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Women in Science | Yeshiva University STERN COLLEGE FOR WOMEN | Volume XV

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2018-19

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Introductory Remarks

The Departments of Biology, Chemistry/Biochemistry, Computer Science, Mathematical Sciences, Physics, Psychology, and Speech Pathology/Audiology each unique in its specific discipline, share a proactive approach in promoting the academic success of students at Stern College for Women (SCW) and in helping them achieve their career goals. The spectrum of career choices in the biomedical, health, natural sciences, physical sciences, and behavioral sciences is varied, with our students entering graduate programs in medicine, dentistry, osteopathy, optometry, veterinary science, psychology, physical therapy, occupational therapy, physician assistant, nursing, genetic counseling, pharmacy, nutrition, speech pathology/audiology, education, social work, and law; masters programs in biotechnology, bioethics, public health, engineering, architecture, and bioinformatics; and doctoral programs in the biomedical sciences, computational biology, chemistry, physics, neuropsychology, clinical psychology, and school psychology. Education in biology, chemistry, physics and engineering sciences are stepping stones toward careers in research and education in technology-oriented fields, including nanoscience and nanotechnology.

The Departments of Biology, Chemistry and Biochemistry, Computer Science, Mathematical Sciences, Physics, Psychology, and Speech Pathology/Audiology direct students to stretch beyond the classroom experience by involvement in scientific research. Both in the academic year and in the summer, students may work one-on-one with on-campus faculty. In the Summer, 2011, a collaborative interaction between Bar Ilan University and Yeshiva University enabled SCW and Yeshiva College (YC) undergraduates to intern in research laboratories in Bar Ilan University and, thereby, to spend a summer in Israel. In the summer 2019, 12 SCW undergraduates participated in this summer laboratory experience, now termed the YU/Bar Ilan Summer Research Program. The science faculties actively encourage the science majors to apply for competitive undergraduate research internships, locally, nationally, and internationally. In the summer of 2019, an additional 50 SCW students were involved in research in a variety of laboratory facilities, including on-campus at SCW and Yeshiva College, and at Albert Einstein College of Medicine (AECOM), Montefiore Medical Center, New York University, Memorial Sloan-Kettering Cancer Center, Columbia University Medical Center, Mt. Sinai School of Medicine, Rutgers University, National Institute of Allergies and Infectious Diseases, Northwestern University, Children's Hospital of Philadelphia, Northwell Hospital, Hackensack Hospital, Englewood Hospital, Boca Raton Regional Hospital, Houston Methodist, Shaarei Tzedek Hospital, and the Weizmann Institute and, as well as in the Health Careers Opportunity Program at the Rusk Institute for Rehabilitative Medicine. Undergraduates majoring in computer science received summer internships at AECOM, the YU/Bar Ilan summer research program, Palantir, Goldman Sachs, Nomura Bank, Brookville Advisory, Google, Facebook, Tifany & Co., Microsoft Research, and UBS Bank.

The Jewish Foundation for Education of Women (JFEW) Fellowship Program now marks its tenth year, with over 70 graduates of the program. The JFEW Program was inaugurated in the 2009-2010 academic year, with a select group of ten participating students with interests in the sciences. Each subsequent year, an additional cohort of students joined the program. The 2017-18 academic year marked the first in which the JFEW Program was expanded to support both science- and liberal arts-focused students. Highlights of the JFEW Fellowship Program include a partial scholarship, a stipend for a summer research internship, a stipend to support professional conference attendance, one-on-one mentoring by a faculty member, and an enrichment program that provides workshops on academic and professional development. Since its inception, JFEW Fellows have obtained internships in a variety of fields of including psychology, cancer cell biology, veterinary medicine, neurobiology, healthcare, molecular biology, computer science, biochemistry, and sociology. The Fellows have interned in prestigious institutions, including the University of Chicago, Emory University, AECOM, The Rockefeller University, Johns Hopkins University, Harvard Medical School, Rutgers University, New York University, Yale University, Barrow Neurological Institute, Hadassah Hospital, Bar Ilan University, Tel Aviv University, and in industry, Citromax. Several of the JFEW students have taken leadership roles in forming and/or leading the Neurobiology Club, the Genetics Club, the Optometry Club, and the Medical Ethics Society. Graduates of the program are currently pursuing careers in various science and health-related fields: medicine, dentistry, physical therapy, occupational therapy, nursing, public health, biomedical engineering, math education, food science, psychology, and veterinary medicine. The JFEW Program provides participants with, in addition to the above, a built-in network and support system of like-minded peers, graduates, and faculty.

The Department of Mathematical Sciences and the Department of Physics owe to the illustrious tradition in mathematics and physics at Yeshiva University, whose notable alumni and former faculty include Paul Dirac, Roger Penrose, Freeman Dyson, and Hillel Furstenberg. Today's B.A. program, M.A. program, and Ph.D. program, continue offering a high-class education, providing preparation for careers in technology, finance, economics, business, or academia. A personalized curriculum, integrated research and training, and one-on-one mentoring are keys for our students' success. We also offer a ~~a~~ variety of enrichment activities at SCW, including the math club, "No Limits", city wide seminars in Dynamical Systems and/or Mathematical Physics, and the Physics Colloquium. Graduates of our programs have been employed by Google, Goldman Sachs, Citigroup, Merrill Lynch, and Bank America, or pursued advanced degrees in physics, mathematics, engineering, computer science, and even law at Harvard, Yale, MIT, Princeton, Columbia, and New York University.

The mission of the Department of Computer Science is to prepare students for employment in various fields of computer science and/or to pursue advanced

studies in computer science. In addition to covering fundamentals of Computer Science theory and practice, department courses

help students maximize their portfolios of significant coding projects. The courses are structured to expose students to a variety of programming languages in a broad range of application areas. Students who complete this program should be well versed in the disciplines of object-oriented design and development, the architectures of software and hardware systems, the theory and practice of programming language technology, the construction and use of data structures and algorithms for the solution of large-scale computing problems, and the theory and application of database systems. There is a strong emphasis in the Department on preparation for challenging jobs in industry - our faculty and adjuncts come from positions of intensive industrial experience and leadership. Students in the department are involved in Computer Science outside the classroom - through an active ACM-W chapter, by participating in regional and national hackathons, and by working in internships at well-known firms, such as Google, Facebook, Microsoft, Palantir, Goldman Sachs, and many others. Honors students in our program work with faculty on computational research projects, preparing them for graduate level work, and/or prime industrial positions.

The Department of Psychology offers an Honor's Research Seminar for upper-level psychology majors. As part of this seminar, students are involved in ongoing research projects, either at SCW or at off-campus sites, such as the Ferkauf Graduate School, NYU Medical Center and Mt. Sinai School of Medicine, among others, and are supervised by an on-site investigator for 6 hours/week for 12 weeks. The primary requirement for the course is a comprehensive literature review and/or scientific report of the students' research projects, as well as a class presentation. The combination of internship and seminar allows the students to gain practical experience in literature review, data collection and management, and scientific writing and oral presentations. Students attending graduate programs in Clinical Psychology have identified the research seminar as being particularly helpful in preparing them for graduate school.

To meet growing student interest in the neurosciences, programs in neurobiology were instituted by a collaborative interaction between the Department of Psychology and the Department of Biology. In these programs, students complete a prescribed combination of courses in biology and in psychology (with each Department emphasizing its own requirements) and upon successful completion of the program, the designation "concentration in the neurosciences" is included on the college transcript.

The Speech Pathology/Audiology Department provides the academic and pre-clinical experiences to begin graduate studies, either for an M.S. in speech pathology or a Ph.D. in audiology. As part of the "extra-curricular" activities of the Department, students edit, manage and publish a journal, reflecting either a unique research project or a literature review. The topics include speech language pathology, audiology, or speech and hearing science. Some students participated in a research project involving dysphagia and dysphonia

associated with anterior cervical spine surgery. These students were part of a project conducted at the North Shore Hospital, reviewing patient data and research materials. The Speech Pathology/Audiology Club hosted renowned professionals to address clinical experiences, research projects, and career issues.

A specific objective of the science departments at SCW, in addition to nurturing the highest level of academic achievement, is to provide students with opportunities for leadership roles. Upper-level students may be appointed to positions as Teaching Assistants (TAs) for laboratory sections and as Recitation Instructors to review materials for the lecture sections of the science courses. Student-led clubs, such as the Biology Club, the Chemistry Club, the Physics Club, the Psychology Club, the PreMed Club, the PreDent Club, the Occupational Therapy Club, the Pharmacology Club, the Nutrition Club, the Global Health Club, the Pre-Engineering Club, the Nutrition Club, the Bikur Cholim Club, *etc*., provide opportunities for students to gain skills in organizing events and in coordinating social functions. The 2010-2011 academic year saw the birth of four new clubs, the Nursing Club, the Genetics Club, the Optometry Club, and the Neuroscience Club. The Public Health Club was launched during the 2011-2012 academic year; beginning in the fall semester 2016, the college instituted a minor of public health. Our newest club, the Physician Assistant Club, was started in the 2012-2013 academic year in order to spur interest in an increasingly popular field. These clubs often invite outside speakers to lecture and to conduct question-and-answer sessions on a variety of interesting topics. The Nursing Club held a number of particularly well-attended events, including an information session with admissions officers from the nursing programs at Columbia University, Fairleigh Dickinson University, NYU and Pace University. It later organized a guided tour of the NYU College of Nursing. The Nursing Club also held a joint information session with the Physician Assistant Club in December 2018. The Occupational and Physical Therapy Clubs likewise joined forces during the fall 2018 semester to run a career panel of Stern alumni in their respective fields. In February 2019, the OT Club invited Nicolaas van den Heever, the founding director of the planned Yeshiva University Occupational Therapy Doctorate (OTD) program, to speak about this exciting new program at the Katz School of Science and Health. These student-run clubs provide students with the opportunity to develop the social and professional skills needed to succeed in their future careers and provide networking opportunities with Stern College alumni already in the field. The YU Career Center plays a vital role in carrying out this goal and organized a well-attended Allied Health Fair in April 2019, at which Stern alumni from the aforementioned professions provided guidance and counsel to current students interested in these fields.

SURGE, the Student Undergraduate Research Group Exchange, is a faculty-sponsored, student-led club that gives students the forum to present their research as a seminar before their colleagues and the science faculty. The goals of this faculty-initiated club are to encourage and foster research and the exchange of research information. Meetings are held once a month, usually with two or three students presenting PowerPoint professional seminars.

Faculty members also use these meetings to inform students of upcoming internships and fellowship opportunities. In the 2018-2019 academic year, the following students presented seminars at SURGE meeting:

FALL 2018 SURGE Meetings		
October 2018		
Name	**Research Title**	**Research Program or University**
Elianna Sharvit	The ATM Pathway Mediates Apoptosis in *sf3b1* Mutant Zebrafish	Albert Einstein College of Medicine
Tzivia Linfield	Immunoglobulin Variable Light Chain Causes Amyloid Fibril Formation in SMA Protein	Bar Ilan University
Allie Schachter	Chemotherapy Induced Stress Granules and the Effects of their Inhibition	Bar Ilan University
November 2018		
Name	**Research Title**	**Research Program or University**
Bailey Frohlich	*C. elegans* as a Model to Study RAGE-related Metal-induced Neurodegenerative Pathologies	Albert Einstein College of Medicine
Miriam Liebling	Deep Learning for Morphology-Based Subtyping of Brain Tumors	Memorial Sloan Kettering Cancer Center
Tova Lambert	Sulfasalazine Increases the Abundance of Glucocorticoid Receptor Alpha in Mice	Feinstein Institute (Northwell Health)
December 2018		
Name	**Research Title**	**Research Program or University**
Abigail Goldberg	Cellular Senescence Markers are Altered in Rat Soleus Muscle Paralyzed by Contusion Spinal Cord Injury	James J. Peters VA Medical Center
Arina Soklakova	GCA Gene Overexpression in Patients with Peripheral Artery Disease	New York University

SPRING 2019 SURGE Meetings		
February 2019		
Name	**Title**	**Research Program or University**
Nurit Esral, Moreet Levine, Anna Schuman	Linguistic Analyses of Narratives and Children's Pre-Literacy Skills	Bar Ilan University
Hannah Brodskaya	Split Car Receptors	Univerysity of California San Francisco
April 2019		
Name	**Title**	**Research Program or University**
Shani Kahan	Novel Treatment for Bronchoconstrictive Disease: Relaxation of Airway Smooth Muscle by Gelsolin Peptide	Columbia College of Physicians and Surgeons
Etti Rapp	Effects of Sabbath Observance on New York City Traffic Patterns	Stern College for Women
May 2019		
Name	**Title**	**Research Program or University**
Ilana Karp	Using a Computational Method of Co-Transcriptional Splicing to Understand Alternative Splicing Outcomes	Albert Einstein College of Medicine
Neda Shokrian	Interaction of TDRD6 and Arginine Methylated Nucleoplasmin Tail	Albert Einstein College of Medicine
Tova Sklar	Noninvasive Brain Stimulation Enhances Speech Motor Learning	New York University

Each Fall semester, the science departments jointly sponsor a research poster competition in which students present their work. The posters, and more importantly the student's understanding of her project and the extent of her hands-on participation, are evaluated by the science faculty and winners are selected to present at a national meeting of the American Chemical Society. The costs of attending the meeting, including transportation and hotel, are underwritten by the Dean's Office, SCW, and by faculty research grants. In the Spring semester of 2019, Nechama Dembitzer (poster title: Antifreeze

Proteins Prevent Freezing Injury by Shaping Ice Crystals) and Elianna Sharvit (poster tile: The ATM Signaling Pathway Mediates Apoptosis in *sf3b1* Mutant Zebrafish) presented at the 257th National Meeting of the American Chemical Society, Orlando, FL.

The SCW Chemistry Club, a student affiliate chapter of the American Chemical Society (ACS), has been awarded a Community Interaction Grant from the ACS for the 2018-2019 academic year. The funded proposal, coordinated by incoming board member Neda Shokrian, described a continuation of educational outreach activities at an elementary NYC public school on the Lower East Side. Participation in the SCW Chemistry Club and affiliation with the undergraduate programs office at the ACS provides our students with invaluable experience in proposal writing, budget allocation, and grant reporting activities.

SCW graduates attending AECOM for their medical education are eligible to apply for Anne Scheiber Fellowships. This unique award provides up to full tuition scholarships based on need for four years of medical training (see "Anne Scheiber Fellowship").

Students considering careers in the various allied health fields (for example, occupational and physical therapy) or in engineering may wish to consider one of our several combined degree programs with other universities. In the spring term of 2009, Yeshiva University entered into a cooperative agreement with the NYU Steinhardt School of Culture, Education, and Human Development, designed to expand opportunities for students to prepare for a career in teaching math and science at the elementary and high school levels. During the fall of 2012, Stern College signed an articulation agreement to implement a combined program with the NYU College of Nursing. Students interested in this program pursue a shaped major that leads to the completion of the necessary prerequisites within five semesters for those who study for a year abroad in Israel (or seven semesters for those who come directly to Stern College after high school). If they are accepted to the program, they will receive a B.A. from Stern College upon completion of their first semester at the NYU College of Nursing. Once they have successfully completed the 15-month accelerated program at NYU, they will be awarded a BSN from their nursing school. This exciting new program has already admitted two classes of SCW students and should be the basis of a productive and long-term partnership between Stern College and the NYU College of Nursing" (see "Combined Programs"). The largest class yet, with 16 admitted students, entered NYU via the joint program in January, 2016.For students interested in nutrition, a shaped major option exists. Students in their senior year may take up to 12 credits in approved nutrition courses at NYU towards their shaped major. These courses will also count toward the DPD sequence requirements at NYU should the student continue in that program after completing her BA degree.

An important focus of SCW is to educate the next generation of Jewish women for leadership positions in their professions and communities. Our

commitment to the YU mission of *Torah U'Madda* is mirrored in the daily lifestyles of our students and thereafter in their future roles as professionals. Stern College students have academic strengths in both general and Jewish studies; the fusion of these worlds is evident in the student publication, *Derech HaTeva, a Journal of Torah and Science*. This SCW publication is distributed nationally and internationally and has received much praise for its level of Torah/science scholarship (see "*Derech HaTeva,*" for a listing of articles that appeared in volumes 1 through 23).

Specific faculty members are assigned roles to provide an intensive involvement in guiding students with their career choices and specifically in assisting with the application process. Dr. Brenda Loewy, director of the Office of PreHealth Advisement, has been joined by Dr. Chaya Rapp, to assist those students interested in careers in medicine, dentistry, optometry, veterinary medicine, and pharmacy. Mr. Jeff Mollin's focus is those students interested in careers in physical therapy, occupational therapy, physician assistant, and nursing and Dr. Harvey Babich assists those interesting in a career in genetic counseling.

In the Fall semester, 2012, SCW alumni, now medical students in AECOM, initiated The Stern-Einstein Mentorship Program (affectionately known as the "Big Sister Mentor Program"). The intent of this program was to connect pre-med or pre-health undergraduates with SCW alumni at AECOM, who will guide the undergraduates in the medical school application and interview processes, as well to be available to answer simple questions that will save time and prevent unnecessary frustration. This program is now beginning its fourth year and has met with much success.

Dr. Loewy organized several seminars in which the guest speakers provided valuable insights into the various professions, as well as information on the admissions process to their graduate and professional programs. This past year, the SCW and Yeshiva College (YC) pre-med clubs organized the annual Medical/Dental School Fair in which admission directors and officers from allopathic and osteopathic medical schools, as well as from American medical student programs in Israel, and Dental Schools attended. The location of the annual fair is alternated between the Wilf Campus (YC) and Beren Campus (SCW); this past year it was held at the Beren Campus. Each school had its own booth, thereby allowing students to approach the representative and to ask questions and gain insight into the school. This year, the following schools were present at the fair: representing the American Allopathic Medical Schools were Hofstra, Stony Brook, Rutgers; representing the American Osteopathic Medical Schools were NYITCOM and TouroCOM; representing the Israel American Medical Student Programs were Sackler, and Ben Gurion, representing the Dental Schools were NYU and Univ of Pennsylvania. Also in attendance were Touro College of Pharmacy and New York College of Podiatric Medicine.

In the 2011-2012 academic year, Dean Karen Bacon initiated the “Deans' Scholars Academic Enrichment Program.” This Program offers those outstanding students in Yeshiva University's undergraduate schools an opportunity to participate in one of three cooperative programs. The program of particular interest to science majors is the “Frontiers in Biomedical Science: Theory and Practice.” This project is under the direction of Dr. Edward Burns, Executive Dean of the Albert Einstein College of Medicine. The seminar meets six Fridays during the semester at AECOM and features leading biomedical scientists and their research. A second program, “Frontiers in Contemporary American Law," is under the direction of Vice Dean Melanie Leslie of Yeshiva University’s Benjamin N. Cardozo School of Law. This exciting enrichment program meets at Cardozo School of Law six Fridays during the Spring semester for two hour sessions and is led by Cardozo faculty. Scholars discuss the ways that the U.S. legal system resolves disputes and addresses fundamental questions of justice through legal reasoning and processes. The third program is Frontiers in Psychology. This enrichment program, organized in conjunction with Dean Lawrence Siegel of Yeshiva University’s Ferkauf Graduate School of Psychology, is an undergraduate program at the Ferkauf Campus. Scholars attend two-hour Friday seminars six times during the semester, led by Ferkauf faculty during the Fall semester on campus. The program aims to expose students to a spectrum of fields and specialties within psychology and to show students how the field’s practitioners evaluate and address current societal issues using the science of psychology.

Department of Biology

Faculty: Anya Alayev, Ph.D.; Levy Amar, Ph.D.; Harvey Babich, Ph.D.; Bill Bassman, M.S.; Amanda Katz, Ph.D.; Brenda Loewy, Ph.D.; Jeffrey Mollin, M. Phil.; Jennifer Odien, Ph.D.; Alyssa Schuck, Ph.D.; Margarita Vigodner, Ph.D.; Richard Weiss, M.D.

The Department of Biology offers a wide range of courses providing students with a thorough grounding in the fundamentals of modern biology, as well as exposing them to the cutting-edge areas of biomedical research. Course offerings include Cancer Biology, Cell Biology, Genetics, Human Anatomy, Human Biology, Human Development, Human Physiology, Immunology, Medical Biochemistry, Microbiology, Molecular Biology, Neurobiology, Nutrition, Pharmacology, Kinesiology, and Reproductive Biology, as well as Journal Club.

The B.A. in biology offered by the Biology Department requires completion of Principles of Biology I and II and 20 credits of advanced courses in Biology, of which four of the courses must be 4-credit lecture/laboratory courses. Also offered by the Biology Department are rigorous programs focusing on a concentration in neurosciences and a concentration in cell and molecular biology. Upon completion of the appropriate course of study, the phrase "concentration in the neurosciences" or "concentration in cell and molecular biology" is noted on the transcript. To accommodate the science requirements for non-science majors, the 4-credit course, Human Biology, lecture with laboratory, was introduced into the college curriculum.

Exciting one credit **Journal Club** courses are offered. As of the Spring semester, 2015, Journal Clubs courses were taught by Stern alumni, either 4th year med students at Albert Einstein College of Medicine (AECOM) or doctoral students in the Ph.D. program at Sue Golding Graduate Division of Biomedical Sciences, AECOM. For the Fall semester 2019, the topic is Infectious Diseases. The Journal Club taught in the Fall semester, 2018, was "Preventive Medicine," led by Sarah Mizrachi and Michelle Haimowitz. In the Spring semester, 2018, Shira Marder and Sarah Noble taught the Journal Club entitled "Women's Health: Epidemiology Studies." "Oncology," was the topic of the Journal Club offered in the Fall term, 2016, and was taught by Rikah Lerer and Miriam Steinberger. In the Spring semester, 2015, the topic of the Journal Club was "Immunology and Disease," taught by Hadassa Klerman, Jennifer Deluty, and Elisa Karp. In the Fall semester, 2015, Dr. James Nussbaum, Ph.D., P.T., instructed the Journal Club entitled, "Human Gait." This Journal Club was directed specifically to pre-PT and pre-OT students; in the Fall semester, 2014, he taught the Journal Club "Biomechanics."

Dr. Dana Lotan, PTD, a SCW alum and a PT with the Rusk Institute for Rehabilitative Medicine, instructs the 2-credit course, Kinesiology.

The newest faculty member of the Department of Biology, as of the Fall semester, 2018, is Dr. Amanda Katz, Ph.D. She earned her doctorate in cancer biology from the Weill Cornell Medical College, Graduate School of Medical Sciences. The title of her thesis is,"The role of tumor-associated astrocytes in PDGF-driven glioma."

Dr. Brenda Loewy, a faculty member of the Biology Department and the recipient of the 2008, Dean Karen Bacon Award for a Senior Faculty Member, is the college's Pre-Health Advisor. Her directive is to guide students interested in medicine, dentistry, optometry, and podiatry through the application process. To accomplish these goals, Dr. Loewy organizes a series of wide-ranging seminars. The overwhelming number of students interested in medicine, dentistry, and optometry, necessitated the recruiting of Dr. Chaya Rapp, Department of Chemistry and Biochemistry, to join the **Office of Pre-Health Advisement**. An important addition to the pre-health advisement staff was the appointment of Mr. Jeffrey Mollin, a member of the Biology Department, to guide students with career goals in nursing, physical therapy, occupational therapy, and physician assistant. Mr. Mollin was the recipient of the 2017 Dean Karen Bacon Award for a Senior Faculty Member. Dr. Harvey Babich guides those undergraduates interested in a career as a genetic counselor. Dr. Alyssa Schuck, faculty member of the Biology Department, heads the **Jewish Foundation for Education of Women (JFEW) Science Fellowship** and guides students participating in this program. Dr. Schuck was selected as the Senior Class Professor of the Year, 2013, 2014, 2016, and 2018 and the Professor Recognition Award for General Studies in May, 2019. In 2016, Dr. Schuck received the Dean Karen Bacon Faculty Award.

Volume 23 of ***Derech HaTeva. A Journal of Torah and Science,*** was published in the Spring semester, 2019. This issue included manuscripts authored by 23 undergraduates, as well as the article, "Scientific thoughts on specific Talmudic passages." authored by Dr. Babich. In the Spring semester, 2019, Dr. Babich was a recipient of the Senior Class Professor Award of graduating class of May, 2019

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Dr. Levy Amar, a relatively new full-time biology faculty member, initiated the Emergency Medical Technician Training Program for pre-health SCW and Yeshiva College (YC) undergraduates, along with the formation of the SCW-EMS and the YU-EMS. An $8,000 scholarship is awarded to students in need of financial assistance. The EMS is operating as an extension of *Ezras Nashim* volunteer emergency response service; the on-campus EMS became operational May, 2019.

Dr. Margarita Vigodner, an Associate Professor of Biology, and Dr. Anya Alayev, a Clinical Assistant Professor of Biology, have put the Biology Department on the "research map," as attested by their record of **publishing scientific research manuscripts** in prestigious scientific journals. Dr. Vigodner holds a secondary appointment at the rank of Assistant Professor in the Developmental and Molecular Biology at AECOM.

Dr. Vigodner's past **research support** included the NIH, NICHD: Academic Research Enhancement Award 1R15HD067944-01A1; "Regulation of Spermatogenesis by sumoylation;" extended until 1/11/2015 as an NIH; NICHD Administrative Supplements to Recover Losses Due to Hurricane Sandy. Through support by the Mitrani Foundation, in the Summer, 2015, the Vigodner laboratory was fully renovated. In addition, the Mitrani Foundation provided a small grant to support student research. **In June, 2019, the Biology Department was extremely proud to congratulate Professor Vigodner on receiving a 3-year R15 grant in the amount of $450,000 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development. The title of the research project is "Cell-type specific inactivation of sumoylation during mouse spermatogenesis." In the Fall semester, 2018, Dr. Vigodner was awarded the Doris and Ira Kukin Chair in Biology.**

Dr. Schuck, whose research interests involve the response of human oral cancer cells to nutraceuticals, as well as Drs. Vigodner and Alayev, actively recruit SCW undergraduates to join their research. The focus on cutting-edge research by the Biology faculty has been the driving force in the publication of numerous manuscripts in peer-reviewed scientific journals.

Below is a list only of faculty-generated manuscripts with a publication date of 2018 and later.

Weeranoppanant, N., **Amar, L.I.**, Tong, E., Faria, M., Hill, M.I., and Leonard, E. F, 2019, Modeling of fouling in cross-flow microfiltration of suspensions. *AIChE Journal*, 65: 207-213.

Amar, L.I., *et al.* 2019, Co-current crossflow microfiltration in a microchannel, *Biomedical Microdevices* 21.1:12.

Cuesta, R., Berman, A.Y., **Alayev, A.,** and Holz, M.K., 2019, Estrogen receptor α promotes protein synthesis by fine-tuning the expression of the eukaryotic translation initiation factor 3 subunit f (eIF3f)., *J. Biol. Chem*. 294:2267-2278.

Bostner, J., **Alayev, A.**, Berman, A.Y., Fornander, T., Nordenskjöld, B., Holz, M.K., and Stål, O., 2018, Raptor localization predicts prognosis and tamoxifen response in estrogen receptor-positive breast cancer, *Breast Cancer Res. Treat.*,168:17-27

Schafler, E.D., Thomas, P.A., Ha, S., Wang, Y., Bermudez-Hernandez, K., Tang, Z., Fenyo, D., **Vigodner, M.,** and Logan, S.K., 2018, UXT is required for spermatogenesis in mice, *PLos One* 132:e0195747.

Bostner, J., **Alayev, A.,** Berman, A.Y, Fornander, T., Nordenskjöld, B., Holz, M.K. and Stål, O., 2018, Raptor localization and estrogen-dependent breast cancer growth. *Breast Cancer Res Treat.* 168:17-27.

Amar, L.I. *et al.,* 2018, Erythrocyte fouling on micro-engineered membranes. *Biomedical Microdevices* 20.3:55.

Dr. Vigodner presented her research at meetings of national and international societies, as well as before learned audiences.

Regulation of spermatogenesis by sumoylation, American Society of Andrology, Chicago, April, 2019.

Regulation of spermatogenesis by sumoylation, seminar, Department of Developmental and Molecular Biology, AECOM, May, 2019.

As part of YU Undergraduate Admissions, **Dr. Schuck** presented, “You Are What Your Genes Say...Or Are You?" and "Custom-Made Genes;" at the YULA Recruitment program, December, 2018. In addition, she presented, "The life and times of a female scientist," Manhattan High School for Girls, January, 2019.

Dr. Amar served as an *ad hoc* reviewer of the following:

JAP18-AR-04217R3 entitled: "Direct measurement of blood flow velocity and shear stress using laser Doppler velocimetry in combination with acousto-optic modulation"

JMRBS-P-109 entitled: "What goes in, must come out."

AIChE-18-20531 entitled: "On the design of sustainable antifouling system for crossflow filtration using membrane technology"

Some undergraduates participate in research in external laboratories and, when their contributions were significant, their names are included as coauthors on the research papers and on abstracts (data only for 2018-2019). Names of such undergraduates are in bold type.

Klinger, R., Altberg, G., Greenstein, J., Hwang, J., Serras, S., and Hahn, B., 2019, Young girl with torticollis, Ann. Emerg. Med., 73:e11-e12.

Girdhar, K., Hoffman, G.E., Jiang, Y., Brown, L., Kundakovic, M., Hauberg, M.E., Francoeur, N.J., Wang, Y.C., Shah, H., Kavanagh, D.H., Zharovsky, E., **Jacobov, R., Wiseman, J.R**., Park, R., Johnson, J.S., Kassim, B.S., Sloofman, L., Mattei, E., Weng, Sieberts, S.K., Peters, M.A., Harris, B.T., Lipska, B.K., Sklar, P., Roussos, P.Z., and Akbarian, S., 2018, Cell-specific histone modification maps in the human frontal lobe link schizophrenia risk to the neuronal epigenome, Nat. Neurosci. 21:1126-1136.

Koppel, A., Ranasinghe, O., Navarathna, M., Coors, C., Abeyweera, N., Codipilly, C., and Schanler. R., 2018, Acidic human milk fortification does not enhance probiotic growth in human milk. Poster presentation, Pediatric Academic Societies Meeting, Toronto, Canada, May.

Codipilly, C., **Koppel, A.,** Navarathna, M., Ranasinghe, O., Coors, C., Abeyweera, N., and Schanler, R., 2018, Milk fat globule epidermal growth factor 8 (MFG-E8) in preterm human milk. Poster presentation, Pediatric Academic Societies Meeting, Toronto, Canada, May.

Codipilly, C., Navarathna, M., **Koppel, A**., Brewer, M., Maffei, D., Ranasinghe, O. and Schanler, R., 2018, Detection of milk fat globule epidermal growth factor 8 (MFG-E8) in intestinal secretions of preterm infants. Poster presentation, Pediatric Academic Societies Meeting, Toronto, Canada, May.

Levy L., Kafri R., Malkin D., 2018, mTOR inhibition increases lifespan in Li-Fraumeni Syndrome fibroblasts by positively influencing the DNA damage response, 255th National Meeting of the American Chemical Society, New Orleans, LA, March.

Linfield T., Park H. E., Menon D., Montaner S., 2018, ANGPTL4 promotes lymphangiogenesis in head and neck squamous cell carcinoma, 255th National Meeting of the American Chemical Society, New Orleans, LA, March.
Our students are proactive and enter various competitions, as noted below:

Undergraduate Awards

Elianna Sharvit, Finalist (Feb. 2019), **Born Seekers Fellowship Program, The Scientista Foundation,** submission - "Searching for G-d in the Laboratory"

Michelle Hoch, (December, 2018), **Trachenberg Essay Contest (27th Annual);** "Death in the hands of the Healer," Center for Bioethics, AECOM and Montefiore Health System, Inc.

