Women in Science

Yeshiva University
STERN COLLEGE FOR WOMEN

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Introductory Remarks

The Departments of Biology, Chemistry/Biochemistry, Physics, Psychology, and Speech Pathology/Audiology 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, public health, engineering, architecture, and bioinformatics; and doctoral programs in the biomedical sciences, 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, 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 Summer 2011, a collaborative interaction between Bar Ilan University and Yeshiva University, now called the Bar Ilan Summer Research Program, 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 Summer 2017, 16 SCW undergraduates participated in this laboratory experience.

The science faculties actively encourage the science majors to apply for competitive undergraduate research internships, locally, nationally, and internationally. In the summer of 2017, an additional 30 SCW students were involved in research in a variety of laboratory facilities, including at SCW, Albert Einstein College of Medicine (AECOM), Montefiore Medical Center, Stony Brook University, Boston Children's Hospital, Northwestern University, and NYU Fertility Center, as well as in the Health Careers Opportunity Program at the Rusk Institute for Rehabilitative Medicine.

The Jewish Foundation for the Education of Women (JFEW) Science Fellowship Program was inaugurated in the 2009-2010 academic year, with ten participating students. Each subsequent year, an additional nine to ten students, all with interests in the sciences, joined the program. Most recently, the Foundation has renewed a grant to support additional cohorts through the 2021 academic year. Highlights of the JFEW Science Fellowship Program include a partial scholarship, a stipend for a summer research internship as well as travel funds, a stipend to support scientific conference attendance,

one-on-one mentoring with a science faculty member, and an enrichment program, providing workshops to aid students in their academic and professional development. This year, the JFEW Fellows have obtained internships, either in clinical or biomedical wet-lab research, in fields of research including psychology, cancer cell biology, veterinary medicine, neurobiology, and molecular biology. The fellows have interned in prestigious institutions, including 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 Department of Psychology offers an Honors 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, 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 Fall 2016, the college instituted a minor in 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 NYU, Columbia University, and Pace University. It also organized a guided tour of the NYU College of Nursing. 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.

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 2016-2017 academic year, the following students presented seminars at SURGE meetings:

	2016 FALL SURGE Meetings	
September 2016		
Name	**Research Title**	**Program/Location**
Hilla Katz & Julia Fisher	The Role of Transcription Factors in Working Memory	Mt. Sinai School of Medicine
Gabriella Shankman	Redox-Sensitive Fluorescent Proteins as New Tools for Curing Neurodenegerative Diseases	Bar Ilan University
Stephanie Roffe	The Effect of Human Milk Fortifier on pH, Osmolality, and Probiotic Bacteria Growth	Feinstein Institute
November 2016		
Name	**Research Title**	**Program/Location**
Hannah Piskun	The FMT Trial: Can it Cure IBS?	NYU
Ilana Karp	Refolding HuiI for Study of KcsA through NMR Spectroscopy	Bar Ilan University
Yael Arshadnia	Transcription Regulation	Bar Ilan University
December 2016		
Name	**Research Title**	**Program/Location**
Briana Friedman	Establishing a New Technique for Generation of Human Peripheral Sensory Neurons for Study of Varicella Zoster Virus	Bar Ilan University
Jordana Gross	The Effect of Beta Catenin Inhibitors on the Growth of Vascular Smooth Muscle and Endothelial Cells	Albert Einstein College of Medicine (AECOM)
Tehilla Sollofe	The Efficacy of Trichodesmium in Oligotrophic Waters	Bar Ilan University
	2017 SPRING SURGE Meetings	
March 2017		
Name	**Title**	**Program/Location**
Amanda Rubin	The Role of Double Negative CD4- CD8- T-cells in Pancreatic Adenocarcinoma Progression	NYU
Avigayil Dietz	The Role of an Intron on the Balance Between Daytime Sleep and Foraging for Food During the Day	Rutgers University
Batsheva Reich	The Effect of Hypoxia on Gabaergic Neurons in the Mouse Prefrontal Cortex	The Rockefeller University
April 2017		
Name	**Title**	**Program/Location**
Lior Levy	The Effect of Male Sex Hormones on Arginine Transport in Human Endothelial Cells through the Modulation of Cationic Amino Acid Transporter-1	Tel Aviv Sourasky Medical Center
Daniella Miller	Examining Pharyngeal Apparatus Development in Tbx1-Cre/+;Foxi3f/f Mouse Embryos to Explain Thymus and Parathyroid Defects	Albert Einstein College of Medicine (AECOM)
May 2017		
Name	**Title**	**Program/Location**
Miriam Saffern	The Role of IL-17a in Fecal Microbiota Transplant Medicated Clearance of C. difficile Infection	Sloan-Kettering Medical Center
Shayna Goldstein	The Effect of Future Priming on Environmental Attitudes	Bar Ilan University
Adina Wakschlag	Characterizing iPLA2 in Drosophila	Yeshiva College

Each fall semester, the science departments jointly sponsor a poster presentation contest. Students present their work and discuss the research with attending faculty. The posters, and more importantly the student's understanding of the project and the extent of her hands-on participation, are evaluated by the science faculty. 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 Spring 2017, Lior Levy (poster title, "Male sex hormones regulate human endothelial nitric oxide synthase system through the modulation of cationic amino acid transporter-1) and Miriam Saffern (poster title, "Role of IL-17a in fecal microbiota transplant mediated clearance of C. difficile infection") presented at the 253rd National Meeting of the American Chemical Society, San Francisco, CA, April. The SCW Chemistry Club, a student affiliate chapter of the

American Chemical Society (ACS), was awarded a travel grant to subsidize student travel to the spring ACS national meeting in San Francisco. 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 consider one of our several combined degree programs with other universities. In Spring 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 implemented a combined program with the NYU College of Nursing. Students interested in this program pursue a shaped major to complete 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 21).

