENE 691 (8 CR) Research

APPENDIX II

SCHEDULE OF LAB ROTATIONS

1st Rotation

Choices due: Wednesday, August 31, 2016
Rotations begin: Monday, September 5, 2016
Rotations end: Friday, October 7, 2016

2nd Rotation

Choices due: Monday, October 3, 2016
Rotations begin: Monday, October 10, 2016
Rotations end: Friday, November 11, 2016

3rd Rotation

Choices due: Monday, November 7, 2016
Rotations begin: Monday, November 14, 2016
Rotations end: Friday, December 16, 2016

Faculty Advisor Selection

Preference Due: Monday, December 19, 2016
Lab Assignments: Wednesday, December 21, 2016

4th Rotation (optional)

Choices due: Thursday, December 19, 2016
Rotations begin: Monday, January 2, 2017
Rotations end: Friday, February 3, 2017

Final lab preferences should be turned in by Monday, December 19, 2016. On June 1, 2017 students will be on the payroll of the professor whose lab they have chosen to join for their thesis research work.

Students on rotations will follow the Employee Holiday Schedule*

| | | |
|------------------|---------------------|--------|
| Thanksgiving | Nov. 24 and 25 | 2 days |
| Christmas | Dec. 23 thru Jan. 2 | 7 days |
| MLK, Jr. Day | Jan. 16 | 1 day |
| Spring Break | Mar. 16-18 | 3 days |
| Memorial Day | May 29 | 1 day |
| Independence Day | July 4 | 1 day |

**These dates are subject to change and approval of the TAMU Board of Regents.*

APPENDIX III

Procedure for Approving New GENE Electives

The revision of the GENE PhD curriculum around competency areas provides substantial flexibility for individual degree programs. Students are required to have 9 CR of electives spread across three of the four competency areas (Molecular Genetics, Quantitative and Population Genetics, Organismal Genetics, and Genomics and Bioinformatics). All courses should have a substantial research literature component. Courses meeting the criteria can be added to the list of qualified courses. The process is:

- 1) A GENE faculty member nominates a course that fulfills a specific competency area to the Chair of the Curriculum Committee.
- 2) The nomination should include the syllabus and a justification for how the course fulfills a specific competency area.
- 3) The justification and syllabus will be forwarded to members of the Curriculum Committee, who will have 10 working days to vote for or against inclusion of the nominated course in the GENE curriculum. Any member can also request tabling the request for discussion at a Curriculum Committee meeting that should occur within 30 days of the request to table.
- 4) A simple majority vote of the Curriculum Committee is required to recommend the course to the GENE Executive Committee for inclusion in the GENE curriculum.
- 5) For courses not approved, the nominating GENE faculty member may request a meeting of the Curriculum Committee to present the course for open discussion, which will be followed by another vote by the Curriculum Committee.
- 6) The GENE Executive Committee will vote for or against inclusion of courses recommended by the Curriculum Committee in the GENE curriculum within 10 working days of receiving the recommendation. A simple majority is required to approve the course.

APPENDIX IV
FORMS

PhD ADVISORY COMMITTEE ANNUAL REPORT
Program of Genetics
TEXAS A&M UNIVERSITY

Student: _____ Date Entered the Ph.D. Program _____

Meeting Date _____ Previous Meeting Date _____

Prelim Date (if applicable) _____

Committee Chair _____ Co-Chair _____
(if applicable)

Name of Reporting Committee Member _____

Journal Club(s) in which student regularly participates:

Summarize your specific recommendations to student:

Assess student's overall progress toward completion of the Ph.D. degree (circle):

Excellent

Satisfactory

Borderline

Unsatisfactory

Additional comments:

| |
|---|
| The Chair of the Committee will collect completed forms at the time of the meeting and copies will be provided to members of the committee, the student, and the Graduate Programs Office of Genetics. Note: Failure to file an Annual Report with the Graduate Programs office will result in a block of registration. |
|---|

PREFERENCE LIST FOR FIRST LAB ROTATION

These are choices for **the first** lab rotation, **NOT** for all three rotations. A new preference list must be submitted before each rotation.

Students are strongly encouraged to talk to more than one professor for each rotation in case the first or second choice cannot be arranged.

The rotation preference list is to be turned in to the Gene Administrator (109A Bio/Bio or MS 2128). Lab rotation assignments are made in consultation with Principle Investigators.

Student Name: _____

Lab Choice for First Rotation

1. _____

2. _____

3. _____

PREFERENCE LIST FOR SECOND LAB ROTATION

These are choices for **the second** lab rotation, **NOT** for all three rotations. A new preference list must be submitted before each rotation.

Students are strongly encouraged to talk to more than one professor for each rotation in case the first or second choice cannot be arranged.

The rotation preference list is to be turned in to the Gene Administrator (109A Bio/Bio or MS 2128). Lab rotation assignments are made in consultation with Principle Investigators.

Student Name: _____

Lab Choice for First Rotation

1. _____

2. _____

3. _____

PREFERENCE LIST FOR THIRD LAB ROTATION

These are choices for **the third** lab rotation, **NOT** for all three rotations. A new preference list must be submitted before each rotation.

Students are strongly encouraged to talk to more than one professor for each rotation in case the first or second choice cannot be arranged.

The rotation preference list is to be turned in to the Gene Administrator (109A Bio/Bio or MS 2128). Lab rotation assignments are made in consultation with Principle Investigators.

Student Name: _____

Lab Choice for First Rotation

1. _____

2. _____

3. _____