Off-campus research placements abound, with SCW students obtaining **research internships** during the 2018-2019 academic year at The Rockefeller University, Mount Sinai School of Medicine, and New York University Medical Center. Summers are a prime time for research. In the Summer, 2019 our students have participated in research in Albert Einstein College of Medicine; YU/Bar Ilan Summer Research Program; Stern College for Women (Alayev lab; Drori lab; Vigodner lab); Yeshiva College (Goswami lab); NYU Medical School; Mount Sinai Medical Center; Montefiore Hospital; Dialyze Innovation (biotechnology company); NYU Health Career Opportunity Program; Boca Raton Regional Hos**p**ital; Houston Methodist; Rutgers University; Northwell Hospital; Microsoft Research; Hackensack Hospital; Englewood Hospital; Memorial Sloan-Kettering; National Institute of Allergies and Infectious Diseases; Children's Hospital of Philadelphia; in Israel - Magen David Adom; Shaarei Tzedek Hospital; Weizmann Institute of Science; and Tel Aviv University; and in Panama - Hospital Pacifica Salud.

The Department of Biology has upgraded the infrastructure of the on-campus research laboratories. Beginning in the Summer, 2011, and extending into the Fall semester, the on-campus research laboratory (room 341 of 253 Lexington Avenue) was renovated and modernized through a $100,000 grant from the Elias, Genevieve, and Georgiana Atol Charitable Trust. This expansion and upgrading of the laboratory accounted, in part, for attracting our students to on-campus research opportunities. In the Summer, 2014 and continuing into the Fall, 2014, through a grant of $200,000 from the Selma T. and Jacque Mitrani Foundation, renovations and modernization of the on-campus male infertility research laboratory of Dr. Vigodner (room 347of 253 Lexington Avenue) commenced. Such renovations and modernizations will allow Dr. Vigodner to upgrade her research operation to further provide opportunities for undergraduate research and to further increase her effectiveness in procuring external funding.

Aware of the need to maintain state-of-the-art scientific technology, the Department of Biology constantly upgrades the equipment used in the teaching laboratories and in the on-campus research laboratories. Through the generosity of the Joseph Alexander Foundation, a Beekman-Coulter Z2 Cell Counter and XCell Surelock Mini Cell with XCell II Blot module, used for western blotting, was purchased in the 2016-2016 academic year. During the 2013-2014 academic year the following items were purchased: Sorvall RC6plus centrifuge, Eppendorf mini-centrifuge, Eppendorf refrigerated mini-centrifuge, Millipore water purification system, Evos fluorescent microscope, heat block, water bath, power supplies, and shaker. Funding from grants were directed to the purchase of an environmental chamber for the Evos fluorescent microscope (used for live cell imaging). An inverted microscope with the capacity to photograph living cells was purchased in 2013 for use in the on-campus research laboratory co-occupied by Drs. Schuck and Babich. During the 2011-2012 academic year, the Biology Department purchased two PhotoDoc-It Imaging Systems, to photograph DNA gels, for use in the teaching laboratories and a BioTek Synergy HT Microplate Multimode Microplate Reader for use in research. In the 2010-2011 academic year, other ourchases included a LiCor Odyssey near-infrared imaging system, a Promega 96-well plate dual-injector spectrophotometer and luminometer, a Millipore Q3 water purification system, and a BioRad real-time PCR optical system. The following equipment was purchased within the prior six years: six VIS/UV spectrophotometers, five inverted microscopes, a Nikon TE2000S epifluorescent inverted microscope system with NIS-Elements research imaging software, a Guava EasyCyte benchtop microcytometry system, Protean II vertical gel electrophoresis system and Transblot cell with power supply for use with gels and western blots, a Glomax 20/20 luminometer, a photodocumentation center, and two laminar flow hoods.

To enhance the **laboratory experiences** in the introductory Biology courses, both for Biology majors (Principles of Biology) and for non-majors (Human Biology), in the Summer, 2008, forty brightfield microscopes were purchased. In the Summer, 2009, Moticam microscope cameras, projectors, and screens were installed in the two laboratories in which the major and non-major

introductory biology courses meet. The camera was interfaced with a computer, allowing the microscope image to be projected on the large screen in front of the room. Furthermore, the computer with projector and screen was a valuable addition for instructors who use PowerPoint presentations as part of their lectures. Three thermocyclers, for use in polymerase chain reactions and purchased in the Summer, 2010, are housed in the Sussman laboratory, a state-of-the-art laboratory utilized for the advanced biology courses. Financed through the Alexander Foundation, in Fall, 2016, a Coulter counter was purchased to enhance student laboratory experiences in the courses.
In Summer, 2018, several microscopes were purchased for use in the teaching labs, computers to interface with an ELISA reader (Schuck lab) and a photodocumentation center (Vigodner lab), a nutator, and a shaking water bath (Vigodner lab). In the 2018-2019 academic year, purchases focused on replacing basic, worn-out, equipment, such as micro- pipettors, micro-centrifuge, gel electrophoresis apparatus, hotplate/stirrer, and a balance.

A new requirement put forth by the Biology Department was that in laboratory, with each student required to wear a lab coat. Aside from health and safety, this created a more serious mind-set for the students when in the laboratory.

In the 2018-2019 academic year, the Biology Club organized a series of career workshops for SCW students majoring in Biology. One particularly nice and informative workshop included a panel of SCW graduates from a variety of professions who spoke about their particular fields of interest. Another workshop focused on instructing the proper protocol for formulating a resume and writing a cover letter for summer internship applications. A rather “fun” seminar was “Meet and munch with SCW Biology faculty,” in which the biology faculty discussed their research and courses. The Biology Club held its annual fundraiser to raise awareness about breast cancer and to benefit “Sharsheret.”

Department of Chemistry and Biochemistry

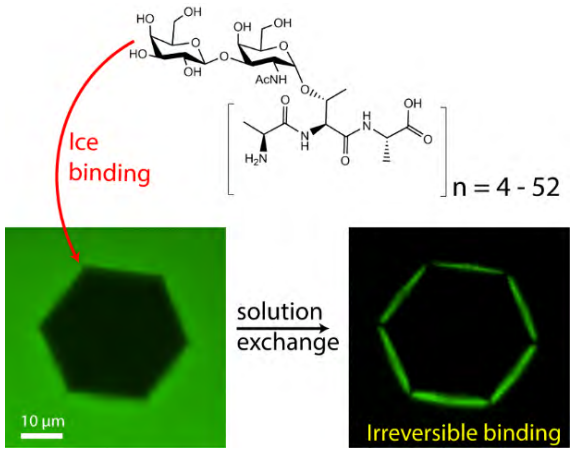
Lora Danley, M.S.; Cecily Dobin, M.S.; Ran Drori, Ph.D; Donald Estes, Ph.D.; Jianfeng Jiang, Ph.D.; Chaya Rapp, Ph.D.; Rosalyn Strauss, Ph.D.

In keeping with the approach to science education at SCW, the Department of Chemistry and Biochemistry offers a series of high level courses, opportunities for undergraduate research, and extracurricular programming to foster an enthusiasm for science and an interest in scientific research.

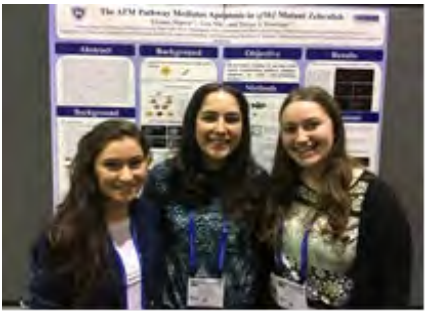
The Department of Chemistry and Biochemistry offers majors in both Chemistry and Biochemistry. Instituted as an official major several years ago, the Biochemistry major attracts students interested in a broad science background, including those that are preparing to attend medical and dental school. Graduates of both majors have gone on to medical, dental, optometry, and law schools, and careers in science education. Several have entered prestigious Ph.D. programs in the biomedical sciences, at the Tri-institutional Weil Cornell/Rockefeller/Sloan Kettering program, Sloan Kettering graduate program, and the Sue Golding graduate division of the Albert Einstein College of Medicine (AECOM).

The courses in our department are continuously being updated to keep pace with current scientific discovery and new technology. In our Honors General Chemistry course, students read articles from current scientific literature related to course content. Courses in analytical chemistry and biochemistry incorporate experiments that are related to the instructors' research interests allowing content to be taught in the context of current, cutting edge, and biologically relevant research. State of the art instrumentation including a nuclear magnetic resonance spectrometer, an automatic titrator, a multimode plate reader, data acquisition software and probes, and molecular modeling software, have been integrated into laboratory courses on all levels so that our students are trained in the use of current laboratory technology. The department also offers a Science Fundamentals course which is popular among students pursuing education or business degrees, and a Chemistry for non-majors course which serves students entering the allied health fields. These courses focus on chemistry as it relates to the world around us and contemporary environmental issues.

The Drori laboratory's main focus is the study of ice-binding proteins (or antifreeze proteins), which aid a variety of organisms to survive in subfreezing temperatures. A unique combination of sensitive temperature control and a fluidic system allows for the cutting-edge capability to study the interaction of molecules with microscopic ice crystals. This advanced instrumentation is coupled with a collaboration with researchers from Canada, the Netherlands and the US, who supplied the purified antifreeze proteins. A recent research paper, published in the Journal of the American Chemical Society, presented the binding mechanosm of antifreeze glycoproteins to ice. During the 2018- 2019 school year, 5 students have been working in the Drori lab, including Tehilla Berger, who recevied the 2018 Kressel award, and Nechama Dembitzer, who recived the best poster award and presented her poster at the national ACS meeting in Orlando. A postdoctoral researcher, Dr. Jinzi Deng, will join the Drori lab at the end of summer 2019.



The department supports extra-curricular activities that enhance student interest and appreciation of chemistry and science in general, both on campus and in the broader community. The Stern College Chemistry Club is a student affiliate of the American Chemistry society and is advised by Don Estes and Chaya Rapp. The club received an Honorable Mention Chapter Award for its 2017-2018 activities from the American Chemical Society. The award was presented at the national ACS meeting in Orlando in Orlando 2019 and the club received a travel grant from the ACS to help defray some of the costs of students attending the conference. In addition, the club was awarded a Community Interactions Grant from the Undergraduate Programs Office of the ACS to conduct an outreach program at a local NYC elementary school.



Elianna Sharvit and Nechama Dembitzer, winners of the Stern College poster competition, present their posters at undergraduate poster session of the 2019 ACS meeting in Orlando, FL. Elana Apfelbaum (right) accompanied the students on the trip.

Nechama Dembitzer accepting the Honorable Mention Award from the ACS in Orlando, FL.

Chemistry Club members at the New York Hall of Science.

Chemistry Club members at an outreach event at a local New York City public school.

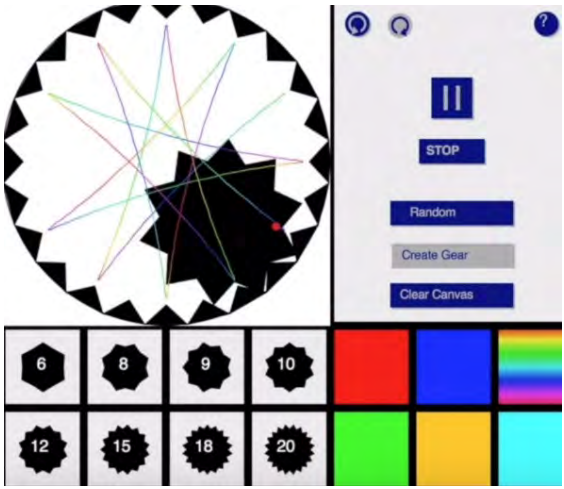
Department of Computer Science

Chair: Alan Broder, Clinical Professor
Joshua Waxman, Assistant Professor
Ari Shamash, Adjunct Instructor
Lawrence Teitelman, Adjunct Instructor

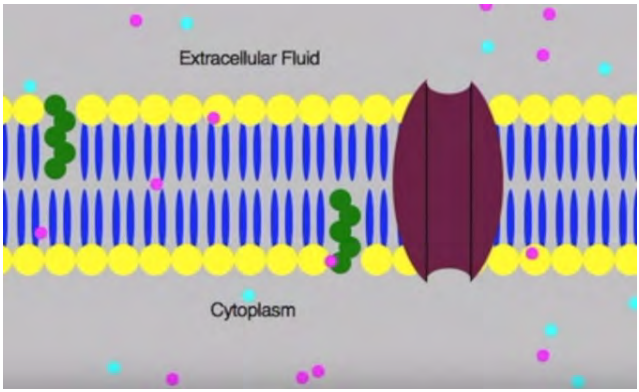
The Computer Science program at Stern College for Women stresses both the practical and theoretical aspects of computing, preparing students for employment in various fields of computer science and to pursue graduate studies. There is a strong emphasis in the department on preparation for challenging jobs in industry – our faculty and adjuncts come from positions of intensive industrial experience and leadership. In addition to covering fundamentals of Computer Science theory and practice, the department strives to help students maximize their portfolios of significant coding projects, via course requirements and through extracurricular activities such as hackathons and internships.

For highlights of a few notable semester capstone projects from our COMP 1300 – Introduction to Computer Science course see the screen shots below, and the video at http://demoreel.sterncs.net/

While these projects seem to be just games, the video demonstrates how much can be accomplished in just a first semester of CS. The semester projects are an inspirational stepping stone to further CS learning, and indeed many of our COMP 1300 students move on to more advanced learning and majoring in Computer Science.



Spirograph Simulator
Tzirliya Plotkin



Simulation of Diffusion Across a Cell Membrane
Tova Narrowe

In the CS degree program, students gain experience with a variety of programming languages including Python, Java, Javascript, R, Go, and C/C++, while learning how to develop applications for Linux, web, and cloud platforms such as Hadoop and Spark.

In 2018, the CS department was the recipient of major private and public grants to build a collaboration lab and technology classrooms for Computer Science students at the Beren campus. The new spaces, to be operational in the Fall of 2019, emulate similar collaboration spaces in top technology companies, including floor-to-ceiling writable and projectable glass walls, flexible furnishings, and large screen displays.

The new Mitrani collaboration lab – Fall 2019
(architect rendering)

Stern's Computer Science program is ideally situated near the heart of Manhattan's "Silicon Alley", convenient to recruiters from major financial and tech employers. Stern Computer Science students have recently been sought and hired for internships and post-graduation employment by premiere employers such as Microsoft, Palantir, Facebook, Goldman Sachs, JPMorgan, UBS, Nomura, and Google.

The department also offers the Professor Thomas Otway Memorial Scholarship for exceptional students who choose Computer Science as their major, established in memory of the beloved Professor.

Students in the department run a chapter of ACM-W, the international Association of Computing Machinery - Women's division. In 2019, Stern ACM-W members ran a "tech Shabbat" bringing together CS students and Stern faculty for community building and tech-themed Torah learning. Stern students are key members of the operation of the city-wide Invent YU hackathon, and have also been participants in the nationwide jHacks hackathon held at the University of Maryland Hillel.

The ACM-W chapter also offers frequent events throughout the year, such as guest lecturers by computer scientists from prominent companies, resume workshops, networking events, and coding practice sessions. Stern CS students are committed to helping other women develop as computer scientists, and frequently serve as peer tutors and teaching assistants in the department, they volunteer at local high schools, and are leaders of high school tech events.

High-achieving students in the S Daniel Abraham honors program will also benefit from an enriched CS educational experience. As part of the honors program, students complete an honors research program and thesis with the mentorship of a CS department faculty member.

Department of Mathematical Sciences

Faculty: Edward Belbruno, Ph.D.; Wenxiong Chen, Ph.D.; Michael Dalezman, Ph.D.; Marian Gidea, Ph.D. (Chair); Antonella Marini, Ph.D.; Morton Lowengrub, Ph.D.; Pablo Roldan, Ph.D.
Visiting Professor: Mina Teicher, PhD, Bar Ilan University.
Affiliate, Quantitative Finance: Yuri Katz, Ph.D.
Affiliates, Physics: Neer Asherie, Ph.D.; Sergey Buldyrev, Ph.D.; Gabriel Cwillich, Ph.D.; Mark Edelman, Ph.D.; Emil Prodan, Ph.D.; Lea Santos, Ph.D., Fredy Zypman, Ph.D.

Mathematics is crucial to the advancement of all other disciplines: biology, medicine, astronomy, robotics, communications, finance, security, technology, and computer science. Students majoring in mathematics enjoy a variety of job opportunities, such as actuaries, computer scientists, quantitative analysts, researchers, teachers and academics. Many other fields that require applied science and technology frequently hire people with a strong mathematical background. This versatility lends itself to a job seeker's market, and the result is a high average annual salary. Professions in mathematics top the best “jobs of tomorrow", in a ranking based on hiring outlook, stress, environment, and income.

The Stern College Department of Mathematical Sciences is leading the way in Yeshiva University’s efforts prepare its students for the marketplace of tomorrow. Our mathematics courses provide students with key knowledge in theoretical and applied mathematics, and help them enhance their analytical abilities and heighten their creative potential. Students in the mathematics program have the opportunity to choose a concentration in Pre-Actuarial/Financial Mathematics. Advanced coursework is focused on modern mathematics, including differential equations, probability and statistics, mathematics of finance, time series, scientific computing, data analysis, network science, mathematical biology, and chaos theory. In addition to coursework, students may participate in research projects focuses on specific areas of practice, or industrial applications, under the guidance of highly active research faculty or industry mentors. There is variety of enrichment activities organized at Stern College, including the math club “No Limits”, Mathematical Colloquia, and citywide seminars in Dynamical Systems and/or Mathematical Physics, which include speakers from around the world.

In addition to an undergraduate degree, the department offers an MA program, as well as a PhD program in Mathematics. An excellent option for math students is the BA/MA program, where qualified undergraduate students can take math graduate classes, and receive up to 12 credit hours of graduate courses towards the BA degree.

Our courses are taught by distinguished faculty with a tradition of excellence in teaching, mentoring, and research. Below are some highlights on our faculty research:

- Prof. Belbruno is the recipient of Humboldt Research Award in 2017, awarded by the Alexander von Humboldt Stiftung/foundation of Germany for lifetime achievements. He designed space missions for NASA and other space agencies, and he created new mathematical models in cosmology, such as for the Big Bang and for black holes.
- Prof. Chen has made significant advances in the theory of nonlinear elliptic partial differential equations and geometric analysis.
- Prof. Dalezman has done research in the theory of prime numbers.
- Prof. Gidea provided a solution to a long-standing open problem in mathematics, the Arnold diffusion conjecture.
- Prof. Katz employs methods rooted in the physics of complex non-equilibrium systems to perform credit risk modeling.
- Prof. Lowengrub is one of the fathers of the WIYN Observatory (Arizona), and a former vice-president of the Association of Universities for Research in Astronomy (AURA). The asteroid 4045 Lowengrub is named after him.
- In the scientific literature, the standard boundary conditions for gauge-invariant equations are called “Marini conditions” in honor of Prof. Marini’s research in this area.
- Prof. Roldan developed a new mathematical theory to explain the existence of “Kirkwood gaps'' in the Main Asteroid belt.
- Prof. Mina Teicher is an internationally renowned scientist, with a broad expertise in algebraic geometry, algebra, applied mathematics, and neuroscience. She is a faculty in the Department of Mathematics and in the Gonda Brain Research Center at Bar Ilan University (Tel Aviv), and the director of the Emmy Noether Institute for Mathematics. She is a VP of International Commission for Mathematical Instruction, a former VP for Research and Development at Bar-Ilan, a former Chief Scientist, and a former chair of USA-Israel Binational Science Foundation.
- Several members of the faculty have written textbooks and monographs in their fields.
- Faculty research has been funded by National Science Foundations, National Aeronautics and Space Administration, National Institute of Health, National Cancer Institute, Simons Foundation, Sloan Foundation, Boeing Corporation, etc.

- Faculty members are frequently invited to lectures at major conferences and workshop in the US as well as other counties in America, Europe, Asia, and Africa.

Department of Physics

Emil Prodan, Ph.D., Professor
Lea Ferreira dos Santos, Ph.D., Professor
Mark Edelman, Ph.D., Clinical Associate Professor

The commitment to the "research and discovery approach" to education is a hallmark of Physics Department at Stern College for Women (SCW). Talented students aspire to a degree in physics due to the opportunities that have been created in the department over the years. All faculties pursue an active research agenda, being constantly invited to present their findings in conferences and workshop, and their articles being published in prestigious professional journals. Their works have been highlighted in several occasions and awarded with major research grants. The exposure to such first class science and the atmosphere of discoveries play a major role for undergraduate students shaping their future career plans.

Stern College students who are interested in physics, physical sciences or engineering have an opportunity to actively participate in faculty research. The Physics Department is always seeking new students interested in doing first class research. They can choose from a variety of projects and work under the guidance of the physics department members. Stern physics students undertake research during the summers and throughout the year. They are coauthors in refereed articles published in physics, chemistry, and materials science journals, and they present their results at national and international science meetings.

Below are the highlights of our Physics Department:

External funding

01/01/2016-12/31/2018
Sponsor: National Science Foundation
Project Title: Physics of Interacting Quantum Systems with Phase Transitions" (DMR - 1603418)
Role: Principal Investigator
Amount: US$285,000

01/06/2016-01/06/2019
Sponsor: Keck Foundation
Project Title: Engineering New Materials Based on Topological Phonon Edge Modes
Role: Principal Investigator
Amount: US$ 1,000,000

01/07/2011-01/07/2017
Sponsor: National Science Foundation

Project Title: CAREER: Disorder and Interaction Effects in Topological Insulators (DMR 1056168)
Role: Principal Investigator
Amount: US$ 425,000

Postdocs supervised
Yafis Barlas (by Emil Prodan)
Mauro Schiulaz (by Lea F. Santos)
Jianfeng Wang (by Mark Edelman)

Students involved in research
Esther Vidal (summer 2018)
Aviva Shooman (spring and summer 2018)
Elisheva Muskat (2017-2018)
Shira Siegel (honor thesis, 2017-2018)
Tamar Felman (honor thesis, 2016-2017)
Jonathan Karp (Kressel + honor thesis, 2016-2017)

(a) Dr. Mark Edelman

Peer-reviewed articles
1. M. Edelman, "On Stability of Fixed Points and Chaos in Fractional Systems", Chaos, **28,** 023112 (2018).

Book edited
1. M. Edelman, E. Macau, and M. A. F. Sanjuan (eds.), *Chaotic, Fractional, and Complex Dynamics: New Insights and Perspectives*; *Series: Understanding Complex Systems*, Springer, eBook, 2018, http://www.springer.com/us/book/9783319681085

Book Chapters
1. M. Edelman, E. Macau, and M. A. F. Sanjuan, "New Insights and Perspectives in Chaotic,Fractional, and Complex Dynamics", in: M. Edelman, E. Macau, and M. A. F. Sanjuan (eds.): *Chaotic, Fractional, and Complex Dynamics: New Insights and Perspec-tives; Series: Understanding Complex Systems*, 1–7, Springer, eBook, 2018.
2. M. Edelman, "Universality in Systems with Power-Law Memory and Fractional Dynamics", in: M. Edelman, E. Macau, and M. A. F. Sanjuan (eds.): *Chaotic, Fractional, and Complex Dynamics: New Insights and Perspectives; Series: Understanding Complex Systems*, 147–171, Springer, eBook, 2018.
3. M. Edelman, "On nonlinear fractional maps: Nonlinear maps with power-law memory", *Chaos, Complexity and Transport Proceedings of the CCT '15, Conference on Chaos, Complexity and Transport 2015, Marseilles, France*, 1 – 5 June 2015; Xavier Leoncini, Christophe Eloy, and Gwenn Boedec (Editors), pp. 119-130, World Scientific, Singapore, 2017.

On-line:
http://www.worldscientific.com/doi/abs/10.1142/9789813202740_fmatter
4. M. Edelman, "Maps with power-law memory: direct introduction and Eulerian numbers, fractional maps, and fractional difference maps, in: A. Kochubei and Y. Luchko (eds.), *Handbook of Fractional Calculus with Applications, Volume 2, Theory*,
De Gruyter, Berlin, 2018 (accepted).
5. M. Edelman, "Dynamics of nonlinear systems with power-law memory" in V.E. Tarasov (ed.), *Handbook of Fractional Calculus with Applications, Volume 2, Applications in Physics*, De Gruyter, Berlin, 2018 (accepted).

Invited talks

1. July 3-5, 2017; **International Conference on Nonlinear Dynamics and Complexity; (NDC 2017),** ŁÓDŹ, POLAND (http://www.ndc17.p.lodz.pl/), **Invited talk** "New face of universality in nonlinear fractional dynamics".

2. May 2017, **Invited lecture** "Nonlinear Fractional dynamics" at School of Control Science and Engineering and Power Electronic Energy-saving Technology & Equipment Engineering Research Center of Education Ministry, Shandong University, Jinan, China.

Editorial Boards

1. Fractional Calculus and Applied Analysis
2. Journal of Applied Nonlinear Dynamics.

(b) Prof. Emil Prodan

Peer-reviewed articles

1. Y. Eisenberg, Y. Barlas, E. Prodan, Valley-Chern Effect with LC-Resonators: A Modular Platform, Phys. Rev.Applied **11**, 044077 (2019).
2. J. Kellendonk, E. Prodan, Bulk-Boundary Principle in Sturmian Kohmoto Type Models, Annals of Henri Poincare **20**, 2039-2070 (2019).
3. X. Ni, K. Chen, M. Weiner, D. J. Apigo, C. Prodan, A. Alù, E. Prodan, A. B. Khanikaev, Observation of Hofstadter Butterfly and Topological Edge States in Reconfigurable Quasi-Periodic Acoustic Crystals, Commun. Physics **2**, 55 (2019).
4. L. Zhu, E. Prodan, K. H. Ahn, Flat Energy Bands within Antiphase and Twin Boundaries and at Open Edges in Topological Materials, Phys. Rev. B **99**, 041117 (2019).
5. D. J. Apigo, W. Cheng, K. F. Dobiszewski, E. Prodan, C. Prodan, Observation of Topological Edge Modes in a Quasi-Periodic Acoustic Waveguide, Phys. Rev. Lett. **122**, 095501 (2019).
6. E. Prodan, Y. Shmalo, The K-Theoretic Bulk-Boundary Principle for Dynamically Patterned Resonators, Journal of Geometry and Physics **135**, 135-171 (2019).

7. Y. Barlas, E. Prodan, Topological Classification Table Implemented with Passive Classical Meta-Materials, Phys. Rev. B **98**, 094310 (2018).
8. D. J. Apigo, K. Qian, C. Prodan, E. Prodan, Topological Edge Modes by Smart Patterning, Phys. Rev. Materials **2**, 124203 (2018).
9. K. Qian, D. J. Apigo, C. Prodan, Y. Barlas, E. Prodan, Topology of Valley Chern Effect, Phys. Rev. B **98**, 155138 (2018).
10. C. Bourne, E. Prodan, Non-Commutative Chern Numbers for Generic Aperiodic Discrete Systems, J. Phys. A: Math. & Theor. **51**, 235202 (2018).
11. D. J. Apigo, A. Kanwa, J. Palmier, K. Dobiszewsky, R. C. Farro, G. A. Thomas, E. Prodan, C. Prodan, Water-Wave Crystals: An Experimental Platform, Scientific Reports **8**, 3324 (2018).
12. T. Kuhne, E. Prodan, Disordered Crystals form First Principles I: Quantifying the Configuration Space, Annals of Physics **391**, 120-149 (2018).

Book

E. Prodan, A Computational Non-Commutative Geometry Program for Disordered Topological Insulators, Springer Briefs in Mathematical Physics, Springer, 2017.
(http://www.springer.com/us/book/9783319550220).

Organized conference

Workshop: Interacting Topological Phases, Banff International Research Station, Oaxaca (Mexico), June 2019.

Invited talks

1. 'Pushing Index Theorems into the Sobolev,' lecture for the Mathematical Picture Language, Harvard Univ., April 2019.
2. 'New directions in materials science guided by research in operator algebras,' lecture for conference 'Operator Algebras in 21st Century,' Univ. of Pennsylvania, March 2019.
3. 'Braiding Majorana-like Modes in Classical Meta-Materials,' Physics Colloquium, Queens College of CUNY system, March 2019.
4. 'K-Theory as a Tool in Spectral Theory,' lecture for the Mathematical Physics Seminar, Yeshiva U., March 2019.
5. 'Physics and Applications of Topological Phases: How KK-Theory can Help,' lecture for the program 'Bivariant K-Theory in Geometry and Physics,' Erwin Schroedinger Institute, Vienna (Austria), November 2018.
6. 'Braiding Majorana Excitations for Quantum Computing,' lecture for the 5th International Workshop on Quantum Coherence, Control and Computing, Stevens Institute, Hoboken (USA), October 2018.
7. 'Topological Mechanics: Is there a limit?,' lecture for the "Kick-off workshop of the annual program on topological aspects of condensed matter", CMSA, Harvard University, Aug. 2018.
8. 'Dynamically Generated Patterns: Applications to Meta-Materials,' lecture for the workshop 'Progress in the Mathematics of Topological States of Matter,' Tohoku University, Sendai (Japan), Aug. 2018.

9. 'Dynamically Generated Patterns,' lecture for the workshop Solid Math 2018, McGill University, Montreal (Canada), Aug. 2018.
10. 'Topological Meta-Materials: Design Principles and Examples,' lecture for the international conference ETOPIM11, Krakow (Poland), July 2018.
11. 'Opportunities and Challenges with Topological Mechanical Systems,' lecture for the ARO workshop "Meta-Structures: Dynamics, Topology and Related Opportunities," Georgia Tech (USA), May 2018.
12. 'Topological Patterns,' lecture for the workshop "Topological Protection in Messy Matter," Georgia Tech (USA), May 2018.
13. 'Fun with Patterns,' lecture for the Mathematical Physics Seminar, Yeshiva University (New York, USA), May 2018.
14. 'Dynamically Patterned Resonators,' colloquium for the Institute of Physics, Universidad Autónoma de San Luis Potosí (Mexico), April 2018
15. 'Aperiodic Topological Systems,' lecture for the Mathematical Physics Seminar, LaGuardia College (USA), March 2018.
16. 'Charge Transport in Thermally Disordered Crystals,' lecture at a workshop at Inst. for Mathematics and its Applications (Minneapolis, USA), March 2018.

(c) Prof. Lea F. Santos

Peer-reviewed articles

1. S Lerma-Hernández, D Villaseñor, MA Bastarrachea-Magnani, EJ Torres-Herrera, LF Santos, JG Hirsch, "*Dynamical signatures of quantum chaos and relaxation timescales in a spin-boson system*", [arXiv:1905.03253]
2. E. J. Torres-Herrera, JA Méndez-Bermúdez, L. F. Santos, "Level Repulsion and Dynamics in the Finite One-Dimensional Anderson Model", [arXiv: 1904.11989]
3. M Niknam, LF Santos, DG Cory, "*Sensitivity of quantum information to environment perturbations measured with the out-of-time-order correlation function*", [arXiv:1808.04375]
4. F Borgonovi, FM Izrailev, LF Santos, *"Timescales in the quench dynamics of many-body quantum systems: Participation ratio vs out-of-time ordered correlator",* Physical Review E **99**, 052143 (2019)
5. M. Schiulaz, E. J. Torres-Herrera, L. F. Santos, *"Thouless and relaxation time scales in many-body quantum systems",* Physical Review B **99**, 174313 (2019)
6. J Chávez-Carlos, B López-del-Carpio, MA Bastarrachea-Magnani, Pavel Stránský, Sergio Lerma-Hernández, Lea F Santos, Jorge G Hirsch, *"Quantum and classical Lyapunov exponents in atom-field interaction systems"* Physical Review Letters **122**, 024101 (2019)

7. F. Borgonovi, F. M. Izrailev, L. F. Santos, *"Exponentially fast dynamics in chaotic many-body systems"* Physical Review E **99**, 010101 (R) (2019)
8. E. J. Torres-Herrera, L. F. Santos, *Signatures of chaos and thermalization in the dynamics of many-body quantum systems* European Physical Journal Special Topics **227**, 1897 (2019)
9. M. A. Garcia-March, S. van Frank, M. Bonneau, J. Schmiedmayer, M. Lewenstein, and L. F. Santos, *Relaxation, chaos, and thermalization in a three-mode many-body model of a BEC* New Journal of Physics **20**, 113039 (2018)
10. M. Schiulaz, M. Távora, L. F. Santos, *"From few- to many-body quantum systems"* Quantum Science and Technology **3**, 044006 (2018)
11. R. Mondaini, K. Mallayya, L. F. Santos, M. Rigol, *Comment on "Systematic Construction of Counterexamples to the Eigenstate Thermalization Hypothesis"* Physical Review Letters **121**, 038901 (2018)
12. S. Lerma-Hernández, J. Chávez-Carlos, M. A. Bastarrachea-Magnani, L. F. Santos, J. G. Hirsch, *"Analytical description of the survival probability of coherent states in regular regimes"* Journal of Physics A **51**, 475302 (2018)
13. del Campo, J. M. Vilaplana, L. F. Santos, J Sonner, *"Decay of a Thermofield-Double State in Chaotic Quantum Systems"* European Physical Journal Special Topics **227**, 247 (2018)
14. E. J. Torres-Herrera, Antonio M. García-García, and Lea F. Santos, *"Generic dynamical features of quenched interacting quantum systems: Survival probability, density imbalance, and out-of-time-ordered correlator,"* Physical Review B **97**, 060303(R) (2018).