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 Pre-Health Advisement, has recently 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 assisting students interested in careers in physical therapy, occupational therapy, physician assistant, and nursing, while Dr. Harvey Babich assists those interesting in a career in genetic counseling.

In Fall 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 is 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, and will be available to answer questions. This program is now beginning its third 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 YC pre-med clubs organized the annual Medical School Fair in which admission directors and officers from allopathic and osteopathic medical schools, as well as from American medical student programs in Israel, attended. The location of the annual fair alternates between the Wilf Campus (YC) and Beren Campus (SCW); last year it was held at the Wilf Campus. Each medical school had its own booth, thereby allowing students to approach the representative and to ask questions and gain insight into the school. The following schools were present at the fair: representing the American Allopathic Medical Schools were Hofstra, Cornell, Quinnipiac, and Jefferson the Commonwealth Medical College; representing the American Osteopathic Medical Schools were Philadelphia College of Osteopathic Medicine and Rowan University School of Osteopathic Medicine; representing the Israel American Medical Student Programs were Sackler, Technion, and Ben Gurion. 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 the Albert Einstein College of Medicine's Executive Dean Edward Burns and Associate Dean Victoria Freedman. 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 Myriam Gilles of Yeshiva University's Benjamin N. Cardozo School of Law. This exciting enrichment program meets at Cardozo School of Law six Fridays during the semester for two hour sessions 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. 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.; Rafael Cuesta, Ph.D.; Marina Holz, 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 Cell Biology, Genetics, Human Anatomy, Human Biology, Human Development, Human Physiology, Immunology, Medical Biochemistry, Microbiology, Molecular Biology, Neurobiology, Nutrition, Pharmacology, and Reproductive Biology.

The B.A. in Biology requires completion of Principles of Biology I and II and 20 credits of advanced courses in Biology, of which four 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.

Exciting one credit **Journal Club** courses are offered. Shira Marder and Sarah Noble, Stern alumni and 4th year medical students at Albert Einstein College of Medicine (AECOM), will be teaching a Journal Club course in Spring 2018, title to be determined."Oncology," the Journal Club course offered in Fall 2016, was taught by SCW alumni Rikah Lerer and Miriam Steinberger, also medical students AECOM. In Spring 2015, the topic of the Journal Club was "Immunology and Disease," taught by SCW alumni, Hadassa Klerman, Jennifer Deluty, and Elisa Karp. In Fall 2015, Dr. James Nussbaum, Ph.D., P.T., instructed the Journal Club course entitled, "Human Gait." This Journal Club was directed to pre-PT and pre-OT students. In Fall 2014, Dr. Nussbaum taught the Journal Club course, "Biomechanics."

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. She guides 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, who guides 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 in 2013, 2014, and 2016. In 2016, Dr. Schuck also received the Dean Karen Bacon Faculty Award.

Volume 21 of Derech HaTeva, A Journal of Torah and Science, was published in Spring 2017. This issue included manuscripts authored by 23 undergraduates, as well as articles by Dr. Levy Amar and Dr. Harvey Babich. In the 2015-2016 academic year the Biology Department hosted a series of **Torah U'Madda** presentations, including talks by Rabbi Yosef Bitton ("Awesome creation"), Rabbi Gideon Weitzman of the PUAH Institute ("HPV and immunizations"), and by Dr. David Kulak, an IVF physician ("Reproductive medicine: replacement of mitochondrial DNA"). In the 2014-2015 academic year, Dr. Itsik Pe'er, Ph.D., spoke on "The sequence of the Ashkenazi genome," and Yael Kramer, M.S., spoke on "Research in fertility interventions: forging a path from bench to baby."

Rabbi Dr. Richard Weiss presented the following Torah U'Madda seminars: (a) Responsibility for Health Care: Personal vs. Communal; April 5, 2016; CareOne Healthcare Facility, Teaneck, NJ; (b) Contraception and Fertility (2 part lecture); March 30 and May 18, 2016; Lander College for Men, Queens, NY; and (c) End of Life Issues; May 18, 2016; Rabbi Isaac Elchanan Theological Seminary (RIETS) for the practical halacha program of the 'semicha' program.

Dr. Levy Amar 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.

