

Genetics Department

Undergraduate Newsletter

May 2017



Photographer: Dr. Jay Tischfield

CONGRATULATIONS TO THE GRADUATING CLASS OF 2017

The Genetics Department would like to congratulate all of the graduating seniors on their outstanding achievements. You all worked very hard to get this far, and we wish you the very best on your future endeavors.

A Note from the Vice Chair

As Vice Chair and Undergraduate Director for the Department of Genetics, it is my pleasure to get to know our majors and watch them truly grow into independent thinkers and scientists. Our goal for the educational mission of the department is to develop a curriculum that builds the skills needed to navigate the professional world of the 21st century. To foster compelling writing and excellent communication skills. To sharpen our students' analytical and problem-solving skills. To learn to adapt to rapidly changing technology and a rapidly changing world. To be more than just consumers of information, but to be producers of new information in our society. We require all of our majors to conduct independent research with our faculty to achieve these very goals, as research grows these specific skills in our students through a direct connection with our faculty. This regular newsletter will continue to solidify that connection and help all of us move towards these important goals.—Chris Rongo, Ph.D.



The Genetics Department Graduating Class of 2017

Anam Ahsan	Anna Hinman	Darya Pavlenko
Henna Akbarzai	Qasim Javed	Amanda Peraino
Gabriel Batzli	Priya Kantesaria	Darcy Pommerening
Neil Bhavsar	Sara Laitusis	Aditi Ranade
Jessie Blackburn	Sukhrob Makhkamov	Rishabh Rattan
Kiera Brennan	Noel Messina	Jennifer Reyes
Laura Byron	Jessica Missel	Leely Rezvani
Victoria Carr	Caitlin Monahan	Alejandra Rondon
Christie Chang	Zinira Munshi	Alexander Salibi
Megan Chen	Calina Noah	Manali Shah
Jessica Clark	John Nowak	Rajvi Shah
Logan Cummins	Dafina Pacuku	Veerin Sirihorachai
Patrick Darcy	Vidish Pandya	Francesca Spinosi
Dominick DeLorenzo	Shveta Parekh	Arushi Sur
Nicole Demos	Aashini Patel	Fahim Syed
Katherine Donohue	Esha Patel	Janell Thomas
Matthew Fastiggi	Kaajal Patel	Kliment Todosov
Robert Fullem	Nikunj Patel	Kedar Venkataramani
Silvia Gunderson	Niyati Patel	Julia Wehrer
Jessica Guo	Vishal Patel	Jeffrey Wu

Please visit the Genetics Department website for photos of our graduating seniors: genetics.rutgers.edu

Genetics Department Honors Program

The Departmental Honors Program was established to provide highly motivated seniors with an opportunity to immerse themselves in an original scientific research project. Students are expected to conduct their own research project during their senior year, culminating in a written thesis around mid-April. Then, students will present their research at the annual Departmental Honors Symposium. Students in this program are also eligible to apply to the three departmental academic awards.

THE DUNCAN AND NANCY MACMILLAN AWARD FOR RESEARCH EXCELLENCE- This award recognizes a graduating senior, majoring in Genetics, who has demonstrated outstanding accomplishment in Research by the completion of a project of publication quality. The Awardees are:

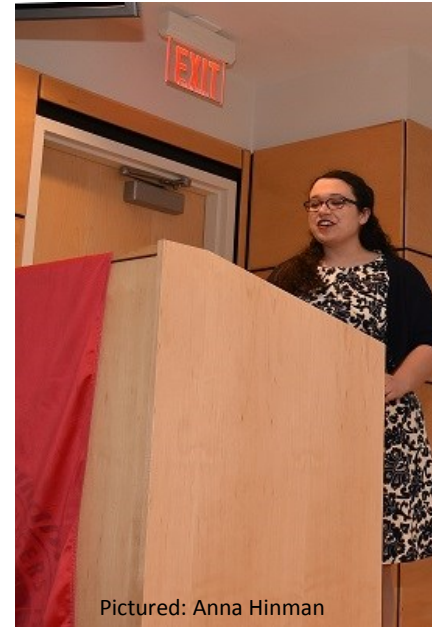
Katherine Donohue **Nikunj Patel**

THE HOWARD C. PASSMORE AWARD FOR DISTINGUISHED ACADEMIC ACHIEVEMENT- This award recognizes a graduating senior, majoring in Genetics, who has demonstrated outstanding achievement in academic coursework, participation in research and commitment to service. The Awardees are:

Priya Kantesaria **Vidish Pandya**

THE DEPARTMENT OF GENETICS AWARD FOR EXCELLENCE IN A RESEARCH PRESENTATION- This award is presented to a graduating senior, majoring in Genetics, who shows extraordinary skills in scientific communication to an audience of peers at the Departmental Honors Day. The Awardees are:

Megan Chen **Anna Maria Hinman**



Pictured: Anna Hinman

The 2017 Genetics Department Honors Program Participants/Mentor/Research Presentation Title:

Laura Byron (Mentor, Dr. Kim McKim)

"A Study of Microtubule, Chromosome, and Kinesin Interactions in Meiosis"

Christie Chang (Mentor, Dr. Lei Lu)

"SIP30 and RSEP1 Gene Involvement in Neuropathic Pain"

Megan Chen (Mentor, Dr. Nancy Woychik)

"Functional Analysis of VapC Toxins in *Mycobacterium tuberculosis*"

Patrick Darcy (Mentor, Dr. Derek Sant'Angelo)

"Defining PLZF's Role In Cytokine Gene Regulation Using an Over Expression Model"

Dominick Delorenzo (Mentor, Dr. Gleb Shumyatsky)

"Dendritic Spine Density and Neurogenesis in Post-Partum Stat4A Mice."

Nicole Demos (Mentors, Dr. Kim McKim & Dr. Patrick Hill)

"Ethical Implications of Preimplantation Genetic Diagnosis"

Katherine Donohue (Mentor, Dr. Bonnie Firestein)

"Intracellular Targeting of Brain-Derived Neurotrophic Factor mRNA Regulates Dendrite Arborization"

Anna Hinman (Mentor, Dr. Kim McKim)

"Regulation of Subito at the Central Spindle in *Drosophila* Oocytes"

Priya Kantesaria (Mentor, Dr. Linda Brzustowicz)

"Examining the Altered miRNA Expression as a Result of the 22q11.2 Deletion in Schizophrenia"

Caitlin Monahan (Mentor, Dr. Monica Driscoll)

"Influence of Compartmentalized Superoxide Stress on *C. elegans* Developmental and Aging Biology"

Vidish Pandya (Mentor, Dr. Ping Xie)

"Investigating the Interaction Between TRAF3 and its Novel Signaling Partner PPP2CA."

Esha Patel (Mentor, Dr. Gleb Shumyatsky)

"Dendritic Spine Density in Stat4A Mice and its Possible Relation to Postpartum Depression"

Nikunj Patel (Mentor, Dr. Kim McKim)

"Exploring C(2)M and its ability to regulate the Synaptonemal Complex (SC) in *Drosophila melanogaster*"

Manali Shah (Mentor, Dr. Shridar Ganesan)

"The Role of TRIM33 in Downstream DNA Repair Pathways"

Rajvi Shah (Mentor, Dr. Martin Schwander)

"Role of DFNA5 in Progressive Hearing Loss"

Veerin Sirihorachai (Mentor, Dr. Michael Verzi)

"Promotion of BrafV600E-mediated Serrated Tumor Initiation by Loss of CDX2"

Janelle Thomas (Mentor, Dr. Christopher Rongo)

"TGF- β Signaling Modulates Protein Homeostasis "

Kliment Todosov (Mentor, Dr. Pal Maliga)

"Marker for Plastid Transformation in Tobacco"

Jeffrey Wu (Mentor, Dr. Derek Gordon)

"Factors That Most Significantly Affect Sample Size For Gene Mapping Statistics"

From Undergrad to Aspiring Genetics Counselor

Kate Donohue is a graduating senior whose interest in genetics has impacted her life on a personal and collegiate level. Her research has led her to push beyond the boundaries most undergrads face, and along the way she discovered that there was more to genetics than just laboratory research.

"I work with brain-derived neurotrophic factor, which is called BDNF. When BDNF is overexpressed, it increases dendrite growth on neurons. This is important because dendrite growth and dendritic arborization is often associated with many neurodegenerative diseases," says Kate about her honors research in Dr. Bonnie Firestein's lab.

"In the lab, they helped me to become my own scientist. I can give suggestions and say: hey can I look at this, or, can we try something different; and they are super open to that."