Proceeding article

- L. F. Santos and F. Pérez-Bernal, *Excited-state quantum phase transitions in systems with many interacting spins-1/2* in **AIP Conference Proceedings,** (2019)

Book Chapters

- L. F. Santos and E. J. Torres-Herrera
  Book Chapter: *"Nonequilibrium many-body quantum dynamics: from full random matrices to real systems",*
  [https://arxiv.org/abs/1803.06012]in **Thermodynamics in the Quantum Regime - Fundamental Aspects and New Directions** Editors Felix Binder, Luis A. Correa, Christian Gogolin, Janet Anders, and Gerardo Adesso
- L. F. Santos and E. J. Torres-Herrera
  Book Chapter: *"Nonequilibrium quantum dynamics of many-body systems",* [https://arxiv.org/abs/1706.02031]
  in **Chaotic, Fractional, and Complex Dynamics: New Insights and Perspectives** Editors M. Edelman, E. E. N. Macau, M. A. F. Sanjuan (Springer, 2018)

Organized conference
Universality and ergodicity in quantum many-body systems
(Simons Center, Stony Brook, NY, USA Aug/26-Oct/18, 2019)

Invited talks
1. Thermalization, Many-Body-Localization and Generalized Hydrodynamics (ICTS, Bengaluru, India, Nov/11-29)
2. Workshop Fundamental Aspects of Statistical Mechanics and the Emergence of
   Thermodynamics in Non-Equilibrium Systems (Delmenhorst, Germany Sep/23-26, 2019)
3. Conference: Out-of-equilibrium systems with long-range interactions (Natal, Brazil, Jul/15-19, 2019)
4. FQMT 2019: Frontiers of Quantum and Mesoscopic Thermodynamics (Prague, Czech Republic, Jul 15-19, 2019)
5. Seminar at Federal University of Rio Grande do Sul (Porto Alegre, RS, Brazil, May/29, 2019)
6. Workshop on "Quantum Dynamics and Control beyond Simple Models and Approximations (CUNY Graduate Center, NY, May/10, 2019)
7. Seminar at Northeastern University (Boston, MA, USA, Apr/03, 2019)
8. II Workshop on Quantum Information and Thermodynamics (Natal, Brazil, Mar/11-22, 2019)
9. Winter Program: 'Many-Body Quantum Chaos' (Aspen, CO, USA, Mar/10-15, 2019)
10. Conference on Nonequilibrium and transport in many-body systems (Rehovot, Israel, Jan/20-24, 2019)
11. Workshop: Equilibration and Thermalization in Finite Quantum Systems (UNAM, Mexico, Jan/15-18, 2019)
12. Workshop on Ergodicity breaking in many body systems, Natal, Brazil (October 2018)
13. Workshop on Out of equilibrium dynamics of many-body systems, Osnabrück, Germany (Sept. 24-26, 2018)
14. International Workshop Disordered Systems: From Localization to Thermalization and Topology, South Korea (Sep. 3-7, 2018)
15. Chirikov Conference, Cuernavaca, Mexico (June 2018)
16. 9th international workshop: Quantum Phase Transitions in Nuclei and Many-body Systems, Padova, Italy, (May 2018)
17. Xi'an Jiaotong University, China (May 2018)
18. Max Planck Institute, Dresden, Germany (March 2018)
19. Workshop on Quantum Many-Body Systems Far from Equilibrium (Stellenbosch, South Africa, Mar. 12-16, 2018)

Postdoc Dr. Schiulaz's presentations:
- APS March Meeting, Boston (March 2019) [2 talks, 1 invited]
- Physical Review, Long Island (May 2019) [invited]
- Trieste, Italy (September, 2018)

Student Aviva Shooman's presentations:

- Static and dynamic properties of a one-dimensional spin-1/2 system, APS March Meeting, Boston, MA, March (oral presentation)
- Static and dynamic properties of a one-dimensional spin-1/2 system, Scientista Symposium, Boston, MA, March (poster presentation)

Department of Psychology

Faculty: Joshua Bacon, Ph.D.; Lisa Chalik, Ph.D.; Terry DiLorenzo, Ph.D. (Chair); Rachel Ebner, Ph.D.; Rebecca Greif, Ph.D.

As a discipline, Psychology is generally categorized as a Social Science together with other fields such as Social Work, Political Science, Economics, and Sociology. However, scientific methodology and empirical research have always been a critical component of the coursework and extra-curricular opportunities offered by our department. Experimental Psychology, as a prerequisite for the majority of other courses offered, highlights the fundamental importance that we place on understanding the subject matter of psychology in the context of rigorous empirical analysis, research methodology, and scientific thinking. The Research Seminar, a course taken by psychology majors who are interested in pursuing a doctorate in Psychology, provides students with research opportunities and classroom instruction that advance their understanding of the application of research methodology to a "real world" setting. Some courses such as the Seminar in Intergroup Cognition, the Seminar in Moral Psychology, Cognition, Learning, and Psychobiology are rooted in the tradition of research and easily fit into the Science framework. Many other courses such as Social Psychology, Developmental Psychology, Personality, and Abnormal Psychology are brought into the arena of Science by faculty who are grounded in scientific methodology and all have active research programs.

In addition to the general psychology major, the department also offers a specialty track in Behavioral Neuroscience This Behavioral Neuroscience track option for Psychology majors provides a focused education to students who are interested in the biology behind human and animal behavior. In addition to the core courses that are required of all majors, further requirements and electives come from critical courses in Neuroscience, such as Cognitive Neuroscience, Behavioral Neuroendocrinology, and a Neurobiology lecture and lab.

Students who are planning to apply to Ph.D. or Psy.D. programs in Psychology or to pursue careers in other health-related fields such as Physical, Occupational, or Speech Therapy, are encouraged to become actively engaged in research. Students have gained invaluable experience outside the classroom by learning about the fundamental role of research in the theory and practice of psychology by working with faculty members in projects off-campus such as with Dr Joshua Bacon in the M.S. Care Center at NYU. On campus, students have worked on research projects with Dr. Terry DiLorenzo focusing on health-related attitudes and cognitions and their relations to health behaviors and in Dr. Lisa Chalik's Developing Minds lab which investigates how children categorize people into social groups and the, inferences they make on the basis of social group membership . Many of the students who

conducted research with our faculty have coauthored presentations at both national and international conferences.

For students whose interests lie in areas outside of those of the department, opportunities are available in a number of academic, hospital, and clinical settings. In this case, a faculty member may serve as a supervisor to maintain continuity of the student's experience as an integrated part of her program in psychology. Students engaged in research are encouraged to present their work at university-sponsored events and other professional meetings.

Below, we introduce the members of the Psychology Department and we look forward to the continued contributions of the Behavioral Sciences to Women in Science.

Dr. Joshua Bacon received his Ph.D. from NYU in 1976. During this time, he also conducted research at Swarthmore College with Dr. Hans Wallach, one of the last remaining students of Wolfgang Kohler, the founder of Gestalt Psychology. In 1976, Dr. Bacon obtained a position as Assistant Professor at Tufts University in Boston and received tenure in 1984. At that time, he was recruited by Yeshiva University and joined the Department of Psychology in 1984. He teaches basic courses in Experimental Psychology and Cognition, as well as the Cognitive Neuroscience course that is a basic requirement for the Behavioral Neuroscience track. Dr. Bacon's area of research is perception and cognition and, in particular, cognitive impairment and rehabilitation in patients with Multiple Sclerosis. He holds a position of Research Associate Professor in the Department of Neurology at the NYU Medical School and is a member of the clinical and research team in the Multiple Sclerosis Care Center of NYUHJD. He is currently working on a cognitive rehabilitation program for MS patients with cognitive impairments and is also the principle investigator of a project to develop a diagnostic battery that will measure subtle cognitive impairments that may emerge in the early stages of MS. Some of his recent studies have looked at the correlation between performance on one of the behavioral tests of cross hemisphere processing he developed and atrophy of the corpus callosum as seen on MRI scans. Undergraduate students from Stern College have been and continue to be involved in this research and have been coauthors on a number of poster presentations at conferences of the Academy of Neurology and of the Multiple Sclerosis Consortium.

Dr. Lisa Chalik received her Ph.D. in Psychology in 2016 from New York University, where she conducted research in the Conceptual Development and Social Cognition Lab and completed a concentration in Developmental Science. She then completed a postdoctoral fellowship at Yale University, where she worked in the Social Cognitive Development Lab and the Infant Cognition Center. In the Fall of 2018, she started as an Assistant Professor at Stern College for Women, where she teaches courses in Psychology and Development. She also founded and directs the Developing Minds Lab, the first ever psychology research lab on the SCW campus, where she mentors students who wish to receive first-hand experience conducting research in Developmental Psychology. Dr. Chalik's research area is social cognitive

development; she focuses on the abstract theories that children build and rely upon as they navigate the social world. Specifically, she investigates how children learn to organize the people around them into social categories, and how they make inferences about people on the basis of social category membership. She also studies the implications of social categorization for moral evaluation. She has published her findings in a number of top Psychology journals and regularly presents at professional conferences, such as the Society for Research in Child Development and the Cognitive Development Society.

Dr. Terry DiLorenzo received a B.A. in psychology from Rutgers University and a Ph.D. in Health Psychology from Ferkauf Graduate School of Psychology of Yeshiva University. She completed a postdoctoral fellowship at Memorial Sloan-Kettering Cancer Center and then was the Director of Research of the Multiple Sclerosis Comprehensive Care Center of New York Medical College until she joined the Psychology Department of Stern College for Women in 1999. Since joining the Department, Dr. DiLorenzo has conducted several studies examining health-related attitudes and cognitions and their relations to health behaviors. Dr. DiLorenzo has also conducted research on the psychometric properties of scales to assess mood and attitudes toward seeking health care. Dr. DiLorenzo also has an interest in sexual health behaviors and has completed a study on sexual health practices in Orthodox Jewish women. Dr. DiLorenzo has published her findings in articles in peer-reviewed journals and has presented at many professional meetings. In addition to her own research, Dr. DiLorenzo has mentored several honors students whose projects have been presented at professional meetings as well. Dr. DiLorenzo teaches several advanced courses including Human Sexuality, the Honor's Psychology Research Seminar, and Introduction to Public Health, in addition to Abnormal and Social Psychology. Dr. DiLorenzo also coordinates the recently developed Public Health Minor at Stern College.

Dr. Rachel Ebner received a Ph.D. in Educational Psychology from the CUNY Graduate Center, where she concentrated in Learning, Development, and Instruction. She also earned an Ed.M. in Prevention Science and Practice from the Harvard Graduate School of Education and an M.A. in Developmental Psychology from Columbia University's Teachers College. Her postdoctoral research has focused on devising and implementing methods to help students self-regulate their learning, especially when learning online. She has taught a variety of courses on child & adolescent development and educational psychology. In addition to teaching at Stern, she also serves as Yeshiva University's Director of Student Learning Assessment. She works with faculty and administrators on developing and supporting their programmatic learning assessment activities.

Dr. Rebecca Greif received a B.A. in psychology from Duke University and a Psy.D. in clinical psychology from the Rutgers Graduate School of Applied and Professional Psychology. She completed a postdoctoral fellowship at the Mount Sinai Eating and Weight Disorders Program, where she is an assistant professor. Dr. Greif's clinical expertise centers on the use of evidence-based

treatments, in particular cognitive behavior therapy and dialectical behavior therapy, for adults with mood disorders, anxiety disorders, and eating disorders. She currently maintains a private practice for adults in Manhattan. Dr. Greif's research interests focus on the advancement and dissemination of empirically supported treatments. Dr. Greif was previously a co-investigator on two NIH clinical research trials which examined the use of a smartphone application to augment treatment for individuals with binge eating disorder and bulimia nervosa. She is currently a co-investigator on an NIH clinical trial which tests a neurobiological model of food avoidance in anorexia nervosa and examines the efficacy of a novel treatment targeting disgust among adolescents with this type of eating disorder. In 2009 Dr. Greif received the Academy for Eating Disorders Early Career Investigator Award and in 2012 she was awarded an Aaron T. Beck Scholarship for Cognitive Therapy. Dr. Greif will begin her position as an assistant professor at Stern College the Fall of 2018. She will be teaching several courses in the undergraduate psychology department including introduction to psychology, abnormal psychology, and introduction to clinical psychology.

Department of Speech - Language Pathology/Audiology

Chair: Elizabeth A. Rosenzweig MS CCC-SLP LSLS Cert. AVT
Neva Goldstein Hellman MS CCC-SLP
Susan Wilson MS CCC-SLP
Sydney Horn-Klein MS CCC-A
Jane Auriemma AuD CCC-A
Ashley Small MS CCC-SLP

The mission of the Department of Speech-Language Pathology/Audiology (SPAU) is to prepare students for admission to advanced graduate programs in the fields of Speech-Language Pathology and Audiology. Through coursework and clinical observation, students acquire knowledge of the anatomy and physiology of the speech and hearing mechanism, typical and atypical development of speech, language, hearing, and swallowing, and (re)habilitation of disorders thereof. Graduates of the SPAU Department are equipped with the foundational knowledge to become clinician-scientists who provide compassionate, evidence-based care to people with communication, hearing, and swallowing disorders and their families.

The SPAU course sequence begins with Introduction to Communication Disorders in the Spring semester of the student's sophomore year, and courses continue in a relatively fixed progression to ensure that students both acquire the foundational knowledge before moving on to advanced study and meet all of the requirements set forth by the American Speech-Language Hearing Association (ASHA) for eligibility for admission to graduate programs. Students in the SPAU department benefit from expert instruction by professors who are also practicing clinicians, allowing for the infusion of case studies and real-life examples into their coursework.

Outside of the classroom, students have many opportunities to enhance their learning. The student-let SPAU Club brings a variety of speakers to campus, helps students prepare for graduate school admission, and organizes both social and philanthropic opportunities. The students also write, edit, and publish an annual Speech and Hearing Journal. Past articles have included topics such as autism, bilingual language learning, stuttering, hearing loss, and more.

We are proud of our students' success both inside and outside of the classroom. Several of our students have been awarded Ben Gurion University summer fellowships, and have spent their summers in Israel working in speech, language, and hearing research labs. Our students have been accepted to many high-caliber graduate programs, often with academic scholarships.

Our graduates have matriculated to both speech-language pathology Master's programs and clinical doctorate programs in audiology at institutions such as: Yeshiva University, Queens College, Lehman College, Touro College, Brooklyn College, Montclair University, University of San Diego/San Diego State University, Towson University, and others.

The Anne Scheiber Fellowship Program

The Anne Scheiber Fellowship Program provides scholarship support to Stern College undergraduates, as well as graduates, pursing their advanced training at the Albert Einstein College of Medicine. The program, established by Ms. Scheiber through a twenty two million dollar bequest, seeks to support high achieving women with financial need to realize their academic and professional goals. Stern College graduates who attend the University's Albert Einstein College of Medicine may apply for awards up to full tuition for their four years of medical training. We proudly salute the Anne Scheiber Fellows who are fulfilling Ms. Scheiber's dream:

Chaya Abelow
Agnes Nathalie Abitol
Nechama Ackerman
Grace Aharon
Diane Algava
Ariella Applebaum
Kayla Applebaum
Yael Arshadnia
Abigail Atlas
Miriam Ausubel
Rachel Aviv
Deena Avner
Tamar Belsh
Nomi Ben-Zvi
Abigail Bergman
Deena Blanchard
Rachel Blinick
Yael Boyarsky
Zahava (Nilly) Brodt
Faigy Burekhovich
Aviva Cantor
Tzipa Chaim
Aliza Charlop
Esti Charlop
Emily Chase
Elana Clark
Barrie Cohen
Davida Cohen
Michelle Cohen
Sarit Cohen
Jennifer Deluty
Ellen Dinerman
Nechama Drefus
Danielle Dubin
Batya Edelman
Esti Feder
Abigail Feldman
Tova Fischer
Rose Fluss
Aliza Forman
Rena Frankel
Tamara Freiden
Ahuva Freilich
Briana Friedman
Caryn Gamss
Eden Gelman
Julie Gilbert
Avigayil Ginsberg
Aviva Ginsburg
Ariella Glueck
Elizabeth Goldberger
Tova Goldstein
Dina Golfeiz
Sharon Gordon
Reena Gottesman
Rachel Gozland
Jessica Gross
Rebecca Gross
Michelle Haimowitz
Orli Haken
Rebecca Herskovitz
Batya Hertzberg
Ariella Hollander
Wendy Hosinking
Tsipora Huisman
Julia Josowitz
Chava Kahn
Elisa Karp
Chava Kaufman
Shira Kaye
Rachel Kirshenbaum
Miriam Klahr
Hadassah Klerman
Michelle Kohansieh
Adira Koppel
Lea Kozirovsky
Aimee Krausz
Malka Krupka
Yosefa Lerner
Rikah Lerer
Elisheva Levine
Elana Levy
Emily Liebling
Elizabeth Lobell
Shira Marder
Yael (Jessica) Mayer
Alexandra Michalowski
Rachel Mirsky
Esther Mizrachi Sara Mizrachi
Rachel Ahuva Motechin
Ahava Muskat
Ariella Nadler
Sarah Nattel
Tova Niderberg
Helen Nissim
Saran Noble
Lily Ottensoser
Chana Gila Ovitz
Chaya Pinson
Yardanna Platt
Tehilla Raviv
Yael Raymon
Shuli Roditi-Kulak
Shira Roszler
Amanda Rubin

Miriam Rubin-Norowitz
Rachel Rubinstein
Chava Ruderman
Debbie Rybak
Michal Schechter
Esther Leah Schoenbrum
Chana Schonbrun
Naomi Schneider
Naomi Schwartz
Yosefa Schoor
Samantha Selesny
Galila Shapiro
Eliana Shaul
Sara Shkedy
Nechama Mina Shoshani
Malki Silverman
Michelle Simpser
Rose Snyder
Shani Snyder
Tirtza Spiegel
Yael Steinberg
Miriam Steinberger
Tehilla Stepansky
Chana Stern
Miriam Stock
Temima Strauss
Jessica Tugetman
Tamar Riegel Weinberger
Yehudit Weinberger
Amanda Weiss
Meredith Weiss
Rebecca Weiss
Sara Leora Wiener
Bella Wolf
Sahar Zaghi
Peri (Melissa) Zundell

Student Accomplishments

Academic Year 2018-2019 and Summer 2019

Department of Biology, Department of Chemistry and Biochemistry, Department of Computer Science, Department of Mathematical Sciences, Department of Physics, Department of Psychology, and Department of Speech Pathology/Audiology (as of June 27, 2019)

M.D./Ph.D. – 2 students
The Tri-Institutional M.D.-Ph.D. Program in Chemical Biology – The Rockefeller University, Sloan Kettering, and Weill Cornell Medical College; Albert Einstein College of Medicine

Allopathic medicine (M.D.) - 14 students
Albert Einstein College of Medicine (8 students); additional 6 students in various American medical schools (including New York Med. College.; Boston University Med. School.; Downstate), University of Toronto Med. School.; and Israeli medical schools (Sackler; Ben Gurion)

Osteopathic medicine – 5 students
Touro College of Medicine (TouroCOM); Rowan Univ. School of Osteopathic; NYIT College of Medicine (formerly NYCOM)

☑ **95%** acceptance rate for medical applicants (national average is 45%) – **21 out of 22**
☑ **11** students received multiple acceptances to medical school

Dental school – 12 students
Harvard; Univ.of Pennsylvania; Columbia Univ.; Tufts; Boston Univ.; Temple; Touro; Rutgers Dental School; NYU; Midwestern Univ., Stony Brook

☑ **92 %** acceptance rate for dental applicants -**12 of 13**
☑ **9** students received multiple acceptances to dental school

Optometry – 2 students
SUNY College of Optometry

Biomedical/Biological Sciences: Ph.D. – 4 students
The Tri-Institutional PhD Program in Chemical Biology - The Rockefeller University, Sloan Kettering, and Weill Cornell Medical College; Weill Cornell; CUNY; Albert Einstein College of Medicine

Computational Biology: Ph.D. – 1 student
Tri-Institutional Computational Biology and Medicine: Cornell University, Weill Cornell Medicine, and Memorial Sloan Kettering Cancer Center

Mathematics: Ph.D. – 1 student
Cornell University (awarded NSF Graduate Research Fellowship, and Cornell University Fellowship, and NSA National Physical Science Consortium Fellowship)

Computer Science: jobs – 5 students
Software Engineer Resident at Google; Software Engineer at Facebook; GTP Analyst at UBS Asset Management; Forward deployed Software Engineer at Palantir; IT Trainee at Broadridge Financial Solutions

Clinical Psychology: PsyD – 5 students
LIU Post; Ferkauf Graduate School of Psychology

School Psychology: PsyD – 1 student
St. John's University

Pharmacy: PharmD – 2 students
Touro (with scholarships)

Physical therapy: Doctorate – 7 students
Touro; Hunter College

Biotechnology & Food Engineering: M.S. – 1 student
Technion

Physician assistant: M.S. – 11 students
Touro (Nassau University Medical Center – started January 2019); Touro (Manhattan); York College (CUNY); Hofstra University; Pace University; Nova Southeastern (Florida)

Occupational therapy: M.S. – 10 students
Columbia; LIU-Brooklyn; NYU; Seton Hall University; York College (CUNY)

Speech language pathology: M.S. – 12 students
Touro; Lehman; Brooklyn College; Yeshiva University; Queens College

Mental Health Counseling: LMHC – 2 students
Touro College; Ferkauf Graduate School

Social Work: M.S.W. – 1 student
New York University

Audiology (Aud - doctorate) – 1 student
San Diego State University/UC–San Diego joint AuD program

Nursing – 20 students
NYU (joint program – 10 students**);** NYU (accelerated program – 5 students); Columbia University (accelerated program – 1 student); Touro (BSN program)

Summer 2019 research internships

Shana Adler: Shaarei Tzedek Hospital (orthopedic surgery)
Adina Allswang: AECOM (Dr. Maitra's lab)
Noa Applebaum: AECOM (Dr. Hollander's lab)
Nicole Aranoff: Department of Molecular Pharmacology, AECOM (Aschner lab)
Rachel Aronoff: NYU Med. School (Dr. Jeffrey Berger)
Sophia Baradarian: Stern College for Women (Dr. M. Vigodner's lab)
Shir Ben-Shoshan: Mount Sinai Medical Center (Neurosurgery Department)
Yael Eisenberg, NASA - Kennedy Space Center (Spring, 2019 internship)
Sara Ekairib: YU/Bar Ilan Summer Research Program
Ailin Elyasi: Montefiore Hospital (Dr. Stuart Greenstein)
Daniela Esses, INDESA Capital (Economic Research and Financial Advisory)
Elianna Felder: Kupcinet-Getz International Summer Science School,
Weizmann Institute of Science (Prof. Boris Rybtchinski, Department of Organic Chemistry)
Ashley Galitzer: YU/Bar Ilan Summer Research Program
Shoshana Gofman: Dialyze Innovation (biotechnology company)
Miriyam Goldman: Montefiore Medical Center
Michelle Hoch: NYU Health Career Opportunity Program (Physician Assistant)
Farida Hosmany: Hospital Pacifica Salud (Panama)
Alexandra Huberfeld: NYU (Dr. Da-Neng Wang)
Oria Itzhaky: Columbia University (Dept. Anesthesiology; Dr. Maya Mikami)
Caroline Jaspan: Mt. Sinai School of Medicine (Dr. C. Kellner)
Shani Kahan: Stern College for Women (Dr. A. Alayev's lab)
Aleeza Katz: YU/Bar Ilan Summer Research Program
Elizabet Kershteyn: Icahn School of Medicine (Dr. D. Yenkelevitz)
Raquel Klinger: YU/Bar Ilan Summer Research Program
Sharon Lahijani: Stern College for Women (Dr. M. Vigodner's lab)
Aviva Landau: YU/Bar Ilan Summer Research Program
Miriam Lattin: Stern College for Women (Dr. A. Alayev's lab)
Shani Lavi: Stern College for Women (Dr. A. Alayev's lab)
Chana Leizman: Magen David Adom (Israel)
Rebecca Levy: Stern College for Women (Dr. M. Vigodner's lab)
Sarah Liberow: AECOM (Dr. William Jacobs)
Rachel Mauda: YU/Bar Ilan Summer Research Program
Renen Melul: Department of Biology, Yeshiva College (Dr. S. Goswami)
Michal Mizrachi: YU/Bar Ilan Summer Research Program
Tamara Morduchowitz: Mount Sinai Medical Center (Cardiovascular Research)
Talia Pachter: Boca Raton Regional Hospital (Emergency Department)
Adina Passy: Houston Methodist Summer Undergraduate Research Internship
Danielle Pasternak: Rutgers University (Genetic Counseling Internship)
Pnina Rabin: AECOM (Dr. Teresa Bowman)
Miriam Radinsky: Northwell Hospital
Etti Rapp: Microsoft Research
Rachel Reeter: YU/Bar Ilan Summer Research Program

Adi Ronen: Stern College for Women (Dr. A. Alayev's lab)
Malkie Rubin: Hackensack Hospital (Genetic Counseling Internship)
Raquel Schwartz: Engelwood Hospital
Tamar Schwartz: AECOM Summer Undergraduate Research Program
Eliana Sharvit: AECOM Summer Undergraduate Research Program
Lottie Shrem: Tel Aviv University
Sophie Shulman: Memorial Sloan-Kettering (Dr. Zelefsky)
Arina Soklakova: YU/Bar Ilan Summer Research Program
Esther Solooki: YU/Bar Ilan Summer Research Program
Tamar Soussana: Department of Chemistry, SCW (Dr. R. Drori)
Esther Stern: YU/Bar Ilan Summer Research Program
Alexandra Tolmasov: YU/Bar Ilan Summer Research Program
Sara Verschleisser: National Institute of Allergies and Infectious Diseases (NIH Internship)
Rena Weinberger: Children's Hospital of Philadelphia (Research with Anethesiologist)
Chemda Wiener: YU/Bar Ilan Summer Research Program
Daniella Well: Northwestern University (arthritis research)
Rivky Zians: AECOM
Sarah Zusin: NYU Langone (Dr. Tomas Kirschhoff)

Student Publications and Presentations

Scientific Journals

(Undergraduate names are in **bold** type)

Lucas. B., **Schwartz, T**., **Levy, R**., Kemeny, S., and M. Vigodner, 2019, Identification of sumoylated targets in proliferating mouse spermatogonia and human testicular seminomas, Asian Journal of Urology (submitted).

Codipilly, C/N., **Koppel, A**., Ranasinghe, O., Roffe, S., Ahn, S., Navaratha, M., Abeyweera, N., Coors, C., Purushotham, A., Kamoga, R., and Schamler, R.J., 2019, Effects of human milk fortifier properties on intrinsic probiotic bacteria, J. Pasrent. Enter. Nutr. (submitted).

Klinger, R., Altberg, G., Greenstein, J., Hwang, J., Serras, S., and Hahn, B., 2019, Young girl with torticollis, Ann. Emerg. Med., 73:e11-e12.

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Presentations at Scientific Conferences

Rubenstein, L., and DiLorenzo, T.L., 2019, Religiosity, sexual behaviors andsSelf-esteem among college-age modern Orthodox Jewish women, Eastern Psychological Association Annual Meeting, New York, NY, March.

Dembitzer, N., and Drori, R., 2019, Antifreeze proteins shape ice crystals to prevent freezing injury, 257th National Meeting of the American Chemical Society, Orlando, FL, April.

Sharvit, E., Nik S., and Bowman T.V., 2019, ATM signaling pathway mediates apoptosis in *sf3b1* mutant zebrafish, 257th National Meeting of the American Chemical Society, Orlando, FL, April.

Shooman, A. and Santos, L.F, 2019, Static and dynamic properties of a one-dimensional spin- 1/2 system, International Meeting of the American Physical Society, Boston, MA, March (oral presentation)

Shooman, A. and Santos, L.F, 2019, *Static and dynamic properties of a one-dimensional spin-1/2 system*, Scientista Symposium, Boston, MA, March (poster presentation)

Koppel, A., Ranasinghe, O., Navarathna, M., Coors, C., Abeyweera, N., Codipilly, C., and Schanler. R., 2018, Acidic human milk fortification does not enhance probiotic growth in human milk. Poster presentation, Pediatric Academic Societies Meeting, Toronto, Canada, May.

Codipilly, C., **Koppel, A.,** Navarathna, M., Ranasinghe, O., Coors, C., Abeyweera, N., and Schanler, R., 2018, Milk fat globule epidermal growth factor 8 (MFG-E8) in preterm human milk. Poster presentation, Pediatric Academic Societies Meeting, Toronto, Canada, May.

Codipilly, C., Navarathna, M., **Koppel, A**., Brewer, M., Maffei, D., Ranasinghe, O. and Schanler, R., 2018, Detection of milk fat globule epidermal growth factor 8 (MFG-E8) in intestinal secretions of preterm infants. Poster presentation, Pediatric Academic Societies Meeting, Toronto, Canada, May.

Levy L., Kafri R., Malkin D., 2018, mTOR inhibition increases lifespan in Li-Fraumeni Syndrome fibroblasts by positively influencing the DNA damage response, 255th National Meeting of the American Chemical Society, New Orleans, LA, March.

Linfield T., Park H. E., Menon D., Montaner S., 2018, ANGPTL4 promotes lymphangiogenesis in head and neck squamous cell carcinoma, 255th National Meeting of the American Chemical Society, New Orleans, LA, March.

Chawla, A., Futran, D., Liriano, R., Mallari, K., Mertil, F., **Radinsky, I**., Schuster, R., and Ta, T., 2017, Student trajectories and school choice in the New York City public school system, MIT Conference on Digital Experimentation, October.

Gerber, N., Dubrovsky, E., Lowe, S., Brodsy, A., Kurz, E., **Marmer, M.,** Chun, J., Schwartz, S., Shapiro, R., Axelrod, D., Guth, A., and Schnabel. F., 2017, DCIS on core-needle biopsy with no residual disease at surgery, SSO Annual Cancer Symposium, WA

Rozner, S. and DiLorenzo, T., 2017. Comfort with sexuality in Orthodox Jewish women. Poster presentation, Annual Meeting of the Society of Behavioral Medicine, San Diego, CA.

Saffern, M.S., Abt, M.C., Pamer, E.G., 2017, Role of IL-17a in fecal microbiota transplant mediated clearance of *C. difficile* infection, 253rd National Meeting of the American Chemical Society, San Francisco, CA, April.

Levy, L., Chernichovski, T., and Schwartz, I., 2017, Male sex hormones regulate human endothelial nitric oxide synthase system through the modulation of cationic amino acid transporter-1, 253rd National Meeting of the American Chemical Society, San Francisco, CA, April.