Dr. Marina Holz, a Professor of Biology, and Dr. Margarita Vigodner, an Associate Professor of Biology, have sky-rocketed the Biology Department to new heights, as attested by their record **of publishing scientific research manuscripts** in prestigious scientific journals and by their receipt of significant external funding. Also in the Holz laboratory are the researcher scientists, Dr. Anya Alayev (clinical assistant professor of biology) and Dr. Rafael Cuesta (post-doc). Both Dr. Holz and Dr. Vigodner hold secondary appointments at the rank of Assistant Professor in the Developmental and Molecular Biology Department (Dr. Vigodner) and in the Department of Molecular Pharmacology (Dr. Holz) at AECOM. In 2012, Dr. Holz was awarded the Point of Light Award at the Yeshiva University Hanukkah Convocation, in 2013 received the LAM Foundation Pilot Award; in 2015, 2016, and 2017, she received the American Society for Biochemistry and Molecular Biology (ASBMB) Undergraduate Faculty Travel Award, and in 2016 received the Platform Presentation Award from the Lymphangioleiomyomatosis (LAM) Foundation (travel award), and the AACR-Bayer Innovation and Discovery Award.

Ongoing research support for the Holz laboratory includes grants from the following:

(1) RSG-13-287-01 TBE Holz (PI) 07/01/2013 - 06/30/2018
American Cancer Society (ACS): mTOR signaling pathway in cancer. To understand the mechanistic, therapeutic and prognostic aspects of the relationship between mTORC1/S6K1 and ER pathways underlying disease progression and therapeutic resistance in breast cancer.

(2) 2R15CA151112-02 Holz (PI) 06/01/2010 - 06/30/2017
National Cancer Institute (NCI): Identification and characterization of S6K1 targets in mammary cell proliferation. Investigation of the mechanistic connections between the mTORC1 and ER pathways.

(3) N/A Holz (PI) 07/01/2016 - 06/30/2017
AACR- Bayer Innovator and Discovery Award: ERRa as a marker in TNBC. Objective is to understand the molecular basis of ERRa expression as a prognostic factor in TNBC and a marker of response to endocrine therapy.

(4) N/A Holz (PI) 06/01/2008 – 05/31/2019
Atol Charitable Trust: The role of S6K1 in breast cancer. Comprehensive assessment of S6K1 as a novel biopharmaceutical target in breast cancer treatment.

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 Summer 2015, the Vigodner laboratory was fully renovated. In addition, the Mitrani Foundation provided a small grant to support student research.

Dr. Schuck, whose research interests involve the response of human oral cancer cells to nutraceuticals, as well as Drs. Vigodner and Holz, 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 2016 and later.

Berman, A.Y., Manna, S., Schwartz, N.S., Katz, Y.E., Sun, Y., Behrmann, C.A., Yu, J.J., Plas, D.R., **Alayev, A., Holz, M.K.**, 2017, ERRα regulates the growth of triple-negative breast cancer cells via S6K1-dependent mechanism, *Signal Transduct. Targeted Ther.*, Nature (in press).

Xiao, Y., Lucas, B., Molcho, ER. Schiff, T., and **Vigodner, M.**, 2017, Cross talk betwen sumoylation and phosphorylation in mouse spermatoctes, Biochem. Biophys. Res. Commun. 487:640-645.

Bostner, J., **Alayev, A.**, Berman, A.Y., Fornander, T., Nordenskjöld, B., **Holz, M.K.**, Stål, O., 2017, Raptor localization and estrogen-dependent breast cancer growth (in press).

Li, C, Liu, Y., Zhang, E., Sun, Y., Li, N., Medepalli, K., Wikenheiser-Brokamp, K., Plas, D.R., Sun, J., Chen, Y., Franz, D.N., Capal, J.K., Mays, M., Kwiatkowski, D., **Alayev, A., Holz, M.K.**, Kruger, D., Siroky, D., Yu, J.J., 2017, Tuberin regulates prostaglandin E receptor 3-mediated viability of mTORC1-hyperactive cells via Rheb (resubmitted after revisions.)

Alayev, A., Manna, S., Schwartz, N.S., Berman, A.Y., Sun, Y., Yu, J.J., Behrmann, C.A., Plas, D.R., **Holz, M.K.**, 2017, ERRα regulates the growth of triple-negative breast cancer cells via S6K1-dependent mechanism (resubmitted after revisions.)

Amar, L., and Hill, M., 2017, Crossflow microfiltration of blood through a uniformly pored Si3N4 microsieve. *J. Membrane Sci.* (submitted).

Alayev, A., Salamon, R.S., Schwartz, N.S., Berman, A.Y., Wiener, S.L., **Holz, M.K.**, 2017, Combination of rapamycin and resveratrol for treatment of bladder cancer. *J. Cell. Physiol.* 232:436-446.

Alayev, A., Salamon, R.S., Manna, S., Schwartz, N.S., Berman, A.Y., **Holz, M.K.**, 2016, Estrogen induces RAD51C expression and localization to sites of DNA damage. *Cell Cycle* 15:3230-3239.

Manna, S. and **Holz, M.K.**, 2016, Tamoxifen action in ER-negative breast cancer. *Sign. Transduct. Insights* 5:1-7.