Beyond the lab, Kate's personal life experience with a family member's diagnosis of Batten disease, a rare autosomal recessive disorder, lead her to seek a better understanding of genetics. "I started asking questions about my cousin's condition and my family didn't understand the importance of genetic information and genetic testing, and why having this condition can affect my other cousins."

Kate's interests in genetic information lead her on the path towards obtaining a genetic counseling certificate. The Genetic Counseling Certificate Program is a highly competitive undergraduate program that provides students with guidance, coursework, and relevant clinical experience to improve their graduate school applications.

"When I dove into the genetic counseling certificate program; and got to see families and patients go to genetics counselors with so many questions, I saw how rewarding it was and how genetic counselors explain the science, and become a support team." The Genetic Counseling Certificate Program is headed by genetics faculty member, Dr. Gary Heiman.

Kate's research and exposure to genetics through her course work with Dr. Heiman and Dr. Firestein has proved invaluable as it is unique, and has opened other doors of opportunity. Some of her research in Dr. Firestein's lab is being considered for inclusion in a publication. Also, Kate did an internship with the New York Genome Center.

Kate is currently in the process of applying to graduate school to further her studies in genetic counseling. When asked about where she sees herself in the future she replied: "I want to come back, take what I learned and teach future genetic counseling students. Hopefully one day I'll be back at Rutgers."



Photo submitted by Kate Donohue

One Student's Path to Become a Genetics Major

Om Kothari, a sophomore majoring in genetics recounts how he came to major in genetics.

"Early on in high school, I was drawn to chemical engineering so I took courses that would put me on that track. I joined the Robotics Team. I was a dedicated member in the organization, spending around 25 hours per week designing, building, and testing our robot; I thought this was my future."

Things changed quickly after I learned that my grandfather, my lifelong idol, was diagnosed with Stage IV colorectal cancer. I felt helpless the entire time. The doctors tried their best and used the most potent chemotherapeutic drugs and strongest pain relievers. Unfortunately, the inevitable happened, but I felt a new purpose beckoning to me. I didn't want to watch from the sidelines while people suffered from such devastating illnesses, and I wanted to know how and why cancer happens. All of this inspired me to pursue a career in the life sciences.

While I only knew one thing about biology - that mitochondria is the powerhouse of the cell - I was determined to change lives. I shuffled around my course schedule, aligning it with that of the typical pre-medical student, and I absolutely loved my first year. My classes were a great time, and I was selected as the 2016 - 2017 Aresty Research Assistant for Dr. Verzi's lab, which, ironically enough, deals with the genetics of colorectal cancer. It was then that I knew I had found a home in the Genetics major!"

Photo Submitted by Om Kothari



Marching to the Beat of Her Own Drum

For junior **Kelly King**, she knew early on that a major in genetics was the right fit for her. "I decided to major in genetics because I have a younger brother with Down Syndrome. From a young age I started to learn about the basics of meiosis and how errors in chromosome segregation can lead to developmental disorders. My curiosity only expanded from there."

Kelly conducts research in the lab of genetics faculty member, Dr. Karen Schindler. "We work to better understand why female meiosis is so error prone." Kelly's research helped her receive funding from the Douglass Residential College (DRC) STEM Summer Stipend. "Dr.



Photo Submitted by Kelly King

Schindler welcomed me into her lab, and I learned so much from being there all day every week-day, and I was able to present my work at the DRC Project Super Research Symposium."

When asked about how her research in genetics has enhanced her life as a Rutgers student, Kelly replied, "Doing research at the Schindler lab has enhanced my work ethic and has taught me to take pride in my work. A valuable lesson that I learned is that, especially in science, you have to focus on the positive. Most experiments aren't going to work out perfectly, but you have to focus on what you did accomplish rather than what you didn't. I have been able to apply this to all aspects of my life."

Aside from academics, Kelly enjoys a robust and balanced extra-curricula life, which included instruments that she taught herself to play. "I have been in the Rutgers Marching band for three seasons. I played the piccolo and trumpet. I am also involved in the Catholic Student Association, which has taught me a lot and kept me grounded throughout my college career. I play the guitar for the Catholic mass that is held on Busch campus."

After she graduates from Rutgers University, Kelly plans to attend medical school and hopes to become an OB/GYN to continue her work in reproductive science.

MITOCHONDRIAL REPLACEMENT THERAPY

An in-depth look into 3 person babies, the process of MRT, and how your mom and dad might respond to this new tech.