Gerber, N., Dubrovsky, E., Lowe, S., Brodsy, A., Kurz, E., **Marmer, M**., Chun, J., Schwartz, S., Shapiro, R., Axelrod, D., Guth, A., and Schnabel. F., 2017, DCIS on core-needle biopsy with no residual disease at surgery, Society of Surgical Oncology Annual Cancer Symposium, WA, March

Berman, A.Y., Alayev, A., Salamon, R.S., Berger, S.M., Schwartz, N.S, Cuesta, R., and Holz, M.K., 2016, Raptor mediated mTORC1 phosphorylation of ERα in breast cancer, 251st National Meeting of the American Chemical Society, San Diego, CA, March.

Wiener, S.L., Berman, A.Y., Alayev, A., Salamon, R.S., Sun, Y., Schwartz, N.S., Yu, J.J., and Holz, M.K., 2016, The combined effects of resveratrol and rapamycin in TSC null diseases, 251st National Meeting of the American Chemical Society, San Diego, CA, March.

Meyers, D., Martinez, K., and Chang, E.B., 2016, Understanding impaired lipid absorption in germ free mice, 251st National Meeting of the American Chemical Society, San Diego, CA, March.

Wakschlag, N. and DiLorenzo, T., 2016, The association between modest dress and body image in Orthodox Jewish Women. Poster presentation, Annual Meeting of the Society of Behavioral Medicine, Washington, D.C.

Li, Y., Korobko, R., **Lerner**, A., Lubomirsky, I., and Frenkel, A.I., 2015, Origin of giant electrostriction in Gd doped ceria revealed by differential QEXAFS, XAFS-15 International Conference, Karlsruhe, Germany, August.

Applebaum, K., recipient of the 2015 UAN Student Travel Award to attend the American Society for Biochemistry and Molecular Biology Annual Meeting, March 28- April 1, Boston Exhibition and Convention Center, MA

Kramer, M.Y., McNabb, N.A., Guillette, L.J., Jr., and Kohno, S., 2015, The potential impacts of environmental endocrine disruptors on reproductive development, 249th National Meeting of the American Chemical Society, Denver, CO.

Gross, R.A., Wooten, A.L., Lewis, Woodard, P., and Lapi, S., 2015, Manganese-52: cyclotron production and PET/MR imaging, 249th National Meeting of the American Chemical Society, Denver, CO.

Kramer, M.Y., McNabb, N.A., Guillette, Jr., L.J., and Kohno, S., 2014, Drugged wildlife: The potential impacts of environmental endocrine disruptors on reproductive development, National Meeting of the Society for Integrative and Comparative Biology, West Palm Beach, FL, Jan. 4th

Kaufman, C., Fulop, T., Boolbol, S.K., Naam, S., Gillego, A., and Chadha, M., 2014, Are more frequent early follow up mammogram protocols necessary after breast-conserving surgery and radiation therapy, San Antonio Breast Cancer Symposium, Dec.

DiLorenzo, T., Freyberg, R, and **Siegel, A**. 2014, Sex education and adherence to sexual health recommendations in Orthodox Jewish Women. Poster presented at the Society of Behavioral Medicine Annual Meeting, Philadelphia, PA, April.

Siegel, A., DiLorenzo, T., Freyberg, R., and Donath, S., 2014, Factors associated with adherence to gynecologic screening recommendations in young Orthodox Jewish Women. Poster at the Society of Behavioral Medicine Annual Meeting, Philadelphia, PA, April.

Lerner, **A**., Li, Y., Frenkel, A.I., Korobko, R., and Lubomirsky, I., 2014, The origin of giant electrostriction in Gd-doped ceria as studied by modulation excitation x-ray absorption spectroscopy, Meeting of the American Physical Society, Denver, CO.

Herskowitz, J., Victor, R., and Mintzer, E., 2014, Daptomycin interactions with TOCL containing membranes, 247th American Chemical Society National Meeting, March, Dallas, TX.

Schoor, Y. and Jordan, B.A., 2014, Prr7 is a novel regulator of the transcription factor, c-Jun, in neurons, 247th American Chemical Society National Meeting, March, Dallas, TX.

Tishbi, N. and Mintzer, E., 2014, Surface and membrane binding properties of the lipopeptide daptomycin, 247th American Chemical Society National Meeting, March, Dallas, TX.

Tishbi, N. and Rapp, C., 2014, The role of sulfation in the CCR5 chemokine receptor complex, 247th American Chemical Society National Meeting, March, Dallas, TX.

Goldsmith, A., Bryan, R., Broitman, J., and Dadchova, E., 2014, Modification of antibody 2556 recognizing HIV protein gp41 with CHXA ligand for radiolabeling and radioimmunotherapy 247th American Chemical Society National Meeting, March Dallas, TX.

Hseih, S.J., Levi, D., Prince, D., Mills, M., Dayton, C., Shah, R., **Zibak, F., Shamsian, J**., and Gong, M.N. 2014, Staged implementation of the ABCDE bundle improves ICU patient outcomes, Amer. Thoracic Soc., Meeting (abstract).

Hseieh, S.J., Hope, A., Dayton, C., Gershengorn, H., Shah, R., **Shamsian, J., Zibak, F**., and Gong, M.N., 2014, The association between pre-ICU frailty and ICU delirium, Amer. Thoracic Soc., Meeting (abstract).

Weisburg, J.H., Schuck, A.G., **Greenbaum, R.E., Golfiez, M.D., Segal, J.R., Weiss, R.A., Liebman, E.C.**, Zuckerbraun, H.L., and Babich, H., 2013, Grape seed extract, a Mild prooxidant selectively cytotoxic to cancer cells. American Institute for Cancer Research Annual Meeting. Bethesda, MD.

Bonner, C., and DiLorenzo, T., 2013, A review of the literature on cognitive-behavioral therapy for anxiety and depression in school settings. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Donath, S., and DiLorenzo, T., 2013, Remediating academic impacts of early neglect. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Farzan, Y., and Freyberg, R., 2013, Effects of affect on prosocial behavior: A review of the literature. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Frenkiel, L., and DiLorenzo, T., 2013, Spiritual and religious coping in cancer patients. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Kazlow, C., and DiLorenzo, T., 2013, The effects of terrorism on children: The implications of type of trauma, level of exposure, and individual vulnerability. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Last, T., and Freyberg, R., 2013, Cyberbulling: Predictive factors and harmful effects. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Pasternak, E., and Bacon, J., 2013, A modified sound localization task as a sensitive test of processing speed in multiple sclerosis patients. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Siegel, A., and DiLorenzo, T., 2013, Are knowledge, family and friend history of disease and perceived risk predictive of the uptake of gynecologic health recommendations in orthodox Jewish women? Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Yarmush, D., and Freyberg, R., 2013, The effect of music on cognitive, verbal, and task performance. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Schuck, A.G., **Wargon, S.E., Tauber, L., Miller, S.H., Weinstock, H.R.,** Weisburg, J.H., Zuckerbraun. H.L., and Babich, H. 2013. Ellagic and gallic acids, dietary polyphenols with selective cytotoxicity to oral carcinoma HSC-2 cells. Society for In Vitro Biology Annual Meeting, Providence, RI

Tishbi, N. and Mintzer, E., 2013, Surface and membrane binding properties of the lipopeptide daptomycin, 57th Annual Meeting of the Biophysical Society, Philadelphia, PA

Joel, K., Kollmar, D., and Santos, L. F 2013, Spectrum, symmetries, and dynamics of Heisenberg spin-1/2 chains (oral presentation), International Meeting of the American Physical Society, March Meeting, Baltimore, MD.

Kollmar, D. and Santos, L. F 2013, Invariant correlation entropy as a signature of quantum phase transitions in spin-1/2 systems (oral presentation), International Meeting of the American Physical Society, March Meeting, Baltimore, MD.

Laufer, T.S. and Rapp, C. 2013, Effects of tyrosine *o*-sulfation on binding affinity in CXCR4-SDF-1 complexes, 245th National Meeting of the American Chemical Society, New Orleans, LA.

Snow, S. and Rapp, C., 2013, Role of tyrosine *o*-sulfation in the CXCR4-SDF-1 chemokine receptor complex**,** 245th National Meeting of the American Chemical Society, New Orleans, LA.

Robin, E.F., Wietschner, J.K., Zuckerbraun, H.L., Babich, H., Schuck, A.G., and Weisburg, H.J., 2013, Gallic acid, an inducer of apoptosis to human oral carcinoma HSC-2 cells as mediated through oxidative stress, 245th National Meeting of the American Chemical Society, New Orleans, LA.

Schoor, Y. and Velisek, 2013, Different route of administration for melanocortin receptor agonist, melanotan II, in the model of cryptogenic infantile spasms, 245th National Meeting of the American Chemical Society, New Orleans, LA.

Weinstein, A., Baker, M.E.R., Hughes, C.M., Allis, D., McEwen, B.S., and Hunter, R.G., 2013, Evidence for the role of a novel histone mark in hippocampal neurogenesis**,** 245th National Meeting of the American Chemical Society, New Orleans, LA.

Sedletcaia, A., **Unger, H.A.,** Maruani, D.M., and Holz, M.K., 2012, New targets of mTORC1 pathway in ER-positive cells, American Association for Cancer Research Annual Meeting, Chicago, IL.

Chitgarha, M.T, Khaleghi, S., Daab, W., Ziyadi, M., Mohajerin-Ariaei, A., **Rogawski, D**., Tur, M., Vusirikala, V., Zhao, W., Touch, J., and Willner, A.E. 2012. Demonstration of WDM OSNR Performance Monitoring and Operating Guidelines for Pol-Muxed 200-Gbit/s 16-QAM and 100-Gbit/s QPSK Data Channels. Optical Fiber Communication Conference and Exposition (OFC).

Amram, R., and DiLorenzo, T., 2012, Prevalence and pedictors of academic dishonesty. Poster to be presented at the Annual Meeting of the American Psychological Association, Orlando, Fl.

Freyberg, R., and **Bart, M**., 2012, Olfactory environment influences close relationships through multiple methods of measurement. Poster presented at the Annual Conference of the Association of Chemoreception Sciences, Huntington Beach, CA.

Gofine, M., and Dilorenzo, T., 2012, How are we doing? A review of assessments within writing centers. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Michalowksi, A., and Freyberg, R., 2012, The effect of directed writing on depression and anxiety. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Pasternak, E., and Bacon, J., 2012, Demystifying insight: A review. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Zughaft, M., Taylor, D.J., and Harburger, L.L., 2012, Effects of endogenous and exogenous sex hormones on object memory and spatial ability in young and aged women. 16th Annual N.E.U.R.O.N. Conference Program.

Zughaft, M., Taylor, D., and Harburger, L., 2012, Effects of endogenous and exogenous sex hormones on object memory and spatial ability in young and aged women. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Gharagozloo, P., Arcasedda, F., Khatamee, M., Gutierrez-Adan, A., Drevet J., Krey, L., **Mandelbaum, M.,** Smith, M., Kramer, Y., Sanchez, X., Lu, L., McCaffrey, C., and Grifo, J., 2012, Age, sperm, & oocyte stress and infertility, American College of Obstetricians and Gynecologists, May 8th, San Diego, CA

Vigodner, M., Nieves,E., Shrivastava, V., Callaway, M.B., **Marmor, H.,** and **Chernyak, S.-B**., 2012, Identification of sumoylated proteins in human sperm, American Society of Andrology (ASA) 37th Annual Conference, April 21 – 24, Tucson, Arizona.

Hachen, M., Hunter, R.G., Pfaff, D.W., and McEwen, B.S., 2012, Stress modulates mitochondrial gene expression in the rat hippocampus, 243rd American Chemical Society Meeting, San Diego, California, Spring semester.

Gubin A. and Santos L.F., Quantum Chaos: An introduction via chains of interacting spins 1/2, Oral presentation, March Meeting 2011, American Physical Society, Boston, MA.

Karp, E., Novikov, L., **Klerman, H.**, and Gamble, M.J., 2012, Understanding the role of intronic cis-acting elements in the splicing of macroH2A1 variants, 243rd American Chemical Society meeting, San Diego, California, Spring semester.

Wolf, B.J., Reiss, S.E., Babich, H., Weisburg, J.H., Schuck, A., and Zuckerbraun, H., and **Fertel, S.** 2012, Proapoptotic effects of ellagic acid, a metabolite of pomegranate extract, on human oral carcinoma HSC-2 cells, 243rd American Chemical Society meeting, San Diego, California, Spring semester, 2012.

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Hachen, M., Hunter, R.G., Pfaff, D.W. and McEwen, B.S., 2011, Stress modulates mitochondrial gene expression in the rat hippocampus, Society for Neuroscience Abstracts, Washington, D.C.

Shrivastava, V., **Marmor**, **H**., **Gutstein**, **L**., Chernyak, S.-B., and Vigodner, M., 2011, SUMO proteins may regulate multiple functions in human sperm which can be significantly affected by cigarette smoke, FAMRI Web Symposium.

Bart,M., and Freyberg, R., 2011, Fragrance change impacted interactions of close female friends. Chemical Senses, 36, A100-101.

Bacon, J., Kalina, J., Bochkanova, A., **Ausubel-Strauchler, Y.** and Herbert, J., (2011). Cognitive rehabilitation benefits multiple sclerosis patients only if they are active participants in the program. Neurology, 76 (S4): A85.

Harburger, L.L. and **Taylor, D.J.,** (2010). The effects of age on object memory and spatial ability in women. Society for Neuroscience Abstracts, Program # 605.2.

Huisman, T., Chatterjee, S., Volpi, S., and Birshtein, B., 2011, AID and Gadd45a: Involved in active DNA demethylation of the 3'RR and in class switch recombination? 241st American Chemical Society National Meeting, Anaheim, CA, March.

Rogawski, R. and Mintzer, E., 2011, Elucidating the interaction of LPA with model membranes, 241st American Chemical Society National Meeting, Anaheim, CA, March

Rosenblatt, K., Avogadri, F., Li, Y., Murphy,J., Merghoub, T., Houghton, A., and Wolchok, J., 2011, Detection of TRP-2 antibodies in the serum of TRP-2 immunized mice, 241st American Chemical Society National Meeting, Anaheim, CA, March.

Schuck, A.G., **Cohen, S.S., Lerman, L.T., Haken, O.,** and Weisburg, J.H., 2011, Pomegranate and olive fruit extracts, prooxidants with antiproliferative and proapoptotic activities towards HSC-2 carcinoma cells. Society for In Vitro Biology Annual Meeting, Raleigh, NC, June

Hasten, E., Lazaros, J., and Schuck, A.G., 2011, Pro-oxidant and pro-apoptotic activities of olive fruit extract toward oral carcinoma cells. Columbia University Undergraduate Research Symposium, April.

Hirth, Y.A., Zuckerbraun, H.L., and Weisburg, J.H., 2011, Decrease in intracellular glutathione and induction of apoptosis in HSC-2 carcinoma cells from the human oral cavity due to pomegranate juice extract. Society for In Vitro Biology Annual Meeting, Raleigh, NC, June

Schneider, J., Gutstein, L., Shrivastava, V., and Vigodner, M., 2011, SUMO proteins may regulate head reshaping, capacitation, and stress response in human sperm, Columbia University Undergraduate Research Symposium, Spring, April.

Hirth, Y.A., Zuckerbraun, H.L., and Weisburg, J.H., 2011, Decrease in intracellular glutathione and induction apoptosis in HSC-2 carcinoma cells from the human oral cavity due to pomegranate juice extract. Society for In Vitro Biology Annual Meeting, Raleigh, NC, June

Schneider, J., Gutstein, L.E., Shrivastava, V., and Vigodner, M. 2011, SUMO proteins may regulate head reshaping, capacitation, and stress response in human sperm, XXI[st] North American Testis Workshop, Montreal, Quebec, Canada, 3/30-4/2.

Maruani, M., **Harris, E., Shachter, A.,** and Holz, M.K., 2011, Co-regulatory relationship between estrogen receptor alpha and the mTOR/S6K1 signaling pathways, American Association for Cancer Research 102nd Annual meeting, Orlando, FL, April.

Schneider, J., Gutstein, L., Shrivastava, V., and Vigodner, M., 2011, SUMO proteins May regulate head reshaping, capacitation, and stress response in human sperm, Columbia University Undergraduate Research Symposium, Spring.

Gross, J., Ennis, R.D., Homel, P., Evans, A., Gliedman, P., Choi, W., Hu, K., Shasha, D., Harrison, L.B., and S. Fleishman, 2010, The rapid increase in radiation oncology consultation and treatment of the extreme elderly and its independence from population growth, America Society for Radiation Oncology (ASTRO) Annual Meeting.

Marinkovic, N., Wang, Q., Barrio, **Cooper**, C., and Frenkel, A.I., 2010, Synchronous XAFS/DRIFTS Study of CO adsorption on Al2O3-supported Pt clusters The First North American Core Shell Spectroscopy Conference, Denver, CO.

Donington, J.S., Blasberg, J.D., Goparaju, C.M.V., **Hirsch, N.**, and Pass, H.I., 2010, Molecular heterogeneity of osteopontin Isoforms in non-small cell lung cancer, American Association of Cancer Research, International Association for the Study of Lung Cancer Joint Conference on Molecular Origins of Lung Cancer, Coronado, CA.

Goparaju, C., Donington, J., **Hirsch, N.**, Harrington, R., and Pass, H.I., 2010, EphB2 expression parallels malignant behavior in mesothelioma, American Association of Cancer Research, 101[st] Annual Meeting, Washington, D.C.

Donington, J.S., Goparaju, C.M.V., Blasberg, J.D., **Hirsch, N.**, Harrington, R,, Pass, H.I., and Neubert, T., 2010, Extracellular mediation of divergent impact of OPN splice variants in non-small cell lung cancer, Osteopontin Biology, FASEB Summer Research Conference, Steamboat Springs, CO.

Donington,. J.S., Blasberg, J.D., Goparaju, C.M.V., **Hirsch, N.**, Harrington. R., and Pass, H.I., 2010, Argatroban inhibition of osteopontin modulates isoform specific malignant properties in non-small cell lung cancer. 10[th] Targeted Therapy meeting, Santa Monica, CA (presented but not published).

Gross, J., Ennis, R.D., Homel, P., Evans, A., Gliedman, P., Choi, W., Hu, K., Shasha, D., Harrison, L.B., and S. Fleishman, 2010, The rapid increase in radiation oncology consultation and treatment of the extreme elderly and its

independence from population growth, America Society for Radiation Oncology (ASTRO) Annual Meeting.

Horowitz, D. and Dilorenzo, T., 2010, The efficacy of hypnosis in pediatric cancer care, Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Stiefel, E. and Freyberg, R., 2010, Trying to remember: A literature review about improving eye-witness testimony, Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Rollhaus, E. and Freyberg, R., 2010, An analysis of the effects of altering directives in narrative therapy, Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Scholl, C. and Dilorenzo, T., 2010, The issue of "faking good" on self report personality measures in personnel selection, Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Zitter, S., Bryk, D., Fox, A., Narlieva, M., Pan, Q., Chang, T., Cloherty, G., and Lucic, D., 2010, Swine influenza or seasonal influenza? The first clinical adaptation of an automated open platform for swine influenza. The Montefiore experience, Young Research Investigators Symposium at Montefiore Medical Center, Bronx, NY, **third place winner.**

Shrivastava,V., **Miller, R., Lazaros, S.H.,** and Vigodner, M., 2010, Sumoylation as a sensitive marker of a tobacco-induced oxidative stress in the testis, FAMRI meeting, Miami, Florida (May)

Deluty, J., Seto, J., and Sealfon, S., 2010, Elucidating the signaling pathways of the immune response in monocytes, Columbia University Undergraduate Research Symposium, Spring.

Dinerman, J. and Santos, L.F., 2010, Controlling the Evolution of a Quantum System with Dynamical Decoupling Methods, Oral presentation, March Meeting, American Physical Society, Portland, OR.

Holz, M.K., **Seligman F.F., Spiegel T.N.,** and **Maruani D.M.,** 2010, Estrogenic regulation of S6 kinase 1 expression creates a positive feed-forward loop in control of breast cancer cell proliferation, AACR 101st Annual Meeting, Washington, DC.

Huisman, T. and Hodgson, L., 2010, Spectral modification to genetically encoded single-chain RhoA biosensor, 239th National Meeting, American Chemical Society, San Francisco, CA

Liebling, E.J., Asenjo, A.B., De Paoli, V.M., Rath, U., Sharp, D. J., and Sosa, H., 2010, Interactions between microtubules and kinesin-1,3**,** 239th National Meeting, American Chemical Society, San Francisco, CA

Mintzer, E., and **Rogawski, R.,** 2010, Elucidating the interaction of LPA with model membranes, Columbia University Undergraduate Research Symposium, Spring.

Solodokin, L.J., **Canter, A., Freilich, A., Haken, O., Ovits-Levy**, C.G., Schuck, A.S., and Babich, H., 2010, Anticarcinogenic and prooxidant properties of pomegranate juice extract and olive fruit extract, Columbia University Undergraduate Research Symposium, Spring.

Weiss, R.S., Zhang, C., and Cuervo, A.M., 2010, Identification of markers for autophagy in serum, 239th National Meeting, American Chemical Society, San Francisco, CA

Yamnik, R.L. and Holz, M.K., 2009, mTOR/S6K1 and MAPK/RSK signaling pathways coordinately regulate estrogen receptor alpha serine 167 phosphorylation, Cancer Res., 69:A31S

Holz. M.K., **Digilova, A., Yamnik, R., Davis, D.,** Murphy. C., and **N. Brodt**, 2009, Estrogen receptor alpha is a target of mTOR/S6K1 signaling in control of breast cancer cell proliferation, Cancer Res. 69:269S (abstract).

Bellman, A. and DiLorenzo, T, 2009, The association between feminism, religiosity, and psychological well-being in Jewish women, Yeshiva University Behavioral Sciences Student Research Conference.

Ganz, D, and DiLorenzo, T, 2009, Comorbid suicidality and alcohol abuse in adolescents: Etiologic factors, Yeshiva University Behavioral Sciences Student Research Conference.

Hanau, T. and DiLorenzo, T, 2009, Etiology and treatment of bulimia nervosa, Yeshiva University Behavioral Sciences Student Research Conference.

Hazan, R. and DiLorenzo, T, 2009, Prolonged/imaginal exposure in PTSD: A literature review, Yeshiva University Behavioral Sciences Student Research Conference.

Hazan, R. and R. Freyberg, 2009, Victim of the act or the offender? Exploring the emotional and psychological responses of sexual assault and rape victims based upon the victim-offender relationship, Yeshiva University Behavioral Sciences Student Research Conference

Miller, R. and Harburger, L, 2009, Does Ben Franklin Effect increase with effort? Yeshiva University Behavioral Sciences Student Research Conference

Reichman, D. and DiLorenzo, T, 2009, Influence of family support on PTSD in children, Yeshiva University Behavioral Sciences Student Research Conference.

Rollhaus, E., and R. Freyberg, 2009, Directives in Narrative Therapy, Yeshiva University Behavioral Sciences Student Research Conference

Sonenberg, R. and DiLorenzo, T, 2009, A review of the literature on the psychological effects of 9/11 in children, Yeshiva University Behavioral Sciences Student Research Conference.

Spiegel, T. and DiLorenzo, T, 2009, Does MRI screening have a negative psychological effect on women who carry the BRCA gene? Yeshiva University Behavioral Sciences Student Research Conference.

Stiefel, E. and R. Freyberg, 2009, The multi-faceted Jew: A study on the integration of the interdependent self and the independent self in Jews in America, Yeshiva University Behavioral Sciences Student Research Conference

Dinerman, C., Keller, and B. Herold, 2009, Genital secretions confer anti-*E. coli* activity, Montifiore Pediatric Research Day, 1St prize for a student poster.

Dukesz, F., **Zilbergerts, M.,** and L. F. Santos, 2009, Interplay between interaction and (un)correlated disorder in Heisenberg spin 1/2 chains, March Meeting of the American Physical Society, Pittsburgh

Ackerman, N.J., Burekhovich, F., Schuck, A.G., Zuckerbraun, H.L., and H. Babich, 2009, Gingko biloba leaf extract induces oxidative stress in HSC-2 carcinoma cells, Columbia University Symposium of Undergraduate Research, Spring. (abstract and oral presentation).

Ruderman, E., Zack, E., and A.G. Schuck**,** 2009, Antitumorigenic and prooxidant activities of blueberry extract to human oral cancer cells, Columbia University Undergraduate Research Symposium, Spring. (abstract).

Bromberg, M.R., Patolla, A., Wang, O., Segal, R., Han W.-Q., Feldman, I., Zypman, F.R., Iqhal, Z., and A.I. Frenkel, 2009 , Platinum nanoparticles on SWNT nanopaper support: Synthesis, characterization, and application in electrocatalysis, The 237th American Chemical Society Meeting, Salt Lake City, Utah, March (abstract)

Charles, G., and E.A. Mintzer, 2009, Comparison of the behavior of native cholesterol and two oxidized cholesterol derivatives, The 237th American Chemical Society Meeting, Salt Lake City, Utah, March (abstract)

Charles, G. and E.A. Mintzer, 2009, Oxysterols alter the propensity of lipid raft formation in model membranes, Columbia University Undergraduate Research Symposium, Spring. (abstract).

Herzberg, B.M., Ting, L.-M., Mwakingwe, A., Croken, M.M., Madrid, D., Hochman, S., and K. Kim, 2009, Genetic studies of adenosine deaminase in the rodent malaria parasites, *Plasmodium yoelii* and *Plasmodium berghei*, The

237th American Chemical Society Meeting, Salt Lake City, Utah, March (abstract)

LeVee, A.J., and E.V. Prodan, 2009, Molecular electronics: Tunneling devices with semiconducting leads, The 237th American Chemical Society Meeting, Salt Lake City, Utah, March (abstract)

Liebling, E., Burger, R.F., Zuckerbraun, H.L., Schuck, A.G., and H. Babich, 2009, Protective effects of pyruvate through mediation of oxidative stress, Columbia University Symposium of Undergraduate Research, Spring (abstract).

Merzel, M., Grace, M., and M. Balwani, 2009, Development and validation of a dried blood spot assay for chitotriosidase, an important biomarker for Gaucher Disease, The 237th American Chemical Society Meeting, Salt Lake City, Utah, March (abstract)

Pekar, M., Grosser, E., Goodfriend, G., Im, J. and M.Vigodner, 2009, Stress-induced response and apoptosis in germ and somatic testicular cells: involvement of SUMO proteins, Columbia University Symposium of Undergraduate Research, Spring (abstract).

Schiffmiller, A., Rapp, C., Kalyanaraman, C., and M. Jacobson, 2009, Theoretical ranking of a congeneric series of protein kinase inhibitors, Columbia University Symposium of Undergraduate Research, Spring (abstract)

Holz, M.K., **Digilova, A., Yamnik, R., Davis, D**., Murphy, C., and **N. Brodt,** 2008, The role of S6 kinase 1 in breast cancer, San Antonio Breast Cancer Symposium

Atlas, A., McCarthy, J.W., and M. Feldmesser, 2008, *Aspergillus fumigatus* proteins bound by a germination-inhibitory monoclonal antibody, National Meeting of the American Chemical Society, New Orleans, LA.

Bellman, A. and T. DiLorenzo, 2008, Gender Identity Disorder: A review of the literature. Ferkauf Graduate School of Psychology Behavioral Sciences Student Research Conference

Blau, L., Estes, D**., Seleski, N.** and **S.A**.**Guigui,** 2008, Stabilizing of deoxyoligonucleotide duplexes by base stacking, National Meeting of the American Chemical Society, New Orleans, LA.

Clark, E., Seideman, J., Silverman, J., Gardner, J., Scheinberg, D.A., and J.H.Weisburg, 2008, P-Glycoprotein independent resistance to oxidative stress in leukemia cells, National Meeting of the American Chemical Society, New Orleans, LA.

Dukesz, **F.,** Frenkel, A.I., Bromberg, M.R.,Wang, O., Asherie, N., Blass, S.,

Rafailovich, M.H., Sun, Y., and J. Kang, 2008, Comparing various methods of synthesis and analysis of gold nanoparticles, National Meeting of the American Chemical Society, New Orleans, LA.

Fathy, J., Seleski, N., Dinerman, E., and M.Vigodner, 2008, Expression of SUMO protein in normal testicular cells and germ cell tumors, Columbia University Spring Undergraduate Research Symposium.

Feldman, A., Benichou, C., Skop, N., and M.Vigodner, 2008, Heat-induced stress response in germ and somatic testicular cells: involvement of SUMO proteins, Columbia University Spring Undergraduate Research Symposium

Freyberg, R., and **M**.**Bensoussan,** 2008, The impact of fragrance on social relationships. Poster presented at the 2008 Biannual Conference on Human Development, Indianapolis, IN.

Freyberg, R., **Bensoussan, M.,** and A. **Silver,** 2008, Disruption of olfactory environment impacts close relationships in young women. National Meeting of the International Symposium of Olfaction and Taste, San Francisco, CA.

Greer, D. and R. Freyberg, 2008, Personality type as a predictor of religious identity and conflicts, Yeshiva University Behavioral Sciences Student Research Conference

Guigui, S.A., House, R., Dulyaninova, N. and A. Bresnick, 2008, Characterization of a scfv to non-muscle myosin-II, National Meeting of the American Chemical Society, New Orleans, LA.

Hazan, R., and T. DiLorenzo, 2008, Treatment methods for PTSD: A literature review, Yeshiva University Behavioral Sciences Student Research Conference

Herzberg, B.M., Ramjeawan, R., Sun, Y., Frenkel, A.I., and M. Rafailovich, 2008, Characterizing protein and folate coated nanoparticles and analyzing their toxic effects on cancerous and normal keratinocytes, National Meeting of the American Chemical Society, New Orleans, LA.

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Reichman, B., and R. Freyberg, 2008, The unique developmental issues and challenges of children with incarcerated mothers, Yeshiva University Behavioral Sciences Student Research Conference

Rollhaus, E., and R. Freyberg, 2008, Effects of written disclosure on mental health, Yeshiva University Behavioral Sciences Student Research Conference

Segal, L., and R. Freyberg, 2008, Social aspects of religious influence on youth, Yeshiva University Behavioral Sciences Student Research Conference

Silver, A., and R. Freyberg, 2008, Unfamiliar fragrances and their effects on nonverbal communication, Yeshiva University Behavioral Sciences Student Research Conference

Stiefel, E., and R. Freyberg, 2008, To co-sleep or separate sleep that is the question: Reasons and developmental effects of co-sleeping vs. separate sleeping, Yeshiva University Behavioral Sciences Student Research Conference

Bacon, J., Fromm, J.T., **Adelman, M., Neuhaus, R**., and J. Herbert, 2007, Targeted cognitive interventions improve cognitive functioning in patients with MS. Int. J. MS Care. 9:P13.

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Balk, E. and T. DiLorenzo, 2007, Risk factors for attrition in intervention programs for conduct disorder, Yeshiva University Behavioral Sciences Student Research Conference.

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Seidenwar, L. and T. DiLorenzo, 2007, The effects of ADHD on parental functioning, Yeshiva University Behavioral Sciences Student Research Conference.

Weiser, A. and R. Freyberg, 2007, The interplay between self-esteem, marital satisfaction, and perceived peer rejection in middle adulthood, Yeshiva University Behavioral Sciences Student Research Conference

Krupka, C.B., and R. Freyberg, 2007, The impact of Judaism and SES on substance use, Yeshiva University Behavioral Sciences Student Research Conference

Glaser, E., and R. Freyberg, 2007, The effects of religious service attendance on well-being, Yeshiva University Behavioral Sciences Student Research Conference

Bensoussan, M., and R. Freyberg, 2007, The nature of fragrance preferences in young women, National Meeting of the Association of Chemoreception Sciences, Sarasota, FL.

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Marmor, R.A., Fathy, J., Vigodner, M., and J.H. Weisburg, 2007, Differential expression pattern of SUMO proteins in normal and drug-resistant HL-60 cancer cell lines, Proceedings of the Columbia University Spring Undergraduate Research Symposium (poster presentation/abstract).

Guigui, S.A., Estes, D., and L. Blau, 2007, DNA's stability: composition vs. sequence, 233rd American Chemical Society National Meeting, Chicago, IL. (poster presentation/abstract).