Cuesta, R. and **Holz, M.K.** 2016, RSK-mediated down-regulation of PDCD4 is required for the proliferation, survival, and migration in a model of triple-negative breast cancer. *Oncotarget* 7:27567-27583.

Manna, S., Bostner, J., Sun, Y., Miller, L.D., **Alayev, A.**, Schwartz, N.S., Lager, E., Fornander, T., Nordenskjöld, B., Yu, J.J., Stål, O., **Holz, M.K.**, 2016, ERRα is a marker of tamoxifen response and survival in triple-negative breast cancer. *Clin. Cancer Res.* 22:1421-1431.

Klionsky, D.J. et al....**Holz MK**...(multiple authors, listed alphabetically), 2016, Guidelines for the use and interpretation of assays for monitoring autophagy (3rd edition). *Autophagy* 12:1-222.

Cuesta, R. and **Holz, M.K.** 2016, RSK-mediated down-regulation of PDCD4 is required for the proliferation, survival, and migration in a model of triple-negative breast cancer. *Oncotarget* 7:27567-27583.

Xiao, Y., Pollack, D., Andrusier, M., Levy, A., Callaway, M., Nieves, E., and **Vigodner M.**, 2016, Identification of cell specific targets of sumoylation during mouse spermatogenesis *Reproduction*, 151:149-166.

Xiao, Y., Lucas, B., Molcho, E., Schiff, T., and **Vigodner, M.**, 2016, Inhibition of CDK1 activity by sumoylation, Biochem. Biophys. Res. Commun., 478:919-923.

Some undergraduates participate in research in external laboratories and, when their contributions were of significance, their names are included as coauthors on the research papers. Names of such undergraduates are in bold type.

McFarren , A., Lopez, L., Williams, D.W., Veenstra, M., Bryan, R.A., **Goldsmith, A.**, Bruchertseifer, F., Zolla-Pazner, S., Gorny, M.K., Eugenin, E.A., Berman, J.W., and Dadachova, E., 2016, A fully human antibody to gp41 selectively eliminates HIV-infected cells that transmigrated across a model human blood brain barrier, AIDS, 30:563-572.

Pereira, A.C., Gray, J.D., Kogan, J.F., **Davidson, R.L.,** Rubin, T.G., Okamoto, M., Morrison, J.H., and McEwen, B.S., 2016, Age and Alzheimer's disease gene expression profiles reversed by the glutamate modulator riluzole, Mol. Psychiat. [published online ahead of print].

Drs. Holz, Vigodner, and Amar presented their research at meetings of national and international societies, as well as before learned audiences. Below are some of these presentations (2016-2017).

Holz, M. 5th Hormel Institute International Cancer Research Conference, Austin, MN. (2017).

Amar, L., Reversing aging through regenerative medicine, Biomedical Engineering Seminars, Columbia University (February 3, 2017)

Vigodner, M. Cross talk between sumoylation and phosphorylation in mouse spermatocytes, American Society of Andrology, Miami, FL (April, 2017).

Vigodner, M. Cross-talk between sumoylation and phosphorylation.at Columbia University (April 27, 2016) and at AECOM (May 16, 2016).

Holz, M. Estrogen induces RAD51C expression and localization to sites of DNA damage (April 4, 2016, ASBMB annual meeting)

Holz, M. International Meeting on Resveratrol, Taipei Medical University, Taiwan (2016)

Amar, L., Wearable artificial kidney: maintaining body homeostasis, Biomedical Engineering Society Annual Meeting, Minneapolis, MN (October 5-8, 2016)

In conjunction with YU Undergraduate Admissions, Dr. Alyssa Schuck presented at Stella K. Abraham High School for Girls as keynote speaker at the Abraham's Honors Society induction event, "Your microbiome and you," (December 8, 2016) and "A Torah perspective on the study of science," (Nov. 2016)

Our undergraduates (bold type) also have presented at national meetings of scientific societies:

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; March

Levy L., Chernichovski T., 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.

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.

Off-campus research placements abound, with SCW students obtaining **research internships** during the 2016-2017 academic year at The Rockefeller University, Mount Sinai School of Medicine, and New York University Medical Center. In Summer 2017, our students participated in the Bar-Ilan University summer research program, as well as interned in the Albert Einstein College of Medicine, Montefiore Medical Center, Northwesteren University, Boston Children's Hospital, University of Maryland Medical School, CUNY, Stony Brook University, and the Rusk Institute for Rehabilitative Medicine.

The Department of Biology has upgraded the infrastructure of the on-campus research laboratories. Beginning in Summer 2011, and extending into the Fall semester, the on-campus research laboratory (room 341 of 253 Lexington Avenue) of Dr. Holz was renovated and modernized through a $100,000 grant from the Elias, Genevieve, and Georgiana Atol Charitable Trust. Dr. Holz specializes in cancer research. This expansion and upgrading of the Holz laboratory accounted, in part, for her successes in securing prestigious grants and in attracting many undergraduate interns. In Summer 2014 and into 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 347 of 253 Lexington Avenue) commenced. Such renovations and modernizations have allowed Dr. Vigodner to upgrade her research operation to further provide opportunities for undergraduate research and increase her effectiveness in procuring external funding.