The More You Know

Genetics senior **Priya Kantesaria** (SAS'17) presented a blog post during her coursework in 447:354 Social, Legal, and Ethical Implications of the New Genetics, to explain mitochondrial transplant to a lay audience; (why we need it, who would want it, how it works). She also described the possible ethical, legal, and social implications.

ASSOCIATION OF UNDERGRADUATE GENETICISTS

AUG officers shared some insights on the purpose and benefits of this club.

Shveta Parekh (AUG President): "AUG provides a club where Genetics majors, and other science majors, can meet new people, have some fun, and make new friends! AUG helps students navigate the major and is a way for students to express opinions amongst their peers. Our club also helps connect students with resources, gain access to mentorship, and serves as a space to freely share ideas with diverse minds."

AUG hosts various informative and exciting events. Here are some examples: Labs 101: Everything You Need to Know About Getting into a Research Lab; discussions about Genetic Counseling. AUG also hosts an ethical debate, and a bi-annual study party. They also host a Fall Eat & Greet where students to mingle with the Genetics faculty over dinner.

When asked about future events; AUG said: "We have some exciting ideas; from a scavenger hunt, to multiple guest speakers, and possibly a speaker panel. We will also be holding our Spring Benefit, which is our annual philanthropic event where all proceeds go towards a genetic related disease or research cause."

The board members also shared the benefits of joining this group and advice for prospective majors. Shveta said that after attending her first AUG meeting, she absolutely loved it. Her advice for students interested in the major: "Make sure you are truly passionate about this major, and if you are, it won't feel like work."

Francesca Spinosi (Vice President) said that joining this group connected her more to her peers.

Adiba Salim (Secretary) said the members were welcoming and made AUG feel like family, and that made her want to join.

AUG PR Chair- **Tania Atanassova** shared this advice: "Take electives you are interested in so the class is enjoyable."

Muhammed Rahim (Treasurer) added: "Join AUG, get involved! Don't be shy; don't be afraid to ask questions to professors and upperclassmen. Join a lab; see how it is and see if you like it. Make sure that this is a major that you are truly passionate about."



Photo Submitted by AUG

The use of mitochondrial replacement therapy in reproductive medicine has gone from something that sounds like a sci-fi movie premise to a promising (and increasing popular) procedure. In 2016, the first baby born with complete mitochondrial transfer was birthed to a couple from Jordan. The family had gone through two failed MRT treatments, all with the intent to prevent their future child from inheriting a genetic disease. The mother's sex cell had mitochondria that carried the devastating Leigh Disease.

Since children inherit their mitochondria from their mother, without MRT, the child would undoubtedly be born with the disease. However with MRT, the parental genetic information was placed into a healthy embryo, constructing a cell with the parental DNA and the donor's healthy mitochondria. This method has proven successful with the Jordanian couple, and recently two women battling with fertility difficult in Ukraine are pregnant with children through MRT.

THREE AREAS OF IMPACT

SOCIAL

The use of the word "three-person baby" invokes an image of a mutant child, not a regular infant. Children born from new tech seem like an experiments which can impact their social integration.

LEGAL

One question raised is does the mitochondrial donor have parental rights over the child. Should the donor be able to visit a child they helped bring into the world, or did they give that right up by signing up to be a donor?

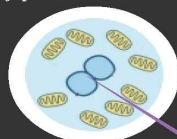
ETHICAL

Ethics come into play when considering who should have access to MRT. Should only those with mitochondrial disease be given access, or should anyone who wishes to "upgrade" be given MRT.

HOW IT WORKS

PARENTAL EMBRYO

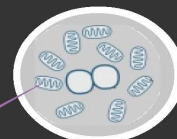
Unhealthy mitochondria (yellow) with healthy parental nuclear DNA (blue)



Parental nuclear DNA is removed from the original embryo and is inserted into donor embryo.

DONOR EMBRYO

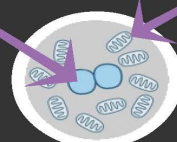
Healthy mitochondria (pale blue) with healthy donor nuclear DNA (grey)



Donor nuclear DNA is removed from the embryo and donor embryo with healthy mitochondria is used to house parental DNA

FINAL EMBRYO

Healthy mitochondrial (pale blue) from donor with parental nuclear DNA (blue circles)



"The Genetics department provides that space and environment to just explore." - Kate Donohue (SAS' 17)