Bursky-Tammam, N., **Platt, Y., Bram, A., Kanner, L., Simpser, M**., Zhou, J., Zhao, S., Rafailovich, M., and A. Frenkel, 2007, EXAFS analysis of hydrogenation effects on the structure of Pd nanacatalysts, 233rd American Chemical Society National Meeting, Chicago, IL. (poster presentation/abstract).

Brodt, N., Yamnik, R.L., Blenis, J., and M.K. Holz, 2007, Increased S6K1 protein expression confers proliferative advantage and rapamycin sensitivity to human mammary cancer cells, 233rd American Chemical Society National Meeting, Chicago, IL. (poster presentation/abstract).

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Bacon, J., **Riber, L**., Fromm, J.T., **Safier, M**., and J. Herbert, 2006, Motivational style as a predictor of adherence to injection therapy for multiple sclerosis. Mult. Scl. (Suppl 1) 12:S117.

Weller, I. and R. Freyberg, 2006, Application of a learning theory framework on to improving self-esteem and treatment outcomes of substance use disorders, Yeshiva University Behavioral Sciences Student Research Conference

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Bensoussan, M., and R. Freyberg, 2006, Understanding fragrance preferences in young women.Yeshiva University Behavioral Sciences Student Research Conference

Glasner, D., and A.I. Frenkel, 2006, Geometrical characteristics of regular polyhedra: Application to EXAFS studies of nanoclusters, XAFS 13 Conference, Stanford, CA.

Ackerman, R., Weiss, T., and T. DiLorenzo, 2006, CBT: Modification of dating habits: A case study, Yeshiva University Behavioral Sciences Student Research Conference.

Dickstein, D. and T. DiLorenzo, 2006, Relationship status as a predictor of caregiver burden in traumatic brain injury, Yeshiva University Behavioral Sciences Student Research Conference.

Goldmintz, E. and T. DiLorenzo, 2006, Risk factors for maladjustment in children from divorced families, Yeshiva University Behavioral Sciences Student Research Conference.

Harris, T., Soussan, **L.,** Isseroff, R., Sun, Y., Rafailovich, M.H., and A.I. Frenkel, 2006, EXAFS studies of palladium nanoparticles: Size control and hydrogenation, XAFS13 Conference, Stanford, CA.

Pease, D.M., Frenkel, A.I., Shanthakumar, P., Huang, T., Balasubramanian, M., Budnick, J.I., Brewe, D., **Abitbol**, **N.**, and O. Odom, 2006, Performance

and improved design of the log spiral of revolution monochromator, XAFS13 Conference, Stanford, CA.

Frenkel, A.I., Pease, D.M., Budnick, J., Shanthakumar, P., Huang, T., **Abitbol**, **N**., and P. Metcalf, 2006, X-Ray Absorption Fine Structure study of the metal-insulator transition in Cr doped V2O3, March Meeting of the American Physical Society, Baltimore, MD.

Sun, Y., Frenkel, A.I., Isseroff, R., **Shonbrun**, **C.,** Forman, M., Shin, K., Koga, T., White, H., Rafailovich, M., and J. Sokolov, 2006, Characterization of Palladium and Gold nanoparticles using x-ray reflectivity, EXAFS and electron microscopy, March Meeting of the American Physical Society, Baltimore, MD.

Zaghi, D., Jacobson. M., and G. Barreiro, 2006, pH Sensitivity in talin, 232nd National Meeting of the American Chemical Society, San Francisco, CA

Feig, J.L., Ha, S., Rudoff, R., and S.K. Logan, 2006, ART-27: a novel coactivator with tumor suppressor function in the prostate, 231st National Meeting of the American Chemical Society, Atlanta, GA.

Fridman, F., Erika, A., Ringia, T., and V.L. Schramm, 2006, Inhibitor screening for human nucleoside phosphorylase, bovine xanthine oxidase, and *E. coli* thymidine phosphorylase, 231st National Meeting of the American Chemical Society, Atlanta, GA.

Goldberg, M.S., Gerke, J.P., and Cohen, B.A., 2006, Correlation of gene expression and sporulation efficiency in *Saccharomyces cerevisiae*, 231st National Meeting of the American Chemical Society, Atlanta, GA.

Levine, E., Mandell, D., Jacobson, M.P., and C.S. Rapp, 2006, An implicit solvent study of phosphorylation in protein molecules, 231st National Meeting of the American Chemical Society, Atlanta, GA.

Soussan, L.L., **Harris, T., Isseroff, R.,** Sun, Y., Rafailovich, M., and A.I. Frenkel, 2006, Thiol-stabolized palladium nanoparticles: size control and hydrogenation, 231st National Meeting of the American Chemical Society, Atlanta, GA.

Estes, D.W, **Ben-Zvi, N.,** and L. Blau, 2006, The DNA melt, 19th Biennial Conference on Chemical Education, West Lafayette, IN, July.

Edelblum, R. and T. DiLorenzo, 2005, Aging: Natural buffer against the effects of multiple sclerosis, Yeshiva University Behavioral Sciences Student Research Conference.

Galian, L. and T. DiLorenzo, 2005, Pain and gender: The underlying difference, Yeshiva University Behavioral Sciences Student Research Conference.

Sweet, R. and T. DiLorenzo, 2005, Sociotropic cognitions and levels of spirituality, Yeshiva University Behavioral Sciences Student Research Conference.

Estes, D.W., **Ben-Zvi, N.,** and L. Blau, 2005, The DNA melt: Composition, sequence, and thermodynamics, Gordon Research Conference on Chemistry Education Research and Practice, Connecticut College, New London, CT, June.

Frenkel, A.I.,Pease, D.M., Shanthakumar, P., Huang, T., **Abitbol**, **N**., **Soussan**, **L**., and J. I. Budnick, 2005, X-ray absorption fine structure study of the metal-insulator transition in Cr doped V2O3, Fall Meeting of the Materials Research Society, Boston, MA

Sun, Y., Isseroff, R., **Shonbrun**, **C**., Forman, M., Frenkel, A.I., Shin, K., Koga, T., White, H., Rafailovich, M.H., and J.C. Sokolov , 2005, Characterization of palladium nanoparticles using x-ray reflectivity, EXAFS and electron microscopy, Fall Meeting of the Materials Research Society, Boston, MA

Nissim, H.A., **Krupka, M.E**., Zuckerbraun, H.L., and H. Babich, 2005, Differential *in vitro* cytotoxicity of (-)-epicatechin gallate to cancer and normal cells from the human oral cavity, 229th National Meeting of the American Chemical Society, San Diego, CA.

Roth, R., Ozelius, L., and L. Liu, 2005, Explanation of alternative splicing in SGCE gene, 229th National Meeting of the American Chemical Society, San Diego, CA.

Nemzer, S., **Harris, T**., **Pister, I**., **Soussan, L**., Sun, Y., Rafailovich, M., and A. Frenkel, 2005, Characterizing nanoparticle size using EXAFS and TEM, 229th National Meeting of the American Chemical Society, San Diego, CA.

Nemzer, S., **Harris, T**., **Pister, I**., **Soussan, L**., Sun, Y., Rafailovich, M., and A.I. Frenkel, 2005, Size control of thiol-stabilized gold nanoparticles: combined EXAFS and TEM characterization, 229th National Meeting of the American Chemical Society, San Diego, CA.

Pister, I., Soussan, L., Nemzer, S., Harris, T., Frenkel, A.I., Sun, Y., and M.H. Rafailovich, 2005, Size dependent changes of the local structure in dodecanethiol-stabilized gold nanoparticles, Annual Meeting of the American Physical Society, Los Angeles, March (oral presentation).

Goldmintz, Y., and T. DiLorenzo, 2004, Efficacy of selective serotonin reuptake inhibitors vs. tricyclic antidepressants in elderly melancholic depressed, Yeshiva University Behavioral Sciences Student Research Conference.

Wiesen, T., and T. DiLorenzo, 2004, Somatization in Dominican individuals, Yeshiva University Behavioral Sciences Student Research Conference.

Wright, N. and T. DiLorenzo, 2004, Social influence on women and heart disease: Perceived risk and preventive health behaviors, Yeshiva University Behavioral Sciences Student Research Conference.

Ben-Zvi, N., Juszczak, L. and J. Friedman, 2004, Unfolding and refolding of the mini-protein TC5b in a confined, cell-like environment, 227th National Meeting of the American Chemical Society, Anaheim, CA.

Douglas, E., Ravetch, J.V. and B. Diamond, 2004, Fcγ receptor expression on peripheral blood mononuclear cells in SLE, 227th National Meeting of the American Chemical Society, Anaheim, CA.

Glasner, D., Frenkel, A.I, and F.R. Zypman, 2004, Geometrical properties of metal nanoparticles, 227th National Meeting of the American Chemical Society, Anaheim, CA.

Suttner, S., Sukhu, B., and H.C. Tenenbaum, 2004, Effect of the inflammatory cytokine (IL)-1β on osteoclast formation and function in human umbilical cord blood cells, 228th National Meeting of the American Chemical Society, Philadelphia, PA

Reinman, I., **Benmergui, D**., and C.S. Rapp, 2004, Theoretical investigation of ligand stabilization in fatty acid binding proteins, 228th National Meeting of the American Chemical Society, Philadelphia, PA

Glasner, D., Zypman, F., and A.I. Frenkel, 2004, *G*eometric properties of metal nanoparticles, Annual NSLS Users Meeting, Brookhaven National Laboratory, May.

Frenkel, A.I., **Glasner, D.,** Zypman, F., Nuzzo, R., and L. Menard, 2004, 3D-structure of thiol-capped gold nanoparticles, Annual Meeting of the American Physical Society, Montreal, Canada.

Reingold, S.O., Gu, J., Fernandez, R. and R.L. Katz, 2003, Interphase fluorescence *in situ* hybridization (FISH) to demonstrate translocation of cyclin D1 (CCD1) gene to chromosome 14 immunoglobulin heavy chain locus (IGH) with resultant overexpression of cyclin D1 protein in a mantle cell lymphoma cell line, 225th National Meeting of the American Chemical Society, New Orleans, LA

Sedletcaia, A. and P. Cohen, 2003, Localization of PMS2 in meiotic cells, 225th National Meeting of the American Chemical Society, New Orleans, LA.

Josovitz, J., Verdier-Pinanrd, P. and S. B. Horwitz, 2003, Analysis of stathmin and MAP- 4 content in taxol resistant cell lines, 225th National Meeting of the American Chemical Society, New Orleans, LA.

Gamss, C.A., Ting, L.-M., and K. Kim, 2003, Inhibition of the purine salvage pathway in *Plasmodium falciparum*, 226th National Meeting of the American Chemical Society, NY, NY.

Frankel, R., Fischer, T. and C.S. Rapp, 2003, The effects of crystal packing on protein loop structures, 36th Middle Atlantic Regional Meeting of the American Chemical Society, Princeton, NJ

Frenkel,A.I., **Frankel, S.C.,** and T. Liu, 2003, Structural stability of giant polyoxomolybdate molecules as probed by EXAFS. XAFS XII Conference, Malmo, Sweden.

DiLorenzo, T, Erblich, J, Montgomery, G, **Ephron, R, Shaffren, M** and Bovbjerg, D, 2002, Family histories of disease and disease-specific worry: The role of perceived risk. National Meeting of the Society of Behavioral Medicine Annual Meeting, Washington, D.C.

Frankel, S.C., and A. Frenkel, 2002, Reduction of nickel oxide with hydrogen from local perspective, 223rd National Meeting of the American Chemical Society, Orlando, FL.

Kenigsberg, B., Kaufman, H. and R. Glover, 2002, Immune responses to recombinant BCG expressing carcinoembryonic antigen, 223rd National Meeting of the American Chemical Society, Orlando, FL.

Kenigsberg, B., Sedletcaia, A., Estes, D. and L. Blau, 2002, Twenty years of bonding; the Chemistry club and the ACS, 223rd National Meeting of the American Chemical Society, Orlando, FL.

Nivasch, R., Chill, J. and J. Anglister, 2002, NMR-based homology model of the interferon α receptor, 2002, 223rd National Meeting of the American Chemical Society, Orlando, FL.

Sedletcaia, A., Kenigsberg, B. and H. Babich, 2002, *In vitro* cytotoxicity of protocatechuic acid, an inducer of oxidative stress, 223rd National Meeting of the American Chemical Society, Orlando, FL.

Sedletcaia, E. Matthiesen, S.H. and B.H. Sator, 2002, Parafusion homologue in *Tetyrahymena thermophila*, 223rd National Meeting of the American Chemical Society, Orlando, FL.

Frankel, S.L. and D.R. Maglot, 2001, LOCUSLINK and REFSEQ: Developing tools for genomic annotation and analysis, 221st National Meeting of the American Chemical Society, SanDiego, CA.

DiLorenzo, T, Halper, J, Piccone, MA and **A**. **Lasky,** 2001, Aging with multiple sclerosis: A preliminary investigation. National Consortium of Multiple Sclerosis Centers, Ft. Worth, TX.

Rivkin, S.Y., Oh, S. and T.A. Bargiello, 2001, Determinants of Vj gating polarity in connexin 32 hemichannels, 221st National Meeting of the American Chemical Society, San Diego, CA.

Goldfischer, R.E., Wencker, D., and R. Kitsis, 2000, Myocyte apoptosis is sufficient to cause cardiomyopathy, 219th National Meeting of the American Chemical Society, San Francisco, CA.

Marton, D., Kang, Y.H., and F. Berthiaume, 2000, Chronic exposure to cytokines suppresses liver-specific function of cultured hepatocytes, 219th National Meeting of the American Chemical Society, San Francisco, CA.

Badrian, C.C., Haspel, J., Friedlander, D., and M. Grumet, 1999, Promotion of neurite outgrowth by regions in human L1, 217th National Meeting of the American Chemical Society, Anaheim, CA.

Blau, L., Babich, H., Zuckerbraun, H.L. and **S.T. Hirsch**, 1999, *In vitro* cytotoxicity of the nitric oxide donor, *S*-nitroso-*N*-acetyl-penicillamine, towards cells from human oral tissue, 217th National Meeting of the American Chemical Society, Anaheim, CA.

Feig, J.S., Cleary, J., and B. Diamond, 1999, Detection of estrogen receptor α mRNA in B and T cell lines by reverse transcriptase chain reaction, 217th National Meeting of the American Chemical Society, Anaheim, CA.

Babich, H. and **S.H. Goldstein**, 1988, Bioassays for monitoring the environment: study with arsenics, 9th Annual Meeting, Society of Environmental Toxicology and Chemistry, Arlington, VA.

Ambalu, M. and L. Blau, 1986, The study of ion fluxes across lipid bilayers, 191st National Meeting of the American Chemical Society-7th Student Affiliates Research Symposium, NY, NY.

Gutman, E.A. and L. Blau, 1985, X537A-mediated transport of calcium across phosphatidylcholine bilayers, 189th National Meeting of the American Chemical Society - 6th student Affiliates Research Symposium, Miami Beach, FL [E.A. Gutman was awarded 1st prize, Biochemistry Section].

Blau, L., **Stern R.B**., Wun, T.C., and R. Bittman, 1984, Calcium transport across phosphatidylcholine vesicles, 8th International Biphysics Congress, Bristol. United Kingdom.

Student Presentations at the National Conference of Undergraduate Research

1998: **Malka Skiba** and **Cheryl Younger**
1995: **Lauren Insel** and **Judy Ehrenberg**
1994: **Yaffa Cheslow**, **Debbie Friedman**, and **Stacey Tuckman**

Derech Hateva, a Journal of Torah and Science

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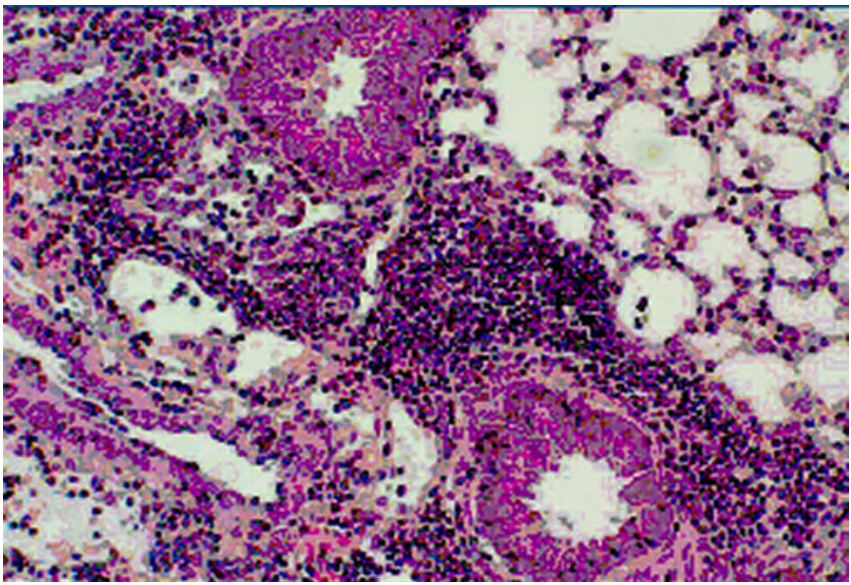

Co-Editors:
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MESSAGE FROM THE PRESIDENT, RABBI DR. ARI BERMAN

Scientific study and investigation represent the exploration of the world God has given to us. We inhabit a universe that is staggering in its complexity and breathtaking in its beauty. A world filled with an incomprehensible level of detail from the largest animals down to the single cell.

As an educational institution committed to the development of leaders grounded in Jewish values, the schools, and programs of Yeshiva University are filled with bright aspiring difference-makers poised to launch their careers and lives from our campuses. In particular, the students of Stern College for Women are situated in an ideal position to advance the scientific enterprise in the next generation. The students of Stern College for Women already occupy some of the most prestigious internships in top-flight research centers worldwide. Over this past summer, our students conducted research at Shaare Zedek Hospital, Bar Ilan University, NYU Langone, Mount Sinai Medical Center, Columbia University, and more. These institutions are leaders in their fields and our students are contributing to their revolutionary work.

This publication is both a tribute to and a signpost for the phenomenal work that our students continue to do in service to both God and humanity at large. The students featured in this publication, and the work contained in its pages, represent a *kiddush Hashem* - a sanctification of the Almighty's name - of the highest caliber.

Rabbi Dr. Ari Berman
President
Yeshiva University

Registry Trial for Carpal Tunnel Syndrome Treatment

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The carpal tunnel is a hollow passageway made of ligaments, tendons, and bones that extends from the wrist into the hand. The median nerve passes through this tunnel to provide sensation to the fingers. If there is pressure on the median nerve due to narrowing of the carpal tunnel, it can cause pain, numbness, or even loss of feeling in parts of the hand. This condition, known as carpal tunnel syndrome (CTS), is one of the most common nerve disorders affecting middle aged and older adults. The narrowing of a carpal tunnel is often caused by a buildup of scar tissue or increased tissue swelling in the region either caused by trauma, like a fractured wrist, or chronic medical conditions such as rheumatoid arthritis and diabetes. Activities that require one to grasp an object or move their wrist for long periods of time can be particularly painful for someone with CTS. Repetitive motions of the wrist can also contribute to further swelling and nerve compression.

The most common treatment for carpal tunnel syndrome is a carpal tunnel release, in which a surgeon cuts through the ligament in the wrist that is compressing the carpal tunnel. This can be done in either endoscopic or open surgery with a local anesthetic. The procedure creates more space for the median nerve in the tunnel, usually improving symptoms. Symptom severity and functional status of patients suffering from carpal tunnel syndrome is commonly assessed using the Boston Carpal Tunnel Syndrome Questionnaire (BCTSQ), which provides a self reported measure of pain and function. Changes in the BCTSQ can be tracked for a particular patient preoperatively, postoperatively, and several months or years following the procedure.

Clinical databases and registries are a useful tool for tracking the status of patients and for allowing healthcare professionals to compare different treatment options and outcomes. Though many such registries exist in the United States, there are few in Israel and particularly, there is not yet one for carpal tunnel syndrome. A database to document and track the treatment outcomes of carpal tunnel release is currently in the trial phases at Shaare Zedek Medical Center. It is the hope that eventually the procedures for establishing and maintaining the database will be extended to other hospitals in Israel so doctors can compare the most effective treatment methods.

The patient pool for this trial is composed of people who present at Sha\are Zedek with carpal tunnel syndrome and consent to be part of the study. At a preoperative appointment, patients complete a survey about their demographics, type of work, and medical history in addition to the BCTSQ. At this point, the doctor also conducts a series of physical examinations including

the Phalen's test, Tinel test, grip strength, two point middle finger discrimination, Durkan's test, and assessment of thenar atrophy to confirm the diagnosis of CTS.

At a post operative appointment following carpal tunnel release patients will complete another BCTSQ. In addition, the treating physician will complete a form regarding details of the procedure. For example, was it endoscopic or open, what type of anesthetic was used, how many days was the postoperative dressing on, and the patient's grip strength following the procedure. This information will allow for analysis of the most effective practices in treatment of CTS. Patients will then complete two more BCTSQs; one at a 6 month follow up and one at a 12 month follow up.

The trial study is currently being conducted on a Redcap, a web application for building and managing online surveys. Aspects of the trial phase for the registry include observing how long it takes patients to complete the surveys and questionnaires and altering questions accordingly. The goal of the project is to ultimately gather complete and accurate information that can be analyzed for doctors to compare their CTS treatment results to others.

cat-2, dat-1 Knockout's Protect Against 6-OHDA Induced Dopaminergic Neurodegeneration

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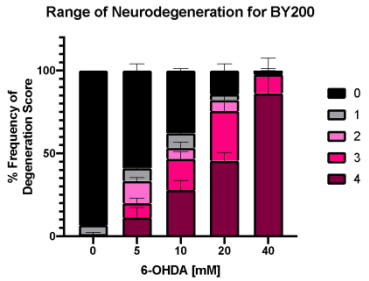
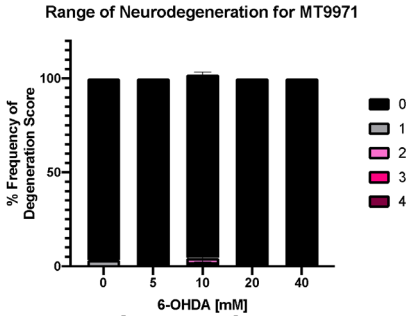
Parkinson's Disease (PD) is a neurodegenerative disorder that affects approximately ten million people worldwide. This disease targets specific nerve cells in parts of the brain known as the basal ganglia and substantia nigra. The nerve cells in this region of the brain are responsible for the production of dopamine and play a crucial role in controlling body movements and motor functions. When approximately 80 percent of the dopamine neurons are lost, PD symptoms, such as motor deficits, begin to manifest. However, though researchers have been studying this illness for years now, the selective nature of dopaminergic death is still quite poorly understood. As a result, we are investigating the specific sensitivity that dopamine neurons play in Parkinsonian degeneration. 6-hydroxydopamine (6-OHDA) is a neurotoxic organic compound used to selectively destroy the dopamine neurons in the brain. Because dopamine (DA) and 6-OHDA are similar in molecular structure, this toxicant can enter the brain by way of the dopaminergic (DAergic) reuptake transporter. Research has been previously carried about by scientists to learn more about the mechanism of damage for 6-OHDA to try to increase understanding about the mechanisms of Parkinsonian degeneration. Yet, there are still many aspects left to be explored. We know that dopamine is generally understood as a potential toxicant in the literature; however, it is not yet known whether the presence of dopamine itself plays a role in 6-OHDA's mechanism of action. In our study, we hypothesized that dopamine and the DA reuptake transporter are intrinsically necessary to render DAergic neurons susceptible to 6-OHDA. We used the *C. elegans* worm as our model organism, taking advantage of their genetic tractability, to investigate this question. GFP-tagged neurons in these transparent worms allowed us to follow neurodegeneration in a live organism upon treatment with 6-OHDA. Through our studies, we confirmed that DA neurons are the only neurons that were susceptible to 6-OHDA. Octopaminergic and serotonergic neurons were not affected at all. Additionally, *cat-2* (tyrosine hydroxylase) and *dat-1* (dopamine transporter) knockouts (KOs) were created in worms that have GFP DAergic neurons. These strains were also treated with 6-OHDA to check for changes in DAergic neurodegeneration. The results from these experiments were in line with our initial hypothesis and showed that in the absence of the *cat-2* and *dat-1*, there is an increase in protection against 6-OHDA toxicity and a decrease in degeneration. Another strain with an increase in *cat-2* in DA neurons was also treated in the same paradigm. The results of this experiment showed a significant increase in degeneration of DA neurons as compared to the wildtype DA neurons. From this we conclude that dopamine and the dopamine

reuptake transporter are necessary to sensitize dopamine neurons to 6-OHDA. The combined results of this study lead us to question whether 6-OHDA is working in tandem with dopamine thereby rendering it a contributing source of the problem.

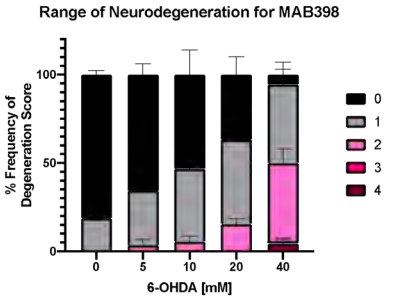


The BY200, wildtype strain, shows that with an increase in exposure to 6-OHDA there was a corresponding increase in neurodegeneration. The scale shown to the right of the graph is a rubric of degeneration that we created; With 0 indicating

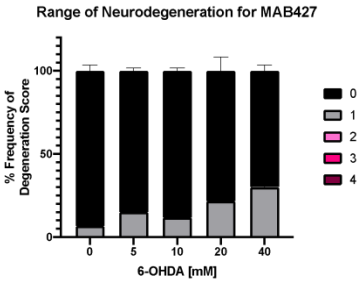
Control for Octopamingeric Neurons



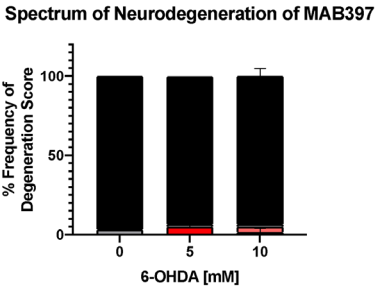
dat-1 Knockout



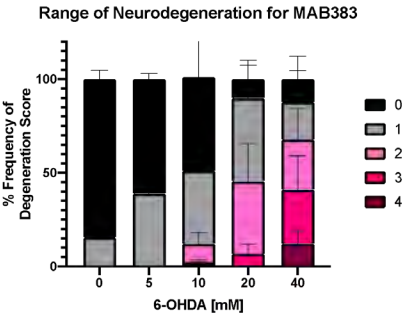
Excess *cat-2*



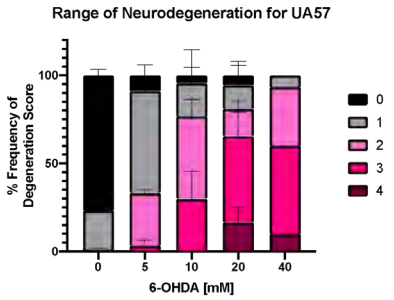
Control for Serotonergic Neurons



cat-2 Knockout



dat-1, *cat-2* Knockout



The Role of Interferon-γ in Cardiovascular Disease

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Cardiovascular diseases (CVDs) are the leading causes of death in the world, and elucidation of the processes, chemicals, and signals which surround CVD could bring clinicians one step closer to identifying better treatments. When Levine et at. discovered a positive correlation between tumor necrosis factor-α (TNF-α) and CVD, cytokines in general became identified as possible contributors to the progression of CVDs. Soon after, literature emerged identifying other cytokines— like migration inhibitory factor (MIF), Interleukin(IL)-6, IL-8, IL-10 and growth differentiation factor- 15 (GDF-15) — that contribute to CVD progression. These cytokines molecularly affect all mechanisms of adverse cardiovascular function.

Interferon-γ (IFN-γ) is an inflammatory cytokine well known for its role in CVD and specifically atherosclerosis. As the only type II interferon, IFN-γ binds to a distinct heterodimeric IFN-γ receptor and is 100-10,000 times more active as an immunomodulator than any other class of interferons. IFN-γ is markedly different than any one of the Type I interferons, although both share the antiviral, growth-inhibitory effects, and immunosurveillance of interferons. The genes that encode Type I interferons are clustered on Chromosome 9 in humans and all share a common homology while Type II interferons— IFN-γ— is located on chromosome 12 and share no common homology between Type I interferons.

IFN-γ plays an important role in both innate and adaptive immunity. Natural killer cells, T helper- 1 cells, CD8+ cytotoxic T cells, natural killer T cells, innate lymphoid cells 1, subsets of dendritic cells and B cells are the primary source of IFN-γ. IFN-γ promotes chemokine expression and recruits leukocytes by their transfer in the endothelial layer, all while activating macrophages and fibroblast-like synoviocytes to promote antigen presentation, increasing T helper 1 differentiation, activating natural killer cells and nitric oxide synthase.

Evidence has shown that IFN-γ helps modulate 2,339 human genes primarily through the Janus Kinase (Jak) signal transducer and activator of transcription (STAT) pathway and other similar pathways. The vital role of IFN-γ must be highlighted, since the cytokine is a central cytokine to normal homeostasis and immunity. Its depletion has been shown to increase susceptibility to infections. In addition, although IFN-γ affects the transcription of many similar genes to Type I Interferons, treatment of IFN-α did not provide complete treatment to IFN-γ depleted organisms. This suggests that IFN-γ has a non-redundant clinical role to the normal homeostatic function of organisms.

In particular, the inflammation caused by cytokines like IFN-γ have a direct connection to cardiovascular diseases. In addition to other pro-inflammatory cytokines, IFN-γ drives the formation, progression, and rupture of atherosclerotic plaques. In atherosclerosis, inflammatory cells accumulate at sites of endothelial injury, where they then contribute to the development of an atherosclerotic plaque. Plaque instability then leads to myocardial infarction or other cardiovascular manifestations, to which proinflammatory cytokines like IFN-γ contribute.

Over the past decade, clinicians have been searching for a better treatment for CVD than statins, since it often leads to unintended drug-drug interactions and increases the risk of adverse events, including statin- associated and hepatotoxicity. Even regardless of the adverse drug-drug interactions that could occur, statins are just not as effective as patients need them to be, as target lipid levels have been difficult to achieve even with the highest recommended levels of statin therapy. The inflammatory theory of CVD links inflammation to CVD biomarkers and causal agents in the pathophysiological network of atherogenesis and plaque vulnerability, and indicates that anti-inflammatory treatment may be a viable option for reducing cardiovascular risk. IFN-γ presents a promising target to be tested to reduce inflammation in patients with cardiovascular disease, mostly through targeting the cytokine itself or targeting the IFN-γ pathway.

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Recycling Methods for Carbon Nanotube Based Films

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The evolving technology of the 21st century demands production of energy storage devices with maximal chemical and mechanical efficiency. Environmental ecology, however, requires that methods for preparing such devices produce minimal waste and utilize recyclable components. Carbon nanotubes (CNTs) are becoming increasingly more important in energy storage applications due to their unique structure and conductivity properties. The high length-to-diameter ratio as well as the covalent sp^2 bonds in CNT networks bring superior electronic and chemical properties that render them ideal electrode material. The intrinsic low solubility of this particular carbon allotrope is solved by dispersing the CNTs with perylene diimide (PDI) derivatives and applying sonication, creating a charge shift from the CNTs to the PDI that increases the hydrophilic nature of the carbon nanotubes. Hybrid buckypaper films are produced via self-assembly by deposition of CNT/EP-PDI (wt 1:1) dispersions onto polyvinylidene fluoride (PVDF) membranes over a simple filtration apparatus. SEM images show that the thickness of the films is about 30 microns. The hybrid nanocomposite films are conductive and mechanically robust, and all of the components may be recovered and reused.