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 Beckman-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, through funding obtained by Dr. Holz: 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 obtained by Drs. Holz and Vigodner 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, through monies obtained from her grant, Dr. Holz purchased a LiCor Odyssey near-infrared imaging system, a Promega 96-well plate dual-injector spectrophotometer and luminometer, and a Millipore Q3 water purification system. Pooling funding from their grants, Drs. Vigodner and Holz purchased 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 Summer 2008 forty brightfield microscopes were purchased. In 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 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 the 2016-2017 academic year, the Biology Club organized a series of career workshops for SCW students majoring in biology. One particularly informative workshop included a panel of SCW graduates from a variety of professions who spoke about their fields of interest. Another workshop focused on resume and cover letter writing 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

Faculty: Rafael Cuesta, Ph.D.; 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.

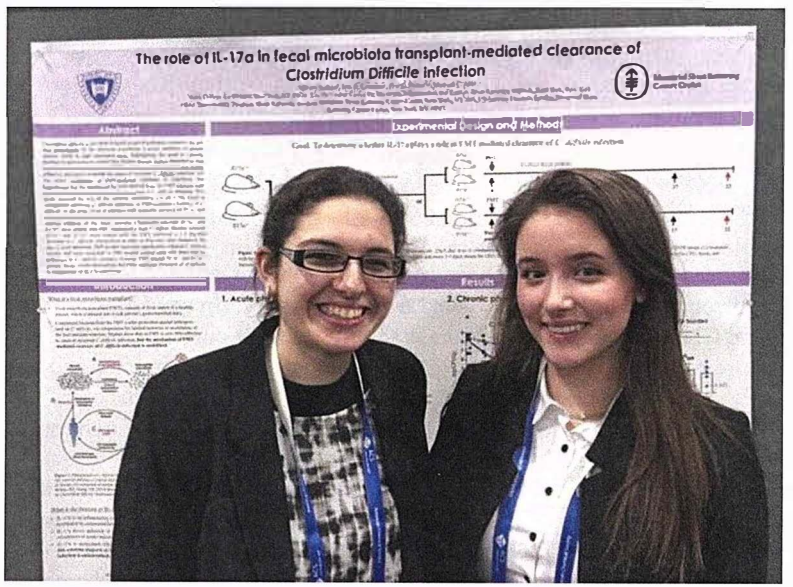
In keeping with the approach to science education at SCW, the Department of Chemistry and Biochemistry offers a series of high level courses, opportunities for undergraduate research, and extracurricular programming to foster an enthusiasm for science and an interest in scientific research.
The Department of Chemistry and Biochemistry offers majors in both Chemistry and Biochemistry. Instituted as an official major several years ago, the Biochemistry major is popular among students interested in a broad science background, including those that are preparing to attend medical and dental school. This coming fall, three graduating Biochemistry and Chemistry majors will be attending 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 AECOM. Other Chemistry and Biochemistry graduates have gone on to medical, dental, optometry, and law schools, and careers in science education.

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.

This year, our department ran a national search for a new faculty member in the interest of building up the department and providing additional research opportunities for our students. Dr. Ran Drori, formerly of Hebrew University and NYU, will be joining the department in the fall of 2017. Dr. Drori is a talented teacher and world class scientist. His multi-disciplinary research in the field of ice crystallization and its effects on agriculture is

anticipated to appeal to students in the biology, chemistry, and physics departments.

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 2015-2016 activities from the American Chemical Society. The award was presented at the national ACS meeting in San Francisco in April 2017 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.



Miriam Saffern and Lior Levy, winners of the Stern College poster competition, present their posters at undergraduate poster session of the 2017 ACS meeting in San Francisco, CA.

Chemistry Club members at an outreach event at the New York Hall of Science.

Chemistry Club members at the annual magic show.

Department of Physics

Faculty: Emil Prodan, Ph.D.; Lea Ferreira dos Santos, Ph.D.; Mark Edelman, Ph.D.

The commitment of faculty to the "research and discovery approach" to education is a hallmark of Physics Department at Stern College for Women (SCW). Talented students will 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, their articles being published in prestigious professional journals and their work has been highlighted in several occasions and awarded with major research grants. The exposure to such first class science and the atmosphere of discoveries plays a major role for undergraduate students shaping their 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 physics department members. Stern physics students undertake research during the summers and throughout the year. They present their results at national and international science meetings and give seminar talks. Physics, Physical Sciences and Pre-engineering students, mentored by Department faculty, are also coauthors in refereed articles published in physics, chemistry, and materials science journals. One such example is:

E. J. Torres-Herrera, J. Karp, M. Távora, and L. F. Santos, "*Realistic many-body quantum systems vs full random matrices: static and dynamical properties*", Entropy **18**, 359 (2016)

Below are the highlights of our Physics Department:

External funding

04/01/2012-03/31/2016
Sponsor: National Science Foundation
Project Title: Physics of Interacting Quantum Systems with Phase Transitions (DMR - 1603418)
Role: Principal Investigator
Amount: US$285,000

01/01/2016-12/31/2018
Sponsor: National Science Foundation
Project Title: CAREER: Studies of Dynamics and Control of Quantum Many-Body Systems Far from Equilibrium" (DMR-1147430)
Role: Principal Investigator

Amount: US$475,000

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

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

Awards

Mark Edelman: Zaslavsky Prize for achievements in nonlinear science and complexity from the Society for Industrial and Applied Mathematics (SIAM) supported conference NSC-2016.

Postdocs supervised

Marco Távora (by Lea F. Santos)

Peer-Reviewed Publications

Mark Edelman (5 articles)

1. M. Edelman, "On Fractional Eulerian Numbers and Equivalence of Maps with Long-Range Power-Law Memory (Integral Volterra Equations of the Second Kind) to Grünvald-Letnikov Fractional Difference (Differential) Equations", Chaos, 25, 073103 (2015); arXiv:1410.6864.

2. M. Edelman and J.A. Tenreiro Machado, "Fractional Dynamics and Systems with Power-Law Memory", Discontinuity, Nonlinearity, and Complexity 4, 381-382, (2015);

3. M. Edelman, "Fractional Maps and Fractional Attractors. Part II: Fractional Difference α-Families of Maps", Discontinuity, Nonlinearity, and Complexity, 4, 391-402, (2015); arXiv: 1404.4906.

4. M. Edelman, "Universality in fractional dynamics", International Conference on Fractional Differentiation and Its Applications (ICFDA), 2014 DOI: 10.1109/ICFDA.2014.6967376, (2014), Page(s): 1 - 6; arXiv: 1401.0048.

5. M. Edelman, "Caputo standard α-family of maps: Fractional difference vs. fractional", Chaos, 24, 023137 (2014); arXiv: 1406.4059.

Emil Prodan (6 articles)

1. E. Prodan, Topological insulators at strong disorder, invited paper for the 2015 Congress on Mathematical Physics.

2. E. Prodan, K. Dobiszewski, A. Kanwal, J. Palmieri, Camelia Prodan, Dynamical Majorana edge modes in a broad class of topological mechanical systems, Nature Communications 8, 14587 (2017).

3. Hsiang-Hsuan Hung, Aaron Barr, Emil Prodan and Gregory A. Fiete, Disorder effects in correlated topological insulators, Phys. Rev. B **94**, 235132 (2016).

4. E. Prodan and H. Schulz-Baldes, Generalized Connes-Chern characters in KK-theory with an application to weak topological invariants, Rev. Math. Phys. **28**, 1650024 (2016).

5. E. Prodan and H. Schulz-Baldes, Non-commutative odd Chern numbers and topological phases of disordered chiral systems, J. Func. Anal. **271**, 1150–1176 (2016).

6. E. Prodan and J. Bellissard, Mapping the current-current correlation function near a quantum critical point, Annals of Physics **368**, 1-15 (2016).

Lea F. Santos (11 articles)

1) E. J. Torres-Herrera, A. García-García, and Lea F. Santos
"Generic dynamical features of quenched interacting quantum systems: survival probability, density imbalance and out-of-time-ordered correlator" arXiv: 1704.06272

2) E. J. Torres-Herrera and Lea F. Santos
"Dynamical Manifestations of Quantum Chaos: Correlation Hole and Bulge" Phil. Trans. R. Soc. A (2017) [arXiv: 1702.04363]

3) M. Sindelka, Lea F. Santos and N. Moiseyev
"Excited-state quantum phase transitions studied from a non-Hermitian perspective" Physical Review A 95, 010103R (2017)

4) M. Távora, E. J. Torres-Herrera, L. F. Santos,
"Power-law Decay Exponents: a Dynamical Criterion for Predicting Thermalization",Physical Review A 95, 013604 (2017)

5) E. J. Torres-Herrera and L. F. Santos,
"Extended nonergodic states in disordered many-body quantum systems"

[arXiv:1610.02035] (accepted at Annalen der Physik, 2017)

6) M. Távora, E. J. Torres-Herrera, L. F. Santos,
"Inevitable power-law behavior of isolated many-body quantum systems and how it anticipates thermalization", Physical Review A 94, 041603R (2016)

7) E. J. Torres-Herrera, J. Karp, M. Távora, and L. F. Santos,
"Realistic many-body quantum systems vs full random matrices: static and dynamical properties", Entropy 18, 359 (2016)

8) F. Pérez-Bernal and L. F. Santos,
"Effects of excited state quantum phase transitions on system dynamics", Fortschritte der Physik (2016); DOI: 10.1002/prop.201600035 (arXiv:1604.06851)

9) L. F. Santos, M. Távora, F. Pérez-Bernal,
"Excited state quantum phase transitions in many-body systems with infinite-range interaction: localization, dynamics, and bifurcation", Physical Review A 94, 012113 (2016)

10) F. Borgonovi, L. F. Santos, F. M. Izrailev, V. G. Zelevisnky,
"Quantum chaos and thermalization in isolated systems of interacting particles",Physics Reports 626, 1 (2016)

11) L. F. Santos, F. Borgonovi, G. L. Celardo,
"Cooperative shielding in many-body systems with long-range interaction: localization and light cone",
Physical Review Letters 116, 250402 (2016)

Books

Emil Prodan

1) 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).