Two methods of recycling and reusing the film components were performed and assessed in order to minimize waste production. In a cycle of ten films, the chloroform filtrate was used each time to dilute the 1:1 CNT/EP-PDI solution, repeatedly increasing the filtrate's EP-PDI concentration. In a cycle of five films, the chloroform filtrate was used each time to disperse the CNTs, without adding anymore EP-PDI to the solution. The latter proved to be the superior method, as it reuses more components while also consistently producing films of superior quality. The filtrate's EP- PDI concentration was acquired using a UV-VIS-NIR spectrophotometer 5000. After production of five films using the same solution, the EP-PDI showed a 91% average recovery with both the electrical and mechanical properties of the films appearing unchanged. We concluded that the amount of EP-PDI lost was negligible and that we are able to produce the same quality films via this recyclable method.

Integrative Narrative Analysis in Typical Adults and People with Aphasia PWA

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I worked with Dr. Carmit Altman on the integrative analysis of narratives that included narrative structure, grammaticality, and fluency features in typical adults with and without aphasia (Mira Goral) . The participants were asked to tell a personal narrative about a vacation they went on, and afterwards, their narratives were transcribed and coded into different Analysis of Speech Units (AS Unit; Foster et al., 2000). Each AS Unit was analyzed both for microstructure and macrostructure. We analyzed each AS Unit to see if it had global and local coherence, the amount of clauses, and how meaningful they were. We also determined what part of the story scheme was an evaluation, setting storyline or an irrelis (Longacre et al, 1996; Labov & Waletzky, 1997/1982). Then, each clause was rated for grammaticality and each word in the clause was broken down linguistically into: nouns, verbs, adjectives, articles, pronouns, auxiliary verbs, and whether they functioned as fillers, false starts, and discourse markers. However, when we were analyzing and coding each narrative, we did not know which participants had aphasia. This was done in order to keep the coder unbiased when analyzing the different texts. After the coding is done, Dr. Carmit Altman who is spearheading this project, will analyze the data and finally reveal which adults actually had aphasia. Based on these data, we will be able to identify which features best characterize the narratives of people with aphasia in comparison to an equivalent control group.

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Developing a System for Citrate Uptake Complementation by Expressing NaCT in *E. Coli*

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NaCT is a sodium citrate coupled transporter protein in humans that allows for the uptake of citrate. It is essential for brain function and cellular metabolism. NaCT is encoded by the gene SLC13A5, found on the 17th chromosome. A condition known as SLC13A5 deficiency is an autosomal recessive trait which occurs when the SLC13A5 gene is mutated, and thus the NaCT transporter does not fold properly. It is characterized by early-onset epilepsy, developmental delays, and tooth dysplasia. Developing a treatment method for those suffering from SLC13A5 deficiency is a pressing concern. This experiment attempts to develop an assay to be used for high throughput screening of chemical libraries. If the mutated protein is exposed to a large number of different chemicals, it is possible that one of the chemicals may induce it to fold properly, and thus function. The assay is developed by expressing the NaCT protein in *E.Coli* cells and growing them in media in which citrate is the only carbon source. *E. coli*'s citrate transporter is highly regulated, only being expressed in anaerobic conditions. If the NaCT transporter has not successfully folded in the *E. coli*, it will not grow under aerobic conditions on media with citrate as the sole carbon source, as it will not be able to absorb citrate from the environment. To express NaCT in bacteria, there are some challenges to overcome. The first is codon usage bias, which is the difference in the frequency of different codons between different types of cells. The SLC13A5 gene has been recoded so that it conforms to the *E. coli* codon frequencies. This should allow the human protein to be expressed more efficiently in the bacteria cell.

The second challenge of expressing a human cell membrane protein in bacteria, is the differences in transcription and translation processes in the cells. One method of overcoming this difference is to attach fusion proteins to the protein of interest. These are proteins that are fused to the target protein and assist in the overexpression of the protein. They increase the solubility and folding of the protein, thereby increasing the likelihood of successful expression. Several different protein combinations were attempted to express the NaCT, including attaching chaperones to the N, C, or both termini. The proteins used were short, hydrophilic, and globular, called YaiN (α) and YbeL (β). Another option for the fusion protein is the Green Fluorescent Protein. The intention is that some combination of fusion proteins and NaCT will allow for proper folding. Once the construct has been proven to express the NaCT protein properly in bacteria, a mutated form of the gene can be transformed into the same construct. It is expected that this mutant transformer will not support growth. It will form the basis of a drug screen, where small molecules

which support growth indicate that they support proper folding of the NaCT protein.

The NaCT gene optimized for *E. coli* was inserted into a vector containing the fusion proteins of interest for each construct through restriction enzyme cloning. Then the entire construct of NaCT and fusion proteins was inserted into a complementation vector, pGEM-5Zf, through ligation independent cloning. This vector allows for the unregulated expression of the protein compared to the tightly controlled pET vectors on which the fusion proteins are found. This plasmid was transformed into Top 10 chemically competent *E. coli* cells and grown in 96-well plates in minimal media containing citrate, for 48 hours, with absorbance checked every hour. As a positive control, a citrate transporter from *K. pneumoniae* was inserted into the pGEM-5Zf vector and transformed into the *E. coli.* This protein had been successfully inserted into *E. coli* previously without the addition of fusion partners. The cells containing the KpCitS protein were able to grow successfully in the minimal media, due to the expression of a citrate transporter. The growth of *E. coli* containing the NaCT constructs were compared to those containing KpCitS.

The constructs that have been attempted are α and β on the N termini. Additionally, growth cells with the combination of NaCT with β on the N and C termini on the pET vector, with the addition of IPTG to the media was attempted. The IPTG inactivates the lac repressor, while not being metabolized, causing expression of the NaCT protein, without providing an alternative carbon source. As of yet, the constructs attempted have not yielded a positive functioning of NaCT, but we are hopeful that the continuing optimization of the assay may prove successful.

Modelling Intracerebral Hemorrhage *In Vitro*

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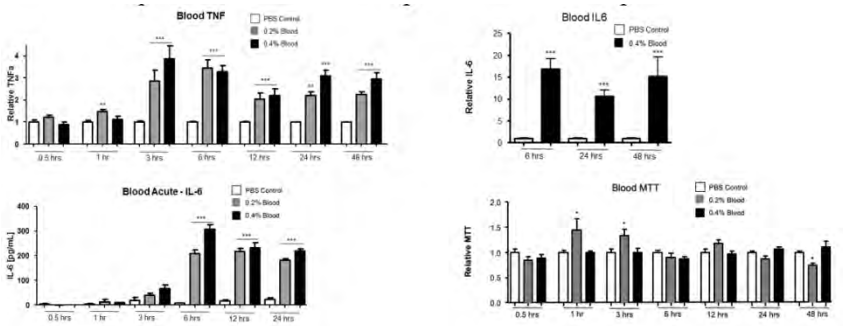
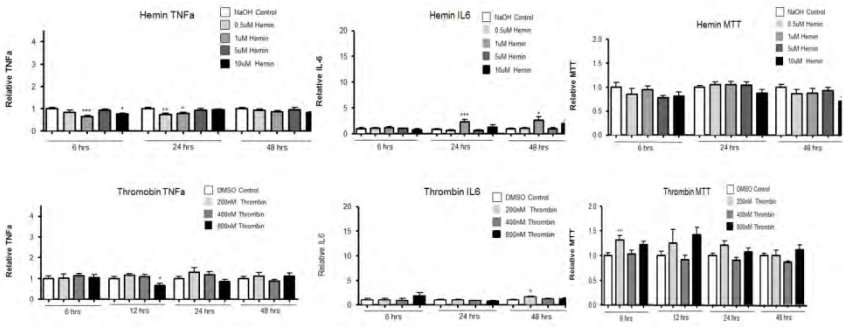
Many neurodegenerative pathologies have been associated with inflammatory activation Microglia. In relation to Intracerebral hemorrhage (ICH), microglia come in direct contact with blood leading to an inflammatory response in the perihematomal space. ICH's current classic *in vitro* models depend on hemin and thrombin as mimicking brain insults and inducing microglia inflammation. We hypothesized that to better model ICH *in vitro*, whole blood can be used as a more reliable, powerful and precise stimulators.

With the a desire to mimic mouse models of ICH, BV2 murine microglia were exposed to media, enhanced with either 0.2% or 0.4% mouse blood, 0.5, 1, 5, 10uM of hemin, 200, 400, 800nM of thrombin, or 0.2% or 0.4% of mouse plasma. They were incubated for 0.5hrs, 1hr, 3hrs, 6hrs, 12hrs, 24hrs and 48hrs. Microglia were exposed to hemin supplemented media because hemin is a widely common stimulants used *in vitro* to model ICH. In addition to hemin, it has been assumed that thrombin proliferates the inflammatory response following ICH. Plasma was used to stimulate microglia and conclude if there was pro-inflammatory cytokine secretion. The cultured media was collected at 0.5hrs, 1hr, 3hrs , 6hrs, 12hrs, 24hrs, and 48hrs after hemin, thrombin, plasma and blood stimulation. The collected cultured media was then used to assess the secreted pro-inflammatory cytokines (tumor necrosis factor (TNFa) and Interleukin 6 (IL-6) by ELISA (enzyme-linked immunosorbent assay). MTT assay, a colorimetric assay, was used to produce the results of the cell viability.

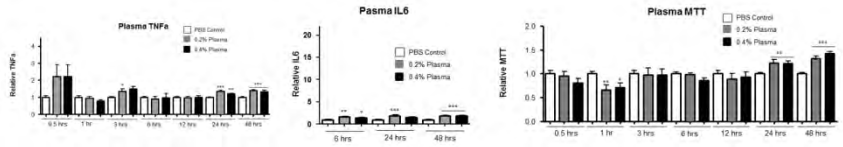
A significant increase in secreted TNFa and IL-6 was detected in microglia stimulated with blood exposure. In evaluating the effect of blood stimulation by MTT assay, we found no toxicity in stimulation up to 48 hours of blood exposure with the exception of 0.2% blood at 48 hours.



Unlike blood and plasma, where TNFa and IL-6 were stimulated, hemin and thrombin did not result in an increase in TNFa at any point, with the exception of 1uM hemin at 24 and 48 hours.



Plasma had very small rises in TNFa with both the 0.2% and 0.4% plasma. It had a maximum increase of 1.39 fold at 48 hours. IL-6 increases were displayed at time points greater than 6 hours of incubation. The highest increase of 1.92 fold was seen at 48 hours. Plasma supplemented media was determined to have no detectable levels of TNFa or IL-6.



We found that blood supplemented media produces a consistent and robust inflammatory response in microglia as measured by TNFa and IL-6. Although moderate induction of both cytokines were shown in plasma, it is not as potent as blood. We did not detect microglial activation in response to hemin or thrombin. Given these results, we conclude that the potent and consistent activation of whole blood stimulated microglia mark this as a better model for ICH *in vitro*, as opposed to hemin and thrombin, allowing for more advanced therapies to reduce stroke related inflammation.

The Use of Indole-3-Carbinol for Treatment of ERa-positive Breast Cancer Cells

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Breast cancer is the second leading cause of cancer related deaths among women and it is estimated that more than 200,000 new cases are diagnosed each year in the United States, resulting in over 40,000 deaths annually. Though tremendous progress has been made in understanding different mechanisms that lead to cancer progression, approximately 40-50% of cancers fail to respond to conventional treatment methods, leading to patient relapse and cancer recurrence, highlighting the need for novel therapeutic strategies.

Breast cancer is often divided into Estrogen Receptor alpha positive (ERα+) and Estrogen Receptor alpha negative (ERα-) breast cancers, based on the tumor's expression of the estrogen receptor and dependence on estrogen signaling for survival. When breast cancer cells have a significant number of receptors for estrogen or progesterone, they are considered hormone-receptor positive. Similarly, breast cancer cells with high levels of HER2, a growth-promoting protein on the outside of all breast cells, are referred to as HER2-positive.

The ERα-positive breast cancers are treated with anti-estrogen therapy to stop cancer progression. However, 40-50% fail to respond to treatment and many develop resistance, which indicates that ERa-positive breast cancers depend on additional signaling mechanisms to survive.

A pathway that is often hyperactivated in breast cancer is the mechanistic target of rapamycin or the mTOR signaling pathway, which serves as the master sensor of nutrient availability within the cell and regulator of protein synthesis and cell growth. mTOR is a serine/threonine kinase that belongs to the phosphatidylinositol 3-kinase-related kinase (PIKK) family, that plays a crucial role in regulating cell growth and gene expression as well as DNA damage. mTOR interacts with other proteins to form two different complexes: mTOR complex 1 (mTORC1) and mTOR complex2 (MTORC2). These two complexes vary in their protein composition, downstream targets, and sensitivity to rapamycin, an FDA approved drug for the treatment of ERα-positive breast cancer, also known as sirolimus.

The PI3K/Akt/mTOR signalling pathway is often hyperactivated in a variety of human cancers. As hyperactivation of this pathway results in unrestricted cell growth, inhibition of mTOR signaling is often accomplished with the use of rapamycin, a macrolide produced by the bacterium *Streptomyces hygroscopicus* that has immunosuppressive and anti-proliferative properties.. However, rapamycin treatment alone is not successful in maintaining prolonged inhibition of the mTOR signaling pathway and patient relapse often

occurs upon cessation of treatment. One of the mechanisms that is responsible for this effect is the fact that rapamycin treatment upregulates autophagy, a cellular process that degrades and recycles misfolded or damaged proteins during nutrient deprivation. Cancer cells utilize this mechanism to continue to survive under stress-induced or low-nutrient conditions, protecting cancer cells from cell death and leading to acquired drug resistance.

Indole-3-carbinol (I3C) is a natural anti-carcinogenic compound with low toxicity, is produced by the hydrolysis of glucobrassicin and is found at high concentrations in Brassica vegetables, such as broccoli, cauliflower, cabbage and Brussel sprouts. Studies have shown that I3C is able to downregulate ERa signaling, induce cell death and regulate different components within mTOR signaling pathway. I3C also regulates processes such as apoptosis and autophagy, which contribute to its anti-tumor effect.

This led us to investigate the use of rapamycin together with I3C in inhibiting ERa-positive breast cancer development. Since I3C was previously shown to regulate the PI3K/Akt signaling pathway as well as apoptosis and autophagy and rapamycin has shown to maintain inhibition of the mTOR signaling, we propose that the combination of I3C and rapamycin will not only maintain inhibition of the mTOR signalling pathway, but will induce cell death and a more sustained outcome.

Experiments using MCF7, an ERa-positive breast cancer cell line showed that the combination of rapamycin together with I3C induces apoptosis, as evidenced by upregulation of cleaved PARP fragment (poly (ADP-ribose) polymerase) as well as down-regularization of survivin, a negative regulator of apoptosis. This was further confirmed by the finding that the combination of I3C together with rapamycin inhibited cell viability as tested by the neutral red, a cell cytotoxicity assay, Additionally, combination therapy inhibits rapamycin-induced upregulation of autophagy as evidenced by the LC3II levels, and maintains inhibition of the mTORC1/S6K1 signaling pathway as evidenced by the immunoblot of p-Akt S473, p-S6K1 T389, p-4EBP1 S65 and pS6 S240/244.

Taken together, our results indicate that combination of rapamycin together with indole-3-carbinol may be more effective therapy than rapamycin treatment alone in inducing cancer cell death while maintaining inhibition of mTORC1 signaling. Such therapy is very promising for breast cancer patients in creating a sustained response.

Evaluating the Relationship between Fluency Measured at Different Levels of Reading and Reading Comprehension in English as a Foreign Language Among Arabic Speaking Learners

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Fluency while performing a reading task is the combination of speed and accuracy. Thus far, research has focused on the relationship between accurate word recognition and improved reading comprehension, while marginalizing the importance of speed. Therefore, fluency was not a primary concern in the design of reading development research for First language (L1) or Foreign language (FL). Moreover, in cases where fluency was tested, previous research defined fluency as the outcome of reading rate and accuracy at the word level (word reading fluency, hereafter WRF), while ignoring Text/Oral reading fluency (TRF).

This previous research has had a negative impact on reading theory. Children who exhibit typical isolated-word decoding accuracy skills, but lack the ability to perform elementary text- based comprehension tasks often do not receive appropriate attention.

Additionally, fluency at both the word and text levels is an essential component of reading comprehension (RC) in both L1 and L2, yet, much remains unknown about whether word fluency and text fluency reflect one fluency construct or two independent constructs.

Mona Saba's PhD research addresses the lack of current research on this topic and investigates fluency among a sample of Arabic speaking learners of English as a foreign language
(EFL) in grades 6, 7, and 8 at three different levels: metalinguistic awareness fluency, WRF, and TRF. This study explores the relationship between these three skills and RC in EFL through parallel Arabic and English speed and accuracy measures. Additionally, the present study addresses metalinguistic fluency in Arabic L1 and its relationship to the same skills in EFL, as well as to WRF and TRF in EFL. Finally, this research investigates whether fluency measured at the different levels enhances or changes our understanding of reading development in EFL than parallel speed and accuracy measures.

This study is expected to provide a deeper understanding of the nature of fluency in EFL, an area of research that is currently lacking sufficient attention, as well as of the nature of development of fluency in EFL among Arabic speaking learners of EFL.

Non-Small Cell Lung Cancer in Never Smoking Women: Higher Susceptibility and Low Dose CT Scan

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According to the American Cancer Society, lung cancer is by far the leading cause of cancer death among both men and women. About 13% of all new cancers are lung cancers. It is the second most diagnosed cancer in women and is the leading cause of cancer related mortality having surpassed breast cancer. Tobacco smoking is widely known to be the main contributor to lung cancer. More than 85% of all patients with lung cancer have a cigarette smoking history, yet only 20% of smokers acquire lung cancer. This suggests that there are factors other than smoking that highly contribute to lung cancer. Gender might be one of them. Recent studies suggest that women, especially never smoking women, might be at a higher risk than men for lung cancer.

According to Lung Cancer Foundation, lung cancer kills 193 women every day – 8 per hour, one death every 7 minutes. Due to increasing smoking rates among women since the World War II, the rate of lung cancer has increased. The risk of lung cancer for males peaked during the 1960s and had since declined as opposed to the rate of lung cancer risk for women that has been constantly rising since the 1960s (Risch et al, 1993). This rise is partly contributed to by the aggressive marketing by the tobacco companies. As a result, there has been an increase of lung cancer incidence in women. According to the Centers for Disease Control and Prevention (CDC) and National Cancer Institute (NCI) statistics for 2001-2015, invasive lung and bronchus cancer are more prevalent in women (296,839 counts) than in men (251,211 counts). Numerous studies have been conducted on this topic. The International Early Lung Cancer Action Program (I- ELCAP) study found that lung cancer was diagnosed nearly twice as often in women compared to men (156 women versus 113 men, rates of 2.1% and 1.2%, respectively). The article concluded that women appear to be have increased susceptibility to tobacco carcinogens when adjusted for age and smoking history but have a lower rate of fatal outcome of lung cancer compared with men. According to the International Association for the Study of Lung Cancer, (IASLC), between 1992 and 2018 in north America there has been a higher prevalence rate in women than in men (2.2% vs. 1.5% respectively). Moreover, the American Lung Association reports that the rate of new lung cancer cases (incidence) over the past 41 years has dropped 35 percent for men while it has risen 87 percent for women. Data from American Cancer Society also expects a higher percentage of women younger than 49 years old to have lung cancer than men – 1 in 673 versus 1 in 719 respectively.

It can be assumed that the rise of lung cancer in women comes from an increased smoking rates among women that might have surpassed the smoking rates of men. However, according to the National Institute on Drug Abuse, men tend to use all tobacco products at higher rates than women. The findings suggest that women, especially younger women, are more susceptible to lung cancer, but is it true for never smoking women? Lung Cancer Alliance reports that women who are never smokers are more than twice as likely to get lung cancer as men who are never smokers. Research by Dias et al showed that out of 558 patients, 125 (22.4%) were never-smokers. These patients were more likely to be female (74% women vs. 26% men) and have adenocarcinoma (93%). This type of lung cancer occurs mainly in current or former smokers, but it is also the most common type of lung cancer seen in non-smokers. It is more common in women than in men, and it is more likely to occur in younger people than other types of lung cancer.

Even though women seem to be more susceptible to lung cancer, they have better survival rates. The overall survival of women was significantly better than that of men for both adenocarcinoma (5-YSR, 77.7% versus 61.9%) and non-adenocarcinoma (5-YSR, 59.3% versus 53.1%). Furthermore, women lived an average of 12 months longer than men, even though equal numbers of stage I disease were present in both groups and more stage IV disease was present among the women (Sakurai H. et al, 2010). According to the CDC and NCI statistics, women have a better survival rate (22.6) than men (16.2). The American Cancer Society also expects better survival rates among women than men in 2019: 66,020 estimated deaths due to lung cancer for women as opposed to 66,020 for men.

It is still not clear as to why women have better survival rates than men. Some research suggests that adenocarcinoma, that is prevalent in women, may be progressing slower than squamous cell carcinoma, that is more prevalent in men. In addition, hormone replacement therapy (HRT) has been associated with decreased survival in lung cancer. Women with lung cancer who received HRT were younger than the women who were not on HRT. Moreover, an increased survival rate in women might be attributable to the higher rate of epidermal growth factor receptor (EGFR) mutations that correspond with a better treatment prognosis. However, low dose CT (LDCT) scan has been shown to increase lung cancer survival to 80% or higher. The cancer is diagnosed and treated earlier than in routine clinical care.

The I-ELCAP research program aims to achieve early diagnosis, treatment, and ultimate cure of lung cancer with the help of LDCT scan. I-ELCAP's methodology involves finding an abnormality on the baseline CT scan. Afterwards, a senior radiologist will make a recommendation based on a particular finding such as a short term follow up scan to observe the growth of the nodule. Other recommendations may include a PET scan or an invasive biopsy to confirm whether the nodule is cancerous or not. On the other hand, a patient might be just asked to come back for an annual CT scan. In addition, the participants provide the information on smoking and medical history.

According to the I-ELCAP, annual CT screening allows at least 80% of lung cancer to be diagnosed at clinical Stage I. The estimated overall cure rate for the 484 patients diagnosed under CT screening was 80% and when diagnosed in Stage I, the cure rate was 92%. Research is ongoing, taking in larger samples of patients to reaffirm early findings and open new suggestions for future research regarding treatment and diagnosis.

CT screening provides information on emphysema and coronary artery calcifications as well as providing a counseling opportunity for smoking cessation.

It is expected that the widespread practice of annual LDCT scan will greatly increase the diagnosis of stage I lung cancer and greatly increase survival rates. If that proves to be true, future research into early detection should focus more on including women, especially never smoking young women, in their programs.

The Cellular and Developmental Roles of the Essential Protein Codanin-1

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Congenital Dyserythropoietic Anemia I (CDA I) is a rare autosomal recessive disorder associated with macrocytic anemia and bone abnormalities. The disorder is caused by a mutation in the *CDANI* gene which encodes for Codanin-1 protein. Our research focuses on the study of the function of Codanin-1 protein. Not much is known about the cellular role of this vital protein. Predictions of Codanin-1's function are further limited by the fact that there are no proteins with a similar genomic sequence to Codanin-1. However, the 3D structure of any protein, as determined by polypeptide folding, hydrophilic and hydrophobic regions, plays a significant role in its function. The predicted 3D structure of Codanin-1 was found to be very similar to the 3D structure of CNOT-1 protein. CNOT-1 has a key role in mRNA stability, translational repression, and transcriptional regulation. Therefore study of the similarities between Codanin-1 and CNOT-1 may allow prediction of cellular function. Furthermore use of CdanR1054W mice, containing the most common human CDA 1 mutation, as an experimental model will allow for the elucidation of Codanin-1's possible involvement in the cell cycle.

Mutated mice were established by using embryonic cells. Embryonic cells grow well in culture and can be experimentally modified. The *CDANI* gene was deleted from the embryonic cells using a process called Cre-Lox recombination; this process is a site-specific recombinase technology, used to carry out deletions, insertions, translocations and inversions in the DNA of cells. Cre-recombinase has the ability to cut out a floxed gene surrounded by two lox P sites. In our research the floxed gene is *CDANI*. Embryos containing an activated Cre protein and floxed Codanin in their genome died within several days of embryogenesis because mice homozygous for the null *Cdan* allele die at an early stage of embryonic development. This leads to the conclusion that Codanin-1 protein is necessary for normal embryonic development. Embryonic mouse fibroblasts, cells involved in animal connective tissue, with floxed *CDAN1* and inducible Cre were grown in cell culture. Under Cre induction, they were analyzed microscopically and it was determined that they were arrested during cell division. A lower percentage of dividing cells were noted with more heterogeneity in nuclear size and a much higher percentage of bi-nucleated cells. This leads us to assume that Codanin-1 is involved in cellular division. Furthermore the presence of chromatin bridges between the two nuclei indicates that *CDAN1* deletion results in cytokinesis failure.

CNOT1 is a scaffolding protein, which is involved in RNA-related processes including mRNA deadenylation, translational repression and transcriptional

control.The significant similar 3D structure of Codanin-1 and CNOT1 suggests similar scaffolding functions for Codanin-1, and possible involvement in similar processes. The major similar structural domains were studied, and identification of interacting proteins bound to these fragments was performed. There are two major approaches utilized to identify these interacting proteins. First, antibodies against Codanin-1 were used for co-immunoprecipitation from HeLa cells, the precipitated proteins were identified by mass-spectrophotometry in the Smoler Proteomics Center, Technion, Haifa, Israel. Protein identification was also accomplished via Tandem affinity purification (TAP). TAP is a form of immunoprecipitation, with the special feature of extracting the protein of interest by tagging it with two high affinity purification tags. In immunoprecipitation only the proteins attached to our protein will precipitate. It is essential to study which proteins bind to determine the similarity between Codanin-1 to CNOT1 and to give us a clue as to what the overall function of Codanin-1 is. C15orf41 is one of two proteins known to be bound to Codanin-1 and for several reasons seems to be very promising in helping to determine the role of Codanin-1. Interestingly, it has been found that a mutation in C15orf41 explains 20% of the cases of CDA1 anemia - the same anemia caused by Codanin-1 mutation.

My area of research focused on further study of C15orf41. Based on C15orf41's sequence it was predicted with high certainty that it is a nuclease, an enzymatic protein that cuts nucleic acids. However, this could allow for many different roles, depending on what type of nucleic acid it cuts. Therefore we decided to produce high quantities of functional C15orf41 protein and incubate it with different types of nucleic acids to see where it would cut. In order to do this we are in the process of producing this protein in a bacterial system that will give a high yield of functional clean protein. In addition, my research involved determining which proteins bind to Codanin-1 on a fragment adjacent to fragment 6, the C-terminal part of Codanin-1, known to bind C15orf41. It is vital to identify and study the proteins that bind to specific areas on Codanin-1, because these proteins may lead to a better understanding of the function of Codanin-1.

SUMOlaytion and Its Role in Male Infertility

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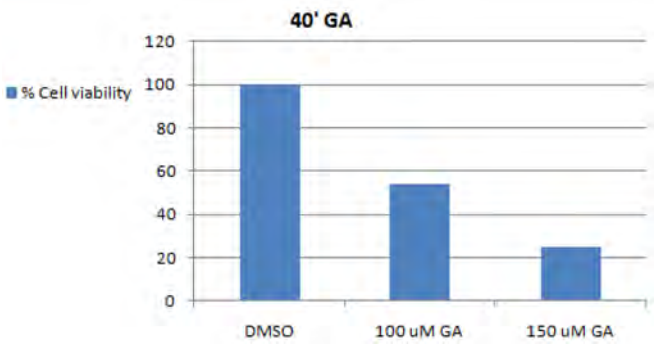
Infertility issues equally affect both males and females. 35% of infertility issues in couples result from the male. Some causes of male infertility derive from damage to the process of spermatogenesis. Damage to this process can affect the male reproductive organs and testis. Within the process of spermatogenesis, there are many molecules and subprocesses which need to occur, such as the modification of proteins by SUMO proteins which are highly expressed in germ cells.

The Vigodner lab sets out to determine the precise roles SUMO proteins play during spermatogenesis and in male fertility. Over the summer, the research focused on the role of sumoylation in Sertoli cells, which are pivotal for spermatogenesis since they produce numerous growth factors and hormones to support germ cell development Therefore, if Sertoli cells are in any way non-functional, this can in turn affect male fertility. In the lab, a mouse Sertoli cell line was maintained and treated with different concentration of Ginkgolic acid (a chemical that inhibits sumoylation. Using spectrophotometric and chemiluminescence analysis (Promega GloMax machine), we have performed viability and proliferation assays following the inhibition of sumoylation. We have also used different antibodies and caspase assays to test whether the apoptosis (programmed cell death is induced). We have found that both Sertoli cell proliferation and survival are affected upon the inhibition of sumoylation. Preliminary data also suggest that the mode of cell death for Sertoli cells is apoptosis. The next steps would be to determine what proteins regulated by sumoylation regulate the critical aspects of Sertoli cell proliferation and survival.



Inhibition of sumoylation (40 minutes using GA) caused Sertoli cell death in a concentration-depended manner.

NMR Investigation on the Impact of WIP upon ubiquitylation of WASP

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Wiskott Aldrich Syndrome (WAS), a rare X-linked recessive immunodeficiency disease, is caused by a mutation that affects the production of Wiskott-Aldrich Syndrome Protein (WASP). [1] WASP aids in the regulation of the actin cytoskeleton which is important for many hematopoietic and immune cell functions. [2] Previous studies show that WASP-Interacting Protein (WIP)'s C terminal contains a multi-epitope WASP binding domain, which attaches to the N-terminal EVH1 domain of WASP, thus stabilizing WASP's inactive closed confirmation. Phosphorylation of WIP tyrosine residues Y455, Y468 and Y475 results in partial dissociation of the WIP/WASP complex and activation of WASP. In this state, WASP is also open to ubiquitylation-triggered proteasomal degradation. [3,4] It is unclear why WIP's partial release of WASP is responsible for the degradation of WASP as the lysine amino acids that ubiquitin attaches to (K76 and K81) are relatively exposed regardless of WIP's position. This project examines a possible explanation: before ubiquitin covalently tethers to the two lysines, it binds *non-covalently* to a WIP-shielded location as a first step towards tethering.

To conduct this experiment both a wildtype and a triple Y-to-E mutant WIP-WASP complex were expressed and isolated. The mutant complex was created with glutamic acid, an accepted phosphomimicking residue, replacing the three aforementioned tyrosine residues. Additionally, both protein complexes were expressed in growth culture containing the 15N isotope so that they could be analyzed using a Nuclear Magnetic Resonance (NMR) spectrometer. Since amino acids in the protein each contain one 1H-15N pair, they each give rise to a single cross-peak in the 1H-15N two-dimensional NMR spectrum, allowing us to observe changes in the electronic environment which typically result from protein-protein contacts. After running the 2D-NMR spectrum for the two different protein complexes and observing the pattern of cross-peaks, ubiquitin (a 76-residue protein) was added to each of the protein complex solutions and the 2D- NMR experiment was repeated. The results were compared to determine which amino acids (if any) ubiquitin has an effect on when WIP partially releases WASP, and to conclude roughly where (if at all) ubiquitin attaches before tethering.

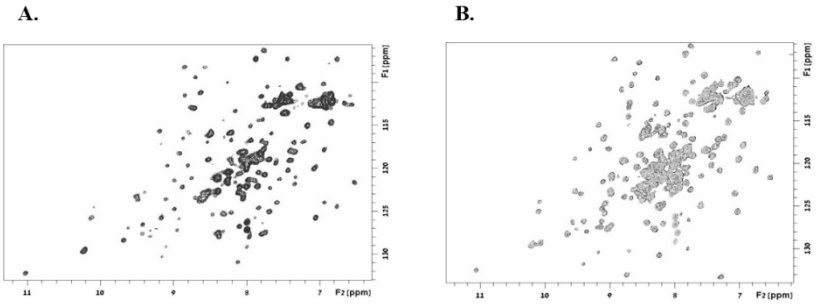

Figure 1 NMR Spectrum. (A) NMR spectrum comparing the wild type WASP-WIP protein complex prior and post the addition of ubiquitin. Dark grey represents the complex prior the addition of ubiquitin and light grey represent the complex after the addition of ubiquitin. **(B)** NMR spectrum comparing the triple Y to E mutant protein complex prior and post the addition of ubiquitin. Dark grey represents the complex prior the addition of ubiquitin and light grey represents the complex after the addition of ubiquitin.