2) E. Prodan and H. Schulz-Baldes, 'Bulk and Boundary Invariants for Complex Topological Insulators: From K-Theory to Physics,' (Mathematical Physics Studies, Springer, 2016)

Book Chapters (2)

Mark Edelman

1) M. Edelman, "On nonlinear fractional maps: Nonlinear maps with power-law memory", in "Chaos, Complexity and Transport", Proceedings of the

CCT '15, Conference on Chaos, Complexity and Transport 2015, Marseilles, France, 1 – 5 June 2015; X. Leoncini, C. Eloy, and G. Boedec (Editors), pp. 119-130 (World Scientific, Singapore, 2017).

2) M. Edelman, "Fractional Maps as Maps with Power-Law Memory" in: "Nonlinear Dynamics and Complexity", Nonlinear Systems and Complexity, 8, V. Afraimovich et al. (Eds.), pp. 79-120 (Springer, New York, 2014); arXiv: 1306.6361.

Invited Talks (9)

Mark Edelman

1) May 16-20, 2016; 6th International Conference on Nonlinear Science and Complexity; Sao Jose dos Campos, Brazil. Plenary talk (Zaslavsky Award Speech): "Systems with power-law memory and fractional dynamics".

2) Dec. 26 - Dec. 30. 2015; International Workshop on Nonlinear Dynamical Systems; cycle of lectures "Systems with power-law memory and nonlinear fractional dynamics"; Dec. 28, five hours at the Sichuan University of Science and Engineering, Zigong; Dec. 30, two hours at the Southwestern Jiaotong University, Chendu; Jan. 1 – Jan 11, 2016, Cycle of lectures (12 hours) on fractional dynamics for graduate students, Xi'an Jiaotong University, Xi'an, China.

3) June 1-5, 2015; International Conference CCT 15 - Chaos, complexity and transport 2015, Marseilles, France (http://cct15.cpt.univ-mrs.fr). Member of the scientific committee. Contributed talk: "Chaos in discrete and continuous systems with power-law memory".

4) August 4-9, 2014; 5th International Conference on Nonlinear Science and Complexity; Xi'an, China. Invited talk: "Systems with Power-Law Memory"; Invited talk: "Fractional Maps and Fractional Attractors: Non-Linear Fractional Difference Equations". Session Chair: Complex Flows and Dynamics; Session Chair: Fractional Dynamics-III.

5) June 23-25, 2014; International Conference on Fractional Differentiation and its Applications; Catania, Italy. Contributed talk: "Universality in Fractional Dynamics". Session Chair: Theory.

6) Mar. 2015; YU Colloquium Talk "Systems with power-law memory and fractional attractors".

7) Apr. 2015; UC Merced, ME graduate Seminar Talk "Systems with power-law memory".

8) Apr. 2015; Courant Institute at NYU, cSplash (an annual one-day lecture series taught by students and faculty at Courant Institute) talk "Systems with power-law memory".

9) Feb. 2016: BCC CUNY, Math department colloquium talk "Systems with power-law memory and nonlinear fractional dynamics".

Emil Prodan

1) 'Correlated topological phases: A KK-theoretic framework,' lecture for the workshop on "Strongly Correlated Topological Phases of Matter," Simons Center for Geometry and Physics, Stony Brook (USA), June 2016.

2) 'Analysis of topological waves in 2-dimensional networks,' lecture for hot-topic workshop "Mathematical Modeling of 2D Materials" organized by Institute for Mathematics and its Applications, Minneapolis (USA), May 2017.

3) 'Fun with K-Theory and Aperiodic Structures', talk for the workshop 'Mathematical and Physical Aspects of Topologically Protected States', Columbia University, May 2017.

4) 'Bulk-Boundary Correspondence for Aperiodic Systems: A K-Theoretic Approach,' lecture for workshop "Novel Optical Materials" organized by Institute for Mathematics and its Applications, Minneapolis (USA), March 2017.

5) 'A KK-Theoretic Framework for Topological Insulators', talk for the workshop 'KK-theory, Gauge Theory and Topological Phases', Lorentz Center, Leiden (Netherlands), March 2017.

6) 'Topological Networks of Coupled Resonators,' talk for the conference 'Topological Metamaterials,' Aspen (USA), Jan 2017.

7) 'Topological Materials: The story behind the 2016 physics Nobel Prize,' Physics Colloquium, New Jersey Inst. of Technology, December (2016).

8) 'Algebraic Methods for Analysis of Topological Systems,' lecture for Condensed Matter Seminar, New York University, December 2016.

9) 'The bulk-boundary principle for topological insulators,' blackboard lecture for Mathematical Physics Seminar, CUNY Graduate Center, New York, October 2016.

10) 'Geometric identities for index theory,' lecture at the conference "QMATH13: Mathematical results in quantum mechanics," Georgia Tech (Atlanta, US), October 2016.