As expected, the NMR spectrum of the wildtype WIP-WASP complex did not change after the addition of ubiquitin. However, the triple mutant WIP-WASP complex spectrum also did not change after the addition of ubiquitin, thus indicating that when WIP partially releases WASP, ubiquitin does not non-covalently bind to WASP before tethering. It is still possible that ubiquitin non-covalently binds to WASP, but no change was seen on the spectrum since the complex used in this experiment was phospho-mimicking the wildtype complex. It is also possible that the non- covalent binding is so weak that it does not appear as a change on the spectrum, but this explanation is unlikely. Alternatively, it is possible that the enzyme ligase which is responsible for the binding of ubiquitin to lysine, before performing its function, non-covalently binds to WASP where WIP partially releases WASP. This would explain why no change was seen with the addition of ubiquitin, and why WASP is only open to ubiquitylation-triggered proteasomal degradation when WIP uncovers part of WASP. Future research needs to be done to further investigate the structure of the WIP-WASP complex and how the proteins interact with one another, and perhaps this research will reveal the answer.

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The Role of SIRT6 in Regulation of Exercise Metabolism and Aging Process

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In the 21st century life expectancy has significantly increased. However, with longevity, many health concerns such as obesity and diabetes arise posing a threat on both life span and health span. The protein SIRT6 may be the solution to avoiding natural consequences of aging. In Prof. Haim Cohen's lab, we examined the role of SIRT6 under forced and voluntary exercise and the effects of SIRT6 on physical exercise performance.

SIRT6 is located in the nucleus and plays a major role in genomic stability, gene expression, glucose and fat metabolism, stress response, lifespan, circadian rhythm and cardiac hypertrophy. Therefore, SIRT6 protein may be the solution to a healthier longer life. SIRT6 protein is a NAD+ dependent deacetylase, deacylase and a mono (ADP)-ribosylase. In addition to SIRT6 role in whole body homeostasis, Adenosine Mono Phosphate Protein Kinase (AMPK) signaling plays a vital role in metabolic hemostasis and regulation of healthy life span. SIRT6 was shown to regulate the activity of AMPK.

Male mice overexpressing exogenous SIRT6 (MOSES) had a significant increase in lifespan compared to the wild-type. Insulin-like growth factor (IGF) signaling plays a major role in regulation of lifespan. MOSES mice showed to have higher levels of IGF- binding protein 1 and altered phosphorylation levels of major components of IGF-1 signaling. Knockout mice, mice that were genetically modified to not express SIRT6, died after a month and suffered from many metabolic disorders. Moreover, they had reduced AMPK activity in muscle.

Physical exercise is defined as planned and structured activity that results from skeletal muscle activation and leads to movement and an increase in energy expenditure. Physical exercise encompasses whole body homeostasis and activates many tissues, organs and physiological systems. Exercise is known to benefit body health; however, more research is needed to elucidate its effect on the aging process mainly on the brain and skeletal muscle. In the project we worked on, we focused on the hippocampus, as it is a source of neurogenesis and memory which are damaged with age and thus connected to longevity. In addition, the hypothalamus was also assessed for comparison as it is a hormonal regulator.

In our experiment, the protein levels in the hippocampus' of three groups of mice were assessed, a negative control group of mice that did not exercise, mice that voluntarily exercised on a running wheel and mice that involuntarily exercised on a treadmill. The physiological changes in these groups were measured using Western Blots in addition to further analyses that were done in

order to quantify the blots.

The Western Blots show 293T cells which overexpress more SIRT6 compared to the control (see fig. 1). In addition, the group of mice that was forced exercised on a treadmill had no change in SIRT6 levels compared to the control in the liver (see fig. 2). When applying Western Blots on proteins extracted from the brain tissues, it was found that different parts of the brain are affected differently by exercise. The hippocampus of the mice that exercised showed an increase in SIRT6 expression and no change in SIRT1 expression (see fig. 3), while the expression of both SIRT6 and SIRT1 was not affected in the hypothalamus (see figs. 4A and 4B). There was no significant change in SIRT1, SIRT6 and AMPK between the running wheel and treadmill groups. However, in the running wheel group pAMPK levels stayed the same while an increase in the TM group was noted compared to the control (see figs. 4A and 4B).

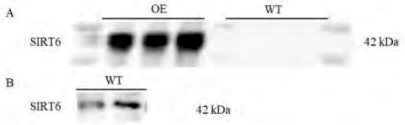

Fig.1 SIRT6 levels in 293T cells, SIRT6 overexpression vs. wild type.
A. SIRT6 overexpressed in 293T cells. Due to short exposure time and significant OE, WT SIRT6 was not visible.
B. SIRT6 expression in 293T wild type cells seen after exposing only the WT bands.

Fig. 2 Hepatic SIRT6 levels of control vs. treadmill in WT male mice (age 3 months)

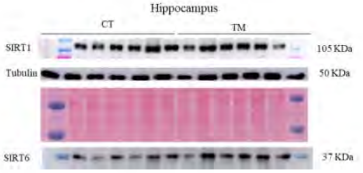

Fig.3 Hippocampal SIRT6 protein expression levels in control vs. treadmill of WT male mice (age 3 months). The ponceau is used as the control.

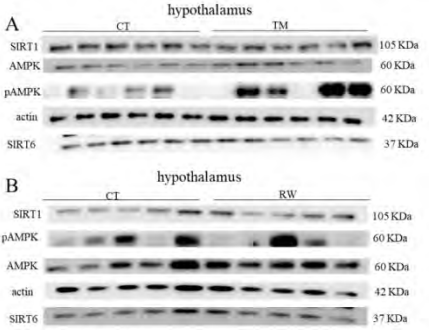

Fig.4 Hypothalamic SIRT6 protein expression levels in WT male mice (age 3 mounts).
A. SIRT6 expression levels in control vs. TM group.
B. SIRT6 expression levels in control vs. RW group.

Electrochemistry: Hydrogen Fuel Cells

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The conservation of energy is one of the most prevalent issues in the 21st century. Nowadays, most of our energy is obtained from the combustion of fossil fuels. While the combustion process produces energy, it releases many toxins into the atmosphere, which are detrimental to our environment, its climate and our health. With increasing industrialization, elevated pollution levels, and peak global warming rates, it is imperative to develop alternative, cleaner technologies for energy production.

In the search for alternative energy conversion technologies, the objective is to find a technology that is cost-efficient, clean, and reliant on abundant materials. One of the most efficient and clean technologies today is the fuel cell technology. It runs on oxygen and hydrogen and produces only water.

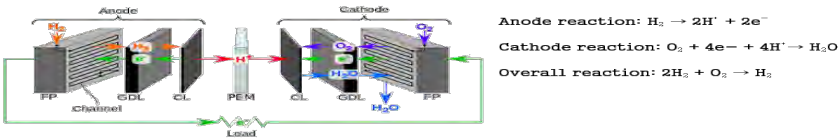

Figure 1: fuel cell diagram and the reactions that occur. Each individual layer is depicted, and all have specific properties vital for fuel cell efficiency

Figure 1 presents a schematic design of a polymer electrolyte membrane fuel cell (PEMFC). By definition, PEMFCs converts the chemical energy stored in the hydrogen molecule into electrical energy. Fuel cells require the use of catalysts in order to carry out the hydrogen oxidation reaction (HOR) and the oxygen reduction (ORR) on the anode and the cathode, respectively, by using a catalyst to increase the ORR kinetics, the overall power output rises. The most common catalyst used for ORR today is Platinum, homogeneously dispersed on a carbon surface.

ORR is considered the bottleneck of PEMFC technology, due to its relatively sluggish kinetics. The focus of this work was to synthesize platinum nanoparticles on carbon support and study their physical and electrochemical properties. The mechanism of ORR catalysis by platinum works by the bonding of the di-oxygen molecule to it and slightly breaking its double bond. The hydrogen protons and electrons are then able to break the rest of the bonds at a much lower activation energy, causing the reaction to happen more efficiently. Although Platinum-based materials are considered to be the best ORR catalysts, Platinum scarcity and its derived price contributes to about 49% of the fuel cell price. One of the main goals in this research is to lower the Platinum loading while maintaining its performance by maximizing its active surface area with smaller Pt particles instead of particles clustering.

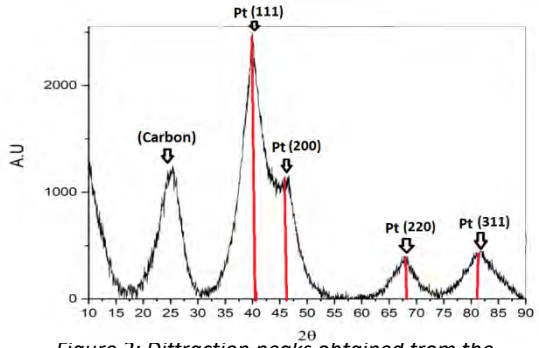

Figure 2: Diffraction peaks obtained from the XRD of Pt-C sample

The catalyst material synthesized in this work is composed of 20%wt Platinum and 80%wt Carbon. The Carbon surface on which the Platinum is impregnated into ensures that the Pt does not grow too large. In this work pseudo allotropic Carbon, Vulcan XC-72, was used. The main characteristics of this carbon is that it is highly porous, allowing the use a method called "incipient wetness impregnation'' to deposit the Platinum on the Carbon surface. The Platinum is introduced onto the carbon as an aqueous salt, hexahydro-chloroplatinic salt, (H_2PtCl_6). Since the Carbon's pores are so small, capillary action allows the dissolved Platinum ions to be pulled into the pores. Then the sample is dried in a tube-furnace overnight while hydrogen gas is purged through it. This hydrogen gas reduces the platinum ions in the salt to metal, and it crystalizes. Being that the platinum is embedded into the Carbon's pores, it is not able to crystalize to particles larger than the pore's size, and therefore it stays small and has maximum catalytically active surface area.

To ensure that the catalyst was properly prepared, several techniques were used to study the product of this synthesis. X-ray diffraction (XRD) was first used to determine Platinums' crystalline structure and size. This method is based on the interaction of X-rays with the material's crystalline structure, which diffracts the rays in an orderly fashion. The structure of a solid depends on the specific elements that form it, which will tend to solidify in a unique way. This dictates the specific diffraction angles obtained from the XRD. By comparing the peaks (figure 2), to expected literature for platinum and its different plane orientations, it is evident that the peaks match the values of cubic platinum crystals. This Confirms that the platinum in our

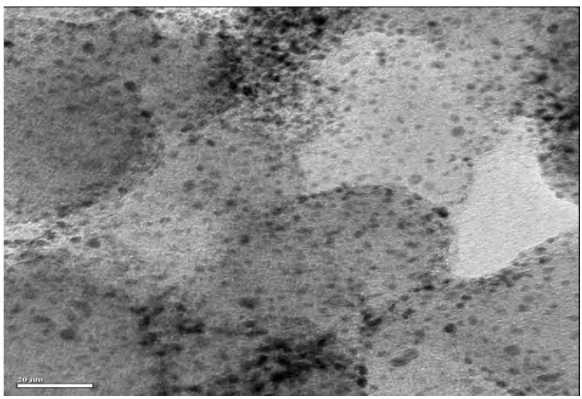

Figure 3: TEM images of Pt-C sample, with a 20nm Bar (bottom left corner). Seeing in comparison to the bar that the Pt particles are signifiga

sample has indeed crystallized into its optimal structure. By applying Bragg's law to compare the wavelengths of the projected X-ray and the diffraction angle, along with the Scherrer equation, the size of the particle was calculated at the peak's full width at half maximum on average to be the microscopic size of 1.64 nm.After calculating that the particles are small, it is still necessary to do further analysis to ensure that the small particles are homogeneously dispersed and did not form larger aggregates. Transmission electron microscope (TEM), that projects a ray of electrons at extremely high voltages, allowing us to have high magnification and resolution of the sample. Carbon and platinum are distinguishable in the image due to the fact that platinum is a heavier element than carbon and not as many electrons can pass through it, causing it to appear darker. Figure 3 indicates that the Platinum particles stayed as small, separate units, that are homogeneously dispersed throughout the sample.

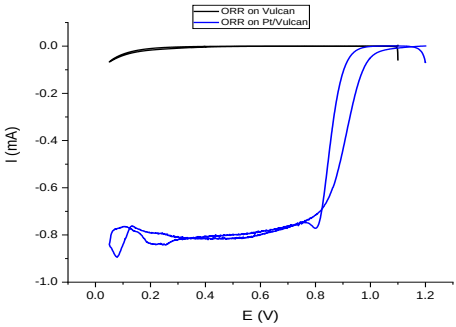

Figure 4: Comparing RRDEs of Vulcan and Platinum with Vulcan in H2SO4 solution

Lastly the sample's catalytic activity was studied using a rotating ring disk electrode (RRDE). The electrode was plated with the catalyst sample, then placed in an acidic solution (0.5 M H2SO4) saturated with oxygen, and set to cycle between two potentials. The graph below depicts the ORR with and without Pt present. The results show Platinum's significance in the reduction of Oxygen. Without the platinum, depicted by the black line, the ORR hardly happens and if it does it is only when reaching a very high potential. When Platinum is present however, depicted by the blue line, the reaction occurs at a much lower overpotential, lower activation energy and there is a significantly larger current. This research proves for the significance of the Pt in the catalyst in fuel cells and shows how the overall amount of Pt can be reduced through maximizing its active surface area while still obtaining the same efficiency.

Omecamtiv Mecarbil treatment for Congestive Heart Failure compared to placebo

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Congestive Heart Failure is one of the most common heart diseases in America. The standard treatment of care for heart failure are medications that include Beta blockers, diuretics and angiotensin blockers or inhibitors. Calcium channel blockers are sometimes used as second line therapy. A double-blind, randomized, placebo-controlled, multicentered study is being conducted in order to evaluate the effects of the calcium channel blocker Omecamtiv Mecarbil made by Amgen on morbidity and mortality of patients with chronic heart failure. The study aims to determine the impact of Omecamtiv on repeat heart failure events and all cause death. Approximately 8000 patients are enrolled in this study and must have a diagnosis of congestive heart failure. This medication or the placebo are added on to the accepted standard of care treatment. Omecamtiv Mecarbil is expected to be well tolerated and superior to the placebo in decreasing the risk of cardiac deaths and heart failure in patients with congestive heart failure when added to to the standard medical therapies. Omecamtiv is also expected to reduce the risk of hospitalization and death while improving symptoms in patients with heart failure. Patients are checked with physical exams, EKG, multiple blood tests including complete metabolic panel, complete blood count and other cardiac tests every few weeks. Omecamtiv Mecarbil is a cardiac specific myosin activator. Cardiac cells contract through the action of myosin and actin. Omecamtiv specifically activates ATPase and improves energy utilization. Omecamtiv is made to accelerate the main step in the contraction cycle to allow the myosin to stay bound to the actin for a longer period of time. A combination of these actions should increase the left ventricle systolic ejection fraction. If effective Omecamtiv will improve heart function without consuming more energy and oxygen while maximizing cardiac efficiency. It is necessary for Omecamtiv to be studied in order to determine its long term effects and its ability to reduce mortality. This ongoing study has patients enrolled for two years with the total follow up of approximately 4 years. After the duration of the study the overall health of the placebo and drug treated patients will be evaluated in order to determine the effect of Omecamtiv Mecarbil.

Effect of variation in the duration of non-invasive magnetic stimulation on cortical excitability

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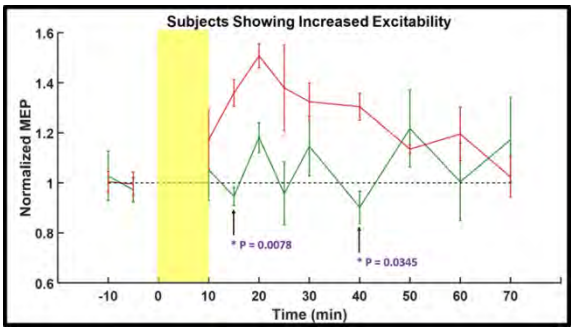
Introduction

The cerebral cortex can be stimulated non-invasively by electromagnetic induction using devices that rapidly change a high strength magnetic field. A non-portable device used for treatment and research, called Transcranial Magnetic Stimulator (TMS), works by producing a brief electric current pulse in a large coil placed over the head to stimulate the cerebral cortex by electromagnetic induction. A new portable wearable device called Transcranial Rotating Permanent Magnetic Stimulator (TRPMS) developed by Helekar and Voss uses high field strength permanent magnets that rotate rapidly to produce a similar effect. A previous study in our laboratory, consisting of 20-min repeated TRPMS stimulation, produced an increase in motor cortical excitability, as measured by a change in the amplitude of motor-evoked potentials (MEPs) elicited by conventional TMS. Repetitive TMS is known to produce a bidirectional effect on cortical excitability with a decrease or increase depending on the rate of stimulation. In the present study, therefore, we asked whether TRPMS stimulation for 10 min would produce a decrease in motor cortical excitability. Here we present evidence that shortening the stimulus duration produces variable effects consisting of a decrease in half the subjects studied and an increase in the other half and a greater variability of changes in excitability depending on test stimulus intensities. These findings might result from a variable simultaneous enhancement of the excitability of both excitatory and inhibitory neurons in cortex.

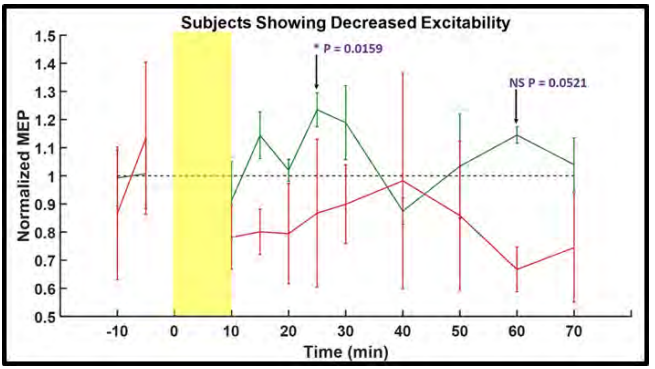
Methods

To test the effects of TRPMS we performed surface electromyographic (EMG) recordings in the first dorsal interosseus (FDI) muscle of 6 adults aged 20 – 40 years (2 males and 4 females) with a standard TMS procedure. We obtained the motor hotspot for this muscle on the contralateral side of the head. We first tried to find the resting motor threshold (RMT), which is the intensity of output on the TMS coil that gives an MEP of at least 100 μV in 5 of 10 trials. Then we tried to find S1mV stimulus intensity, which is the intensity of output that gives MEPs of at least 1 mV in 5 of 10 trials. If we could not find it, we used an intensity that produced 0.8 – 1 mv responses in 5 of 10 trials. We also tested responses to stimuli at the mid-point of these two intensities and if possible, at an intensity higher (S1+) than S1mV by the same amount.
We conducted MEP recordings at 11 time points, 2 time points before and 9 time points after 10-min active or sham TRPMS stimulation in a double blind

randomized order. Active and sham TRPMS stimuli were of 100 ms duration delivered at the rate of 0.2 Hz (one every 5 s). The recording software automatically computed the MEP amplitudes at each time point and a MATLAB program developed in-house automatically plotted them as a function of time.



Group averaged MEPs (n = 3) measured before and after 10-min application of active (red) and sham (green) TRPMS (100-ms stimuli every 5 s) over motor cortex. MEP amplitudes in response to S1mV TMS stimuli are normalized to baseline (BL) measurements acquired 5 and 10 minutes prior to TRPMS application. In these 3 subjects, active TRPMS results in larger MEPs relative to baseline and sham. The graph shows the sample mean with the standard error at each time point. Using a two-tailed paired t test, at time points 15- and 40-min post-TRPMS stimulation there was a significant increase in MEP amplitude in active vs sham TRPMS conditions.



Group averaged MEPs (n = 3) measured the same as the figure above In these 3 subjects, active TRPMS results in smaller MEPs relative to baseline and sham.. Using a two-tailed paired t test, at 25 min post-TRPMS stimulation there was a significant decrease in MEP amplitude in active vs sham conditions. At the 60-min time point the observed decrease in MEP amplitude in the active condition did not reach statistical significance.

Results and Discussion

We saw that repeated delivery of 100 ms active TRPMS stimuli every 5 s for 10 min produces a decrease in excitability in 3 of 6 subjects and an increase in the remaining three when amplitudes of MEPs produced by S1mV TMS stimuli are compared. The MEP amplitudes at other TMS stimulus intensities

show variable effects in different subjects consisting of a decrease, no change, a biphasic response and an increase. These findings suggest that TRPMS stimulation duration of 10 min might be stimulating both excitatory and inhibitory cortical neurons with the net effect being dependent on the exact balance between excitation and inhibition in each subject. This study tested the hypothesis that the newly developed non-invasive TRPMS device produces bidirectional changes in cerebral cortical excitability depending on the total duration of stimulation. Our findings, using a standard EMG recording method of measuring cortical excitability, indicates that at a stimulus duration of 10 min TRPMS produces increased excitability in half the adult human subjects studied and a decrease in the remaining half. Given that at 20-min stimulus duration we saw a significant increase earlier, the 10-min duration appears to be at the threshold of reversal of the direction of change in excitability. This predicts that a shorter duration would show a decrease in excitability in all subjects.

Investigating Genetic Interactions in Regulation of Hematopoiesis

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Hematopoiesis begins in early embryogenesis and continues to replenish the different lineages of the blood throughout life. It is driven by self-renewing stem cells that also differentiate into progenitors and mature blood lineages. After hematopoietic stem/progenitor cell (HSPC) emergence they reside in the bone marrow and function to sustain hematopoiesis throughout adult life. Myelodysplastic syndrome (MDS) is a bone marrow failure disorder that arises from HSPC dysfunction, and results in ineffective hematopoiesis and cytopenias. It affects approximately 10,000 people annually in the USA[1]. Approximately 30% of MDS cases progress into Acute Myeloid Leukemia (AML). Recent patient sequencing studies have shown that spliceosomal components and epigenetic regulators are among the most prevalently mutated factors in MDS[2], yet it remains unclear whether the combined dysfunction in these components leads to hematologic defects. Splicing is an important event in regulation of hematopoiesis[3]. Splicing factor 3b subunit 1 (SF3B1) is a component of the U2 small nuclear ribonucleoprotein, and mutations in this factor are most common among splicing mutations in patients with MDS. Epigenetic control is also crucial to normal hematopoiesis. The ten-eleven translocation (TET) family of methylcytosine oxidases regulate DNA methylation modifications, which is critical in HSPC development[4]. In human myeloid malignancies mutations in SF3B1 and TET2 occur as heterozygous somatic missense mutations.

The Bowman laboratory utilizes zebrafis[5]h as an *in vivo* model to study hematopoiesis. The zebrafish is an established model for examining both normal and malignant blood development since its hematopoietic development is analogous to mammals. Zebrafish are also a valuable tool because of their high reproductive rate, and easy microscopic visualization during embryogenesis. The Bowman laboratory previously showed that *sf3b1*^{hi3394} loss-of-function mutant embryos have hematological defects including

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erythroid and myeloid deficiencies and severe defects in HSPC emergence[6]. Homozygous *sf3b1* mutants are lethal by 72 hours post fertilization (hpf) precluding analysis of adult hematologic traits, but heterozygous mutants appear normal throughout life[7]. Loss-of-function *tet2* mutants (*tet2*$^{m/m}$) developed normally until 11 months then they begin to show signs of dysplasia in the kidney marrow (equivalent to mammalian bone marrow) but MDS does not develop until 24 months of age[8].

The goal of this study is to determine if Sf3b1 and Tet2 interact to regulate hematopoietic homeostasis using a zebrafish *in vivo* model. I began the study by in-crossing the double heterozygous line (*sf3b1*$^{+/-}$;*tet2*$^{+/-}$) to generate large cohorts of fish carrying one or both mutations. To genotype the fish, I used polymerase chain reaction and gel electrophoresis. My experimental approach was to examine hematopoietic parameters in zebrafish of all possible genotypes in both embryonic and adult stages. I studied embryonic hematopoiesis as genes important in hematologic diseases often have important roles in hematopoietic development. Also, it is possible that the embryos carrying mutations in *sf3b1* and *tet2* might look grossly normal but have subtle defects in hematopoietic development that are overcome with age due to gradual compensation by other factors. Alternatively, I might not observe differences in embryonic hematopoiesis in the compound heterozygotes, but over time defects arise due to changes in the aging microenvironment of the marrow or due to environmental signals. The results of both studies will be valuable for expanding our knowledge on the effects of these genetic mutations in human blood disorders and how the animal age and environment might influence outcomes.

I conducted embryonic studies to determine if Sf3b1 and Tet2 genetically interact in blood development across erythroid, myeloid and HSPC lineages as they first develop. I analyzed embryos at 3 and 5 days post fertilization (dpf). I performed *in situ* hybridization to detect HSPCs (*cmyb)* and myeloid cells (*mpx)* in the caudal hematopoietic tissue and peripheral circulation. I used O-dianisidine staining to measure hemoglobin, a metric of mature erythrocytes. I imaged each embryo, quantified the staining in FIJI/ImageJ, then genotyped the samples after this analysis such that the studies remained blinded to diminish bias.

I performed an ageing study of adult zebrafish hematopoiesis at 6, 10, 12, 18, 24, and 30 months to determine if combined deficiencies in *sf3b1* and *tet2* had a joint effect on the types and frequency of blood cells in the kidney marrow. I dissected the adult kidney marrows and processed them into single cell suspensions. Using flow cytometry, I quantified the relative proportion of

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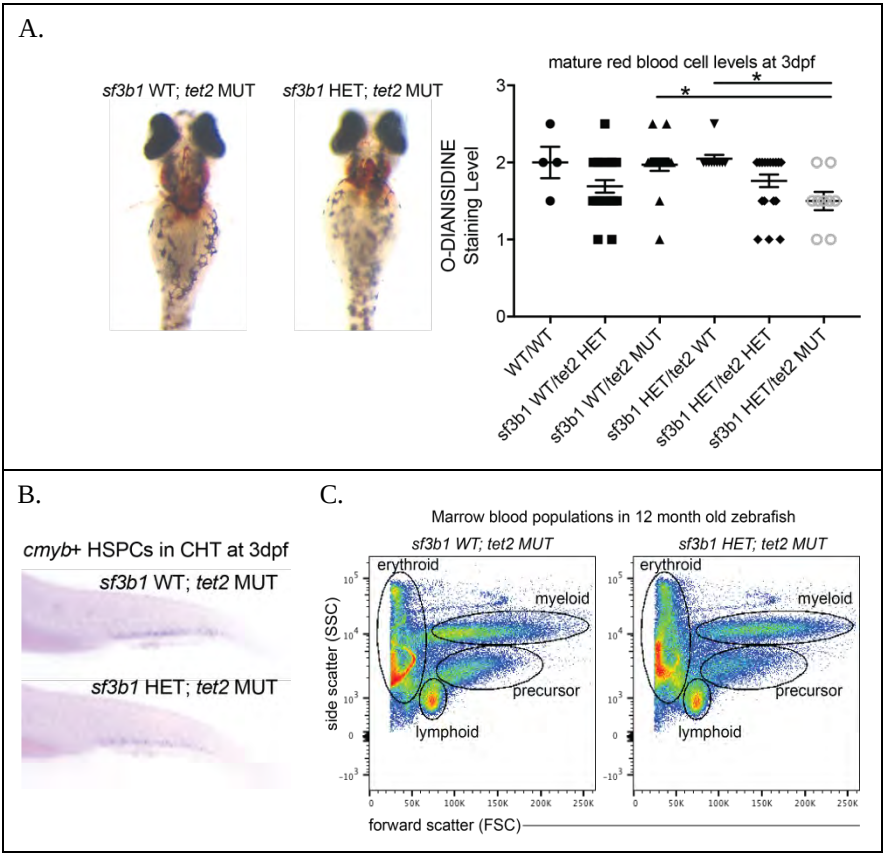
[6] De La Garza A. et al; Spliceosomal component Sf3b1 is essential for hematopoietic differentiation in zebrafish. *Experimental Hematology,* 44 (2016): 826-837.

[7] An M., Henion P.; The zebrafish *sf3b1*^{b460} mutant reveals differential requirements for the *sf3b1* pre-mRNA processing gene during neural crest development. *International journal Developmental Biology,* 56 (2012): 223-237.

blood cell populations (erythroid, myeloid, lymphoid, and precursors) to determine if there was a lineage bias arising based on the *sf3b1* and *tet2* genotype. To analyze the morphology of the blood cells, I cytocentrifuged the adult kidney marrow cells onto slides and performed May-Grunwald Giemsa staining. I will perform imaging analysis to assess lineage maturation by cell morphology and staining intensity.
The data I have collected thus far from my experiments are still under analysis and in the preliminary results stage.



A. Representative images of o-dianisidine staining and graph quantifying levels in all tested genotypes.
B. Representative images of *c-myb in situ* staining. **C.** Representative flow cytometry plots.

Effect of Parietal Activation on Episodic Memory: A New Paradigm

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Recently, the neuropsychological community encountered an intriguing puzzle. For years, it was considered established that the parietal cortex was not involved with episodic memory. This was supported by numerous cases of patients with parietal lesions who did not exhibit significant episodic memory deficits. However, modern brain imaging technologies yielded findings showing that the parietal cortex is in fact frequently activated during episodic memory retrieval.

How to approach this apparent contradiction? Recent developments have helped clarify the true role of the parietal cortex in connection to episodic memory. The advent of event-related fMRIs and new neuropsychological studies have enabled scientists to distinguish between particular types of memory processes and identify how each are related to parietal cortex activations. For example, while patients with parietal lesions did not experience actual amnesia, they did exhibit a decrease in certain memory functions such as vividness and abundance of detail, remembering states and memory confidence, as compared to a control group.

With this newfound information, researchers have hypothesized several models for how parietal activation affects episodic memory. However, while each model is supported by recent neuropsychological test results, most acknowledge limitations and inconsistencies. Additionally, the amount of studies done on this topic is scant, and "future research might bring different evidence to bear on it." (1) For these reasons, this area of research is a worthwhile realm to explore, and will likely yield new and exciting results.

The present study aims to create a paradigm which can be used to test these different models and further explore this field. This paradigm proposes the use of arithmetic tasks that activate the angular gyrus (AG), a region of the parietal cortex shown in imaging studies to be activated during memory retrieval, to potentially enhance episodic memory. It has long been established that basic arithmetic tasks activate the AG (2), which is associated with the rote verbal memory used to recall familiar multiplication tables and addition problems. For this study, all equations have a sum that is less than ten in order to maximize rote memory, as opposed to more challenging problems, which would be less familiar and could activate problem solving and working memory functions.

The benefits of this paradigm are twofold. Firstly, cognitive tasks are less costly and time consuming than most imaging techniques. Secondly, most imaging techniques cannot activate a region in the brain; they merely allow us

to observe brain activation, typically during a particular cognitive task. In contrast, the arithmetic task activates the AG, potentially enhancing its function.

The present study is composed of three parts. The first is an encoding task, where the subject is presented with 48 words to memorize. The second part is an arithmetic task, where the subject is presented with basic arithmetic equations and is asked to determine whether the answer is correct. This is meant to activate the AG, and potentially enhance episodic memory function for the third part, which is a memory test. There were also two control conditions which did not activate the AG (a letter substitution task, and a blank condition where participants do nothing between the encoding and retrieval stages). In the third part, the subject is presented with 48 words, which are either from the previous list or new. Upon seeing each word, the subject determines whether they recall the word (have a particular image or sensory association with it in addition to remembering that it was in the previous list), know the word (do not have a particular association with it but remember that it was in the previous list) or do not remember it at all.

Because the groups were small (7-8 subjects each), we did not run statistical analysis on the results; rather, we looked for trends to point us in the right direction for future studies. “Recall’’ rates (vivid details and associations) were higher in the arithmetic task group (.54) than in both control groups (.50 and .43), while the opposite was true for “know” rates (familiarity without associations). These results support the theory that arithmetic tasks activate the AG and enhance the memory functions specifically associated with that area (i.e., richness and abundance of detail and context). Future studies may test this paradigm further as a user friendly and effective mechanism to explore the relationship between the parietal region and episodic memory.

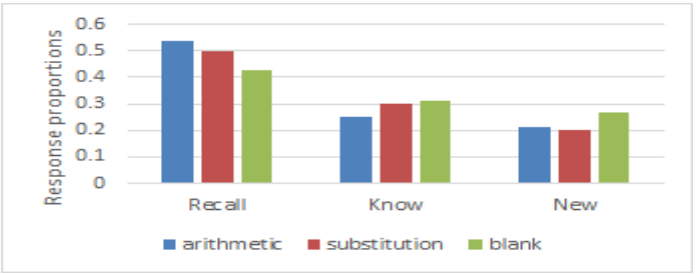

Figure 1- Memory Retrieval as a Function of Tasks

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The Breast Tumor Suppressor MLL3 may Regulate Enhancer Histone Marks in Mammary Epithelial Cells

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Breast cancer is the leading cause of cancer deaths in females worldwide. There are a number of genes that have been found to contribute to tumor formation and development, some of which are known and others less well-known, such as MLL3, a methyltransferase protein. Encoded by the KMT2 gene, MLL3 and its homolog, MLL4, have been found to play a key role in regulating post-translational modifications on lysine residues of histone 3 such as H3K4 monomethylation and H3K27 acetylation. Both processes have been identified as activators of enhancer genes which promote transcription. While this gene has been established as an important tumor suppressor in cancer growth and particularly in breast cancer, it remains unknown how its pathway functions and at what stage of tumorigenesis process it affects. More specifically, we wish to determine whether various histone marks vary among different mammary epithelial cell lineages. Furthermore, we seek to determine the impact of Mll3 SET domain mutant and Mll3/Mll4 double mutants on the global levels of enhancer marks in mammary cells.

Immunofluorescence staining was used to analyze the presence of high and low-profile histone in cells within breast ducts of mouse breast gland tissue samples. ImageJ computer image analysis program was used to isolate color channels in the fluorescent images and to identify high-stained histones using the “multi-point” counting tool.

After staining for both ER positive and negative cells types, it was determined that the global H3K4me1 and H3K27ac levels were comparable between the two, and ER negative basal cells presented a similar ratio. Interestingly, all three cell types contained distinct cells with low or high levels of enhancer marks, although more cells have high levels of H3K27ac. Double knockout mutant mice with both MLL3 and MLL4 SET domain deletions presented a greater than 50% decrease in histone content when tested for methylation yet barely changed in the case of acetylation. However, while staining of the mll3 mutant animals for both methylation and acetylation suggested that a deletion may present a drastic depletion in high-histone markers, due to heterogeneity among the animals tested, further experiments must be conducted in order to conclude whether mll3 knockout animals are depleted of histone markers when mutated. Furthermore, a ChIP-seq (chromatin immunoprecipitation sequencing) experiment would be useful in future studies in order to identify the particular binding site in which MLL3 modifies chromatin and whether that differs in ER+ and ER- cells and in double mutant genotypes.

Acknowledgements:
This work has been supported by DOD BCRP Breakthrough Award as well as the Summer Undergraduate Research Program at Einstein. A special thank you is expressed to Dr. Guo and all of the members of the lab who assisted along the way, Wei Tang, Piril Erler, Jihong Cui, Yu Liu, and Hui Hu.

ATM Inhibition Suppresses Apoptosis and Anemia in *ddx41* Mutant Zebrafish

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Myelodysplastic syndromes (MDS) are a preleukemic condition arising from mutations in hematopoietic stem and progenitor cells (HSPCs) resulting in an expansion of dysfunctional blasts and ineffective hematopoiesis. Germline mutations in *DEAD-box Helicase 41* (*DDX41*) were identified in patients with MDS with inferior overall survival, suggesting a contribution to disease pathogenesis. Though a strong clinical correlation is found between mutations in *DDX41* and MDS, the *in vivo* role of DDX41 in hematopoiesis has not been elucidated.

Previous work in our lab has shown that *ddx41* loss-of-function homozygous mutants (*ddx41* mutants) have developmental hematopoietic defects including megaloblastoid-like anemia and increased HSPC formation at 36 hours post-fertilization (hpf). Additionally, *ddx41* mutant cells exhibit cell cycle arrest and apoptosis, phenotypes commonly mediated by the DNA damage response (DDR). DNA damage can trigger several signaling pathways via the activation of distinct kinases, such as Ataxia Telangiectasia Mutated (ATM) in response to double-strand breaks, and ATM and RAD3-related (ATR) in response to single-strand breaks or replication stress. If these DNA damage response kinases mediate apoptosis or the hematological defects in *ddx41* mutants has yet to be elucidated.

To address these questions, we pharmacologically inhibited the ATM and ATR kinases and then assessed levels of apoptotic cells, mature erythrocytes, and HSPCs in *ddx41* mutants and sibling controls. ATM kinase inhibition led to a partial but significant suppression of apoptosis and anemia in *ddx41* mutants as compared to DMSO vehicle-treated *ddx41* mutants. In contrast, ATR kinase inhibition did not significantly impact either defect. Taken together, these results suggest that ATM, but not ATR, partially mediates the DDR and erythropoietic defect in *ddx41* mutants.

In future studies, we aim to determine the involvement of ATM and ATR kinases in HSPC expansion and cell cycle arrest in *ddx41* mutants. Additionally, we will explore which components downstream of ATM mediate its effects on apoptosis and erythroid differentiation. These results highlight the important role of Ddx41 as a protector of genomic integrity and the negative impact of the DNA damage response on erythropoiesis. These studies provide potential therapeutic targets for treating *DDX41* mutated MDS and AML.

Learning Shapes Functional Connectomes from Sensory to Motor Neurons to Generate an Appropriate Behavioral Response

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Learning processes cause modifications at a number of neural sites which lead to numerous adaptive alterations in the behavior. The invertebrate gastropod mollusc *Aplysia* was used to describe several aspects of long-term memory as its neurons and synapses are readily accessible for examining. Access to most of the neural circuit controlling the behavior allows one to determine the logic and the cellular mechanisms of individual changes that together produce the overall change in behavior.

To examine whether the functional connectome is changed at multiple sites when long-term memory is expressed after learning, we utilized an associative learning task affecting *Aplysia* feeding, in which it tries, but fails to eat inedible food. Food promotes biting and unsuccessful attempts to swallow, which lead to active rejection and eventually to termination of any responses towards food. Twenty-four hours after training, long-term memory is shown by fewer attempts to bite and swallow food, because the food is actively rejected, and by a decrease in time to stop responding to food that is specific to the taste of food used in the training. After showing the presence of the memory, rejection activity was tested by inducing animals to swallow a cannula, which induces repetitive rejection responses. Rejection was compared in trained and in naïve animals. Trained animals displayed significantly improved rejection (Fig. 1), indicating that memory after training with inedible food is partially expressed as a general tendency towards rejection even non-food objects.

Localization of molecular correlates of memory formation to the mechanoafferents and the ability of peptides released by these afferents to bias motor activity to rejection lead us to test whether rejection activity is increased as a part of memory after animals are trained as described above. To examine whether changes in the synaptic outputs of mechanoafferents contribute to behavioral change after training with inedible food, we first examined in naïve animals the connectivity of a subpopulation of mechanoafferents, the S1 neurons, to 5 followers with different functions (Fig. 2) in feeding behavior, expressing long-term memory were compared to those in naïve animals. In trained animals, there were net increases in excitation to B4/B5 and to B61/B62, with a net increase in inhibition to B63. There were no net changes

in connectivity to B8a/b and to B31/B32(Fig.3). These changes are consistent with increased bias to produce rejection.

The different effects of training on connections from S1 neurons to its followers, biasing behavior to rejection, and the finding that cessation of feeding and taste specificity after training is localized to a different ganglion and occurs via a different cellular mechanism, indicates that the functional connectome is regulated by learning at a variety of different sites, by a variety of cellular mechanisms. Access to both presynaptic and postsynaptic neurons in *Aplysia* allows the subsequent identification of the signals and the mechanisms producing the individual changes that together lead to a global change in behavior.

Figures

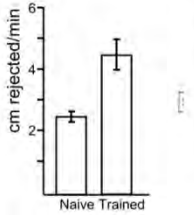

Fig.1 Increased rejection after training and connectivity of S1 and followers. A) Training enhances rejection, as measured by the time required to reject a cannula that was swallowed by the animals. The data show the mean and standard errors of the cm/min rejected in naïve ($N = 7$) and trained ($N = 7$) animals ($p = 0.002$, $t = 3.97$, $df = 12$, two-tailed t-test).

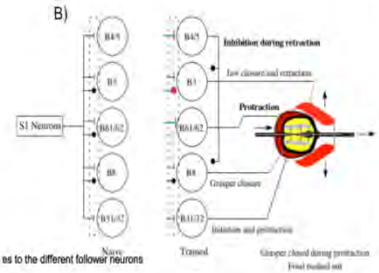

Fig.2 Left: Patterns of synaptic connectivity from S1 mechanoafferents to the 5 followers that were examined. Excitatory synapses are shown by a flat line; inhibitory connections are depicted by circles. Note that 3 followers show exclusively excitatory connections, whereas 3 others show both excitation and inhibition. Right: Changes in connectivity after training. Increased excitation is shown by green shading; increased inhibition is shown by red shading.

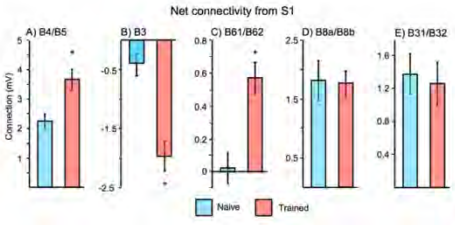

Fig.3. Training biases motor activity toward rejection. Mean net connectivity from S1 mechanoafferents to 5 followers in buccal ganglia from naïve and trained *Aplysia*. Standard errors are shown. Significant effects are marked with an asterisk.

Studying the Effects of pH on CueR, the Copper Efflux Metalloregulator

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Maintaining homeostasis is a basic and necessary function for both prokaryotic and eukaryotic organisms. In the proper concentrations, metal ions play an integral role in facilitating essential cellular processes. At the same time, however, their toxicity in high concentrations is lethal to all organisms. In the human body, copper is required for proper neurotransmitter function in the brain, but accumulation of this metal can lead to neurodegenerative diseases. Prokaryotic systems require copper ions as cofactors for enzymes that catalyze oxidation reduction reactions taking place within their cells. As in humans, an improper concentration of copper will lead to the cells' death. Microorganisms have therefore developed sophisticated systems devoted to regulating the concentration of metal ions in their environments. The Ruthstein Lab is studying copper homeostasis mechanisms in both the human body and E. coli – which is used as a model because of its presence in the human system. The lab hopes that a more thorough understanding of these copper regulation cycles will aid in the development of new antibiotics. These drugs will work to kill the bacteria while ensuring the safety of a human host.

The Ruthstein Lab is now studying the effects of pH levels on CueR, the copper efflux metalloregulator protein present in E. coli. CueR comes from the MerR family of proteins, which is comprised of domains for DNA and metal ion binding. Metalloregulators are cytoplasmic or transmembrane proteins which bind to specific metal ions with high affinity and play a role in regulating the concentration of these metal ions within the cell. CueR, a transcription factor, is able to induce or repress the expression of two specific genes through metal binding. In its repressed form, CueR bends DNA in a way that prevents RNA polymerase from binding to the promoter, thus stunting transcription. When copper ions bind to CueR, however, a conformational change occurs. The protein, now in its active state, allows for RNA polymerase to bind to the promoter region of the DNA strand. Once transcription is initiated, the expression of two genes begins and consequently two proteins are formed. The first is CopA, an ATPase, which pumps Cu+ from the cytoplasm to periplasm. The second is CueO, the copper oxidase, which oxidizes the toxic Cu+ to the less toxic Cu2+ ion.

We studied the effects of pH on CueR in four states: unbound (apo), bound to copper (holo), bound to DNA (repressor) and bound to copper and DNA (activator). In order to discern structural changes or denaturation of CueR caused by pH, we employed the use of two methods: continuous-wave electron paramagnetic resonance (CW-EPR) and circular dichroism (CD) spectroscopy. In order to obtain a spectrum of CueR through EPR, we spin label the protein with paramagnetic centers. Thus, as the constant magnetic field B_0 excites the

unpaired electrons to jump to a higher spin state, the system measures and records electrons' reflection of the power. EPR spectroscopy also allows us to study our protein in solution. We are therefore able to study CueR while it is free to move, as it able to within the cell. Through this technique, we can record hyperfine interactions – the interactions between unpaired electrons and the nucleus. This helps in determining the polarity of the labeled region of the molecule and how its folding is affected due to changes in pH. Additionally, if exchange interactions between nearby electrons are visible in the spectrum, EPR measurements allow us to discern the formation of aggregates in solution, showing that the protein is unstable in the given environment (fig. 1). CD spectroscopy is a type of light spectroscopy which emits circularly polarized light in 2 directions. It is used to study the structure of asymmetric biological molecules. The peptide bonds between amino acids of the protein absorb the incoming rotating light emitted by the spectrometer. The absorbance changes based on the conformation or structure of the protein. We are thus able to detect any changes in the secondary structure of the protein – alpha helix or beta pleated sheets (fig. 2).

These two methods allow us to understand the behavior of a protein in specific conditions. We can detect protein flexibility and changes in conformation due to the instability of the protein in a given environment. The knowledge of the dynamics of the protein is essential in order to fully comprehend the biological system. Further data, however, must still be collected in order to fully understand the effects of pH on CueR.

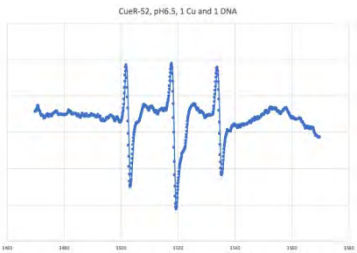

Fig. 1 EPR Spectrum for CueR
The smaller peaks found in between the three main peaks are exchange interactions and may indicate the formation of aggregates in solution.

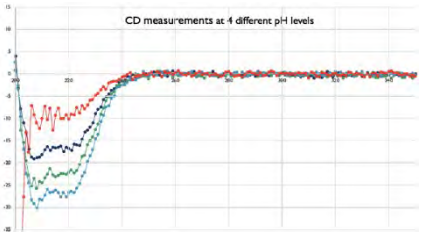

Fig. 2 CD Spectrum of CueR at pH 9.5 (dark blue), 8.5 (green), 7.5 (light blue), 6.5 (red). The spectrum shows changes in the secondary structure of the protein at pH 6.5.

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Time-Dependence of Antifreeze Proteins' Activity is Induced by Ice Crystal Shaping

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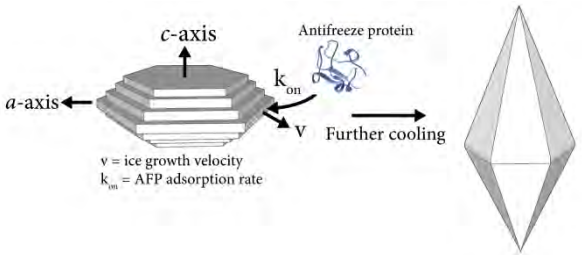
Background:

Antifreeze proteins (AFPs) are vital proteins for the survival of cold environment organisms such as fish, insects, bacteria, fungi, and plants. These proteins function by binding to ice crystals and inhibiting their growth. The process of AFPs adsorbing to ice increases local curvature of the surface by allowing ice to grow between the bound proteins. This action results in a depression of the freezing point, creating a gap between the melting point and freezing point of the ice crystal. Within this gap, known as thermal hysteresis (TH), the ice does not grow.

AFPs are a diversified group of proteins. For example, AFPI found in winter flounder, binds only to the pyramidal planes of ice crystals. Therefore, ice growth is inhibited along the *a*-axis but continues to grow along the *c*-axis. In contrast, AFPIII-QAE found in eelpouts, binds to both the pyramidal and prism plane of an ice crystal. This altogether inhibits ice growth along the *a*-axis. Both proteins cannot bind to the basal plane of ice, which grows step-wise along the *c*-axis.



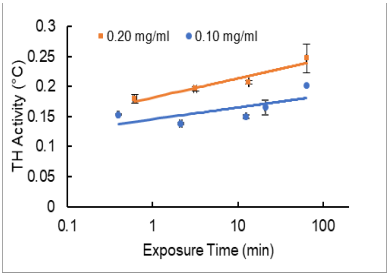
With each additional step in the presence of AFPs, there is competition between the velocity of ice growth and the rate of AFP adsorption. As long as AFP adsorption to the new crystal surface surpasses, the crystal shapes into a hexagonal bipyramid, where the sharp tips of the crystal are the basal faces to which these AFP cannot bind. Once the temperature decreases beyond a critical value, the velocity of ice growth becomes faster than the rate of AFP adsorption. At this point, the freezing point is reached and sudden ice growth is observed. Our hypothesis is that antifreeze proteins minimize the basal face area to which they cannot bind, thus the shape of the crystal becomes important for growth inhibition. That is, the smaller the basal face, the higher the TH activity.

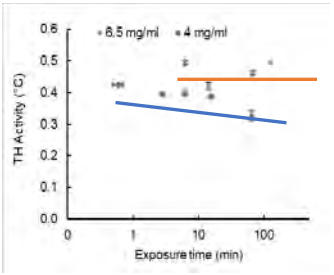
While the increased concentration of AFPs is known to increase the TH activity, it is unclear whether time plays a similar role. We therefore tested the time dependence of both AFPI and QAE. According to Chapskey *et. al*[i], increasing exposure time of a crystal in the TH gap allows further orienting of bound AFPI, maximizing their efficiency and leading to an increase in TH. The TH activity of AFPIII-QAE was also reported to be affected by exposure time, but only at lower temperatures[ii]. We hypothesize that further inhibition

along the *a*-axis causes increased sharpening of the crystal tip with longer exposure time, leading to an increased TH.

Methods:

We use a custom-made nanoliter osmometer to measure the TH activity. Video microscopy and image analysis were used to determine the melting point and burst point of ice crystals. The temperature of the sample is decreased until ice nucleation is achieved. The temperature is then slowly increased until a single crystal (size 10–15μm) remains, and the melting point is determined. The crystals were grown at a constant cooling rate until temperature decreased about half the amount of the previously measured TH. The crystals were observed at this constant temperature for various amounts of time (0-120 min). Following this time period, the temperature commenced a constant cooling rate until the crystal burst.





Results:

For both concentrations of AFPI, 6.5 mg/ml and 4 mg/ml, no increase in the TH was found with exposure times up to 120 min. This trend is much unlike the one described by Chapskey *et. al*. On the other hand, both 0.1 mg/ml and 0.2 mg/ml concentrations of QAE displayed an increase in TH activity with longer exposure times (Figure 2).

Conclusion:

The kinetic behavior, time dependence, and ice shaping of multiple types of AFPs were compared here. We found that the TH of AFPIII-QAE is time dependent while AFPI is not. This finding may be explained by the nature of each protein to bind to the surface of the crystals. AFPI does not bind to the prism plane and therefore does not cause the same amount of sharpening that is induced by AFPIII-QAE. These proteins have many practical applications including minimizing the damaging effects of frost on various entities such as agricultural, and can also be helpful for food and drug preservation. With increased understanding of the function of these proteins, we will be able to better utilize them in application.

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Further Insight in 'Aha'; A Look into Forward and Backward Remote Associates

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There is much in the way of insight that remains unknown, resulting in a multitude of current research on the subject matter. Insight can be described as "a sudden change in or the formation of a concept or other type of knowledge representation, often leading to the solution of a problem" (Kounios & Beeman 2014). A further understanding of insight can be achieved by discussing what it is not-- an analytic solution. Insight solution is distinguished from an analytic solution in that the former is accompanied by a burst of emotion that includes a positive surprise (Kounios & Beeman 2014). This burst of emotion, the eureka moment, is referred to as the 'aha' moment. This is a defining feature of insight, which largely borne via unconscious processing. Therefore, when insight occurs it seems disjunct from the conscious stream of thought which is disrupted by the 'aha.'

In current neuroscience studies, the creation of problems that are solvable by insight has been a productive way to quantify insight as well as creativity (Bowden & Jung- Beeman 2003). Bowden and Beeman used a set of remote associate problems made up of three words each (e.g cottage, Swiss, and cake). The participant is then tasked with finding an associate word that forms a compound or familiar phrase with the given three words (e.g cheese). Bowden and Beeman's paradigm is modeled after Mednick's remote associates test of creativity (Mednick 1962). Although predominantly used to quantify creativity, Mednick's Remote Associates Test (RAT) is one of the more direct ways of studying insight.

There are two types of remote associate word sets: forward (e.g given 'cat' and looking for 'mouse' in response) and backward (e.g given 'cake' and looking for 'cup' in response) remote associates. It is generally thought that forward associations are easier to solve because they are more direct, whereas backward associates need to be flipped to generate an answer. This distinction brought us to theorize that this could also be the case with remote associates that measure insight. This prompted a further look into results from insight remote associate task provided by Bowden and Beeman. Our analysis strongly suggested a difference between the triplets that have a forward association to the target word. Thus, a study was warranted to further investigate this difference between forward and backward association in insight, this time with an emphasis on seeing its effect on 'aha' moment and accuracy.

In the present study, 40 remote association triplets were presented to each participant via computer. Half of the triplets were forward associates and the other half were backward associates. Each triplet was associated with a target word, and was chosen based on association strength from Nelson's word

association norms (Nelson 1998). Participants were given 20 seconds to think of the target word. If they had succeeded in generating the target word within the allotted time, we referred to this as 'insight'. Participants were then asked two questions: Whether they experienced an 'aha' moment, and how confident they were in their answer choice. If they did not give an answer within 20 seconds they were asked to write their best guess answer and how confident they were. Then they were shown the correct response and were asked whether the experienced an "aha" moment.

We did not run statistical analysis on the results; rather, we looked for informative trends in the data. Results show that both 'aha' moment strength and accuracy rates are greater in forward association triplets as compared to backward association triplets. This supports our theory that there exists a forward association advantage in the context of insight, as shown through both increased aha moment strength and accuracy. Further research should be done to find the neural correlates of insight as it relates to forward and backward remote associates.

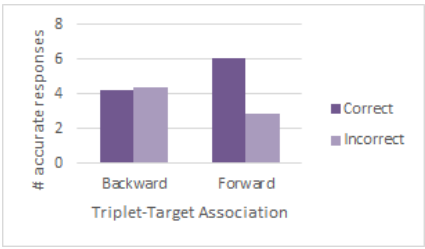

Figure 1. Accuracy in both forward and backward association triplets in correct and incorrect responses with insight

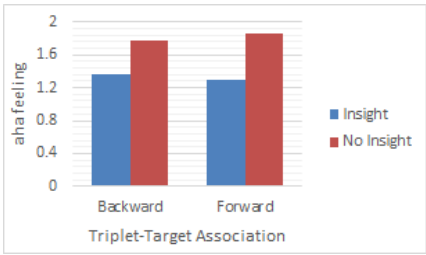

Figure 2. 'Aha' moment in the correct responses with insight and in the incorrect responses without insight with forward and backward associates

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Use of Sugammadex at a Quaternary Pediatric Institution, 2017-2019

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Neuromuscular blocking agents (NMBAs) are routinely administered for the purposes of facilitating endotracheal intubation and providing skeletal muscle relaxation for surgery. Neuromuscular blockade must be reversed at the end of the procedure to allow for safe extubation and prevention of complications due to residual weakness in the postoperative period.

Cholinesterase inhibitors act via competitive inhibition to reverse a neuromuscular block. Cholinesterase inhibitors prevent the normal breakdown of acetylcholine concentration, thereby increasing the amount of acetylcholine that competes with NMBAs at the neuromuscular junction. These drugs are therefore limited in their ability to reverse a deep neuromuscular blockade and are only fully effective when endogenous acetylcholine is competing with a relatively low concentration of NMBA at the neuromuscular junction. In addition, the systemic increase in acetylcholine can also cause unwanted side effects, including bradycardia and postoperative nausea and vomiting.

In December 2015, the FDA approved a new drug for reversal of neuromuscular blockade. Sugammadex is a selective relaxant binding agent that works via a unique mechanism of encapsulating the steroidal rings of NMBA molecules. This inactivates the NMBA and creates a concentration gradient causing more NMBAs to leave the neuromuscular junction and move into the plasma, where they are inactivated by sugammadex. This mechanism causes a very rapid and complete reversal of neuromuscular blockade. Sugammadex is particularly helpful in the case of deep neuromuscular blocks, surgical cases that complete quickly and need earlier reversal than anticipated, and cannot intubate/cannot ventilate situations that require immediate reversal of neuromuscular blockade in order for spontaneous respiration to resume.

Concerns regarding anaphylaxis and hypersensitivity reactions from sugammadex have been raised based on data from clinical trials. However, incidence of anaphylaxis has been mostly linked to high doses of sugammadex. According to the FDA, the recommended dose of sugammadex is 2-4 mg/kg, depending upon the degree of neuromuscular blockade as indicated by train-of-four stimulation, and a dose of 16mg/kg if the block needs to be within three minutes of NMBA administration. Another concern about sugammadex involves its administration to females of childbearing age, because it can interfere with the efficacy of hormonal contraceptives. Progestins, which are a component of hormonal birth control, have a similar steroidal structure to NMBAs. Therefore, when sugammadex is administered it

encapsulates progestins and inhibits their contraceptive function. All female patients who are using hormonal means of contraception should receive discharge instructions recommending the use of backup contraception for seven days. At this institution, backup contraception instructions are supposed to be provided to all female patients of childbearing age, whether they have reported use of hormonal contraceptives or not.

This was the first clinical review of sugammadex use in a pediatric institution. Sugammadex was first available in this hospital in May 2017. In this study, we conducted a chart review of all cases of sugammadex administration from May 2017- June 2019, looking for the incidence of anaphylaxis associated with sugammadex administration. All cases of sugammadex administration were screened for any signs of anaphylaxis (including administration of epinephrine during the anesthetic, a free text search for “anaphylaxis” in each patient's chart, and review of the Anesthesia Quality Incidents (AQI) database). We also examined all high doses (>6 mg/kg) of sugammadex to determine the reason and/or indication for these doses. As sugammadex costs approximately 10 times as much as the standard reversal agents for the recommended 2-4 mg/kg, inappropriately high doses incur significant unnecessary cost, in addition to the elevated risk of hypersensitivity reactions and anaphylaxis. Additionally, we took note of compliance with supplying female patients that are above twelve years old with discharge instructions about using backup contraceptive for seven days. Moreover, we evaluated any tendencies toward particular patient demographics (gender and age) in the use of sugammadex.

In 724 administrations of sugammadex, we found no cases of anaphylaxis. While the absence of a reaction or adverse outcome cannot conclusively prove its safety, these findings are reassuring. We discovered multiple cases of high doses of sugammadex that were all administered ten minutes or longer after NMBA administration, when a lower dose could likely have been given and a second dose only if reversal was incomplete. We discovered that the percentage of females of childbearing age (12-years and older) who received sugammadex was significantly lower than those receiving sugammadex in the 0-11 year age range and lower than the percentage of childbearing age females in the control population. Furthermore, 41% of females that were ages 12-18 didn’t receive discharge instructions to use backup contraceptives, although compliance was trending upward over the course of the study period.

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Voronoi Topology for Analysis of the Vicsek Model

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In 1995, Tamas Vicsek studied the behavior of bacteria systems and self-propelled particles under specific conditions. The two conditions Vicsek tested were the density of the system and the amount of random movement each particle in the system underwent (noise). In his experiment, Vicsek showed that under a low density and a high noise, the bacteria system behaves very erratically, with all the particles traveling in random directions. However, at high density and low noise, the particles will align, cluster and move uniformly. These experiments later became known as the Vicsek model (Figure 1). This mathematical model is used to describe active matter and other systems that are able to move on their own. This summer we further investigated the Vicsek model by utilizing a new method of analysis: Voronoi topology.

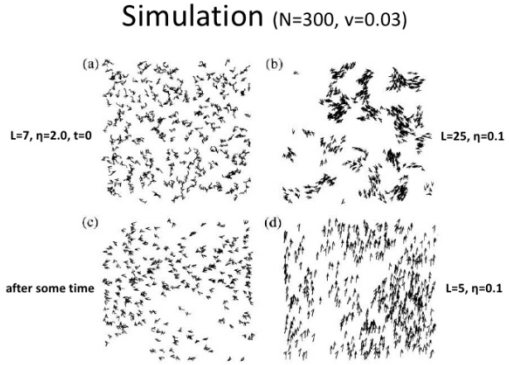

Figure 1: Vicsek's Experiments

Voronoi topology is a type of mathematical graphing that examines the physical arrangement of particles in space. Each particle in the system is bounded by a voronoi cell, which indicates the region that the particle occupies. These regions are divided by line segments that divide the area based on the distance of one particle to another. For example, the public school system uses voronoi topology to divide students into the various public schools based on where they live. In this example, the schools represent the particles in the system. Each school receives the students that are closest to their school, with the students on the border becoming the line segment and shared area of the two schools as shown in the image provided (Figure 2).

Figure 2: Example of Voronoi Topology

We used Voronoi topology to analyze the Vicsek model to see how the various particles in the system interacted with one another. If all of the particles clustered, as it does in the case of high density and low noise, we would see that every particle would have a small voronoi cell area and there would only be a few sides per voronoi cell. This is expected because like in any circle, the smaller the radius the smaller the circumference: when the particles become so clustered, there are fewer particles physically able to surround a center particle, therefore, there will be fewer sides to the voronoi cell surrounding the particle. However, if the particles are travelling at random, the voronoi cell would have many sides because the particles would be further away, thus allowing for more particles to affect it and consequently, more sides to the voronoi cell.

Using the data collected from the simulations of the Vicsek model with Voronoi topology applied, we attempted to compute a graph of the Voronoi shape of each particle and the changes it underwent (Figure 3). We are hoping to find some pattern in the Vicsek model by examining the transitions each particle undergoes and the number of times the Voronoi cell appears in the graph.

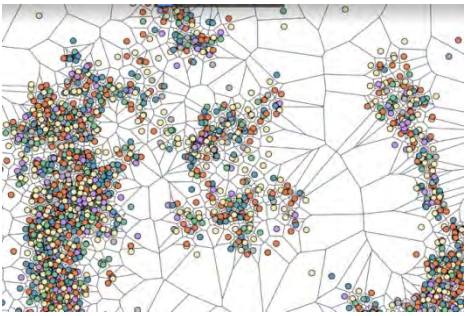

Figure 3: Our simulation incorporating Voronoi topology.
This one is under L=25 Noise=2.00

Role of Macrophage TNTs in Inducing Stemness

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Breast cancer invasion and progression can be increased by the presence of tumor associated macrophages. Macrophages have been shown to increase the elongated morphology of tumor cells, increase invasion and metastasis, the formation of tunneling nanotubes (TNTs), and chemoresistance. Although these properties exist when macrophages and tumors interact, these are also characteristic properties of cancer stem cells (CSCs). We hypothesize that traditional stem cell markers are regulated by coculture with macrophages. In addition, we propose that TNTs contribute to the ability of macrophages to enhance CSC properties. We tested this hypothesis by evaluating the expression of CD44 and CD24 on two breast cancer cell lines, MTLn3 and MDA-MB-231 (231) when cultured alone or in the presence of RAW/LR5 macrophages. We also tested the role of macrophage TNTs by comparing the use of a control macrophage cell line or line reduced in TNT production through the suppression of the protein Msec (or TNFAIP2). We found that coculture of control macrophages with MTLn3 cells led to changes in expression of CD44 and CD24 which were Msec dependent. However, expression of CD44 and CD24 by 231 cells was not altered by coculture with macrophages.