11) 'A computational non-commutative geometry program,' lecture for the IGA/AMSI workshop "Topological matter, strings, K-theory, and related areas," University of Adelaide (Australia), September 2016.

12) 'KK-Theory of weak topological invariants,' blackboard seminar for the workshop "N-Body Problem,' organized by J. Bellissard, J. Cunz and W. Winter, Munster (Germany), September 2016.

13) 'The Anderson localization-delocalization transition in IQHE and topological insulators,' lecture for the EMS-IMAP summer school in mathematical physics "Universality, Scaling Limits and Effective Theories," Roma (Italy), July 2016.

14) 'Generalized Wannier functions,' talk for the SIAM meeting "Mathematical aspects of materials science," Philadelphia (USA), May 2016.

15) 'Computing the response functions of disordered solids: An operator algebras approach,' talk for the SIAM meeting "Mathematical aspects of materials science," Philadelphia (USA), May 2016.

16.) 'Non-commutative geometry techniques for disordered topological insulators,' blackboard seminar for the program "Geometry of Quantum Hall States," Simons Center for Geometry and Physics, Stony Brook (USA), April 2016.

17) 'Bulk-boundary principle for disordered topological insulators,' workshop on "Geometry of Quantum Hall States," Simons Center for Geometry and Physics, Stony Brook (USA), April 2016.

18) 'Fitting the topological insulators in Alain Connes' noncommutative geometry program,' Informal Mathematical Physics Seminar run by Okounkov and Krichever, Columbia University, New York, March 2016.

19) 'Topological Invariants: Why do we care and what we can do with them,' Colloquium for Physics Department, Seaton Hall University, South Orange NJ, Feb 2016.

Lea F. Santos

1) 2nd Brazilian Meeting on Statistical Mechanics
(Ilheus, Bahia, Brazil, Sep/17-20, 2017)

2) Open Quantum Systems
(Bengaluru, India, Jul/17-28, 2017)

3) FQMT 2017: Frontiers of Quantum and Mesoscopic Thermdynamics
(Prague, Czech Republic, Jul 09-15, 2017)

4) LaGuardia Community College – CUNY
(Apr/26, 2017)

5) CUNY Workshop
(Mar/20-23, 2017)

6) NMP17: Nuclei and Mesoscopic Physics 2017 Conference
(East Lansing MI, USA, Mar 06-10, 2017)

7) CUNY Graduate Center
(Mar/03, 2017)

8) The Royal Society
(London, UK, Feb/6-7, 2017)

9) Universidad Autónoma de Mexico
(Mexico City, Mexico, Jan/23, 2017)

10) Benemérita Universidad Autónoma de Puebla
(Puebla, Mexico, Sep/30, 2016)

11) University of Waterloo
(Waterloo, Canada Aug/31, 2016)

12) University of Heidelberg
(Heidelberg, Germany, Jul/05-07, 2016)

13) 10th International Workshop on Disordered System (IWDS10)
(Brescia, Italy, Jun/27-Jul/01, 2016)

14) Workshop: Quantum Phase Transitions in Nuclei (QPTn)
(Prague, Czech Republic, Jun/6-9, 2016)

15. 6th International Conference on Nonlinear Science and Complexity [Plenary Talk]
(São José dos Campos, Brazil, May/16-20, 2016)

Organized Conferences

Mark Edelman

1) May 16-20, 2016; 6th International Conference on Nonlinear Science and Complexity; Sao Jose dos Campos, Brazil.

Emil Prodan

1) April 2-4; Special session "Topological Mathematical Physics" at the AMS Central Sectional Meeting.

2) August 8-12; Summer School "Introduction to Topological Phases of Matter," University of Illinois Urbana-Champaign.

Lea F. Santos

1) Workshop: Quantum non-equilibrium phenomena
(International Institute of Physics, Natal, Brazil, Jun/06-18, 2016)

Department of Psychology

Faculty: Joshua Bacon, Ph.D. (Co-Chair); Terry DiLorenzo, Ph.D.; Rachel Ebner, Ph.D.; Aharon Hersh Fried, Ph.D.; Marcel Perlman, 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 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, Psychology and Religion, 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 the 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 or with Dr. Aharon Fried on his research in Special Education in the Hebrew Schools. 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. 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. 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. Aharon Hersh Fried received his doctorate at the New School for Social Research. His research and his dissertation were in the area of Visual perception. He taught at Hunter College and John Jay College, both of CUNY, before joining SCW where he is Associate Professor of Psychology and Education. Amongst the courses he teaches are, Psychology & Religion, Developmental Psychology, and Psychological Tests and Measurements. Outside of SCW he is best known for his work in developing programs in Special Education for the dual curriculum Hebrew Day Schools. Dr. Fried's research and writing interests are focused on the synthesis of Psychological and Educational research on cognition, education, and ethical and moral development with the source material of Judaic Studies. He has developed a widely used test of Hebrew Reading, and is currently involved in developing a test of Hebrew Vocabulary, and of a program for teaching Talmud in the elementary schools. Dr. Fried also maintains a private practice in Psychology, evaluating children who have learning or behavioral problems in school and guiding their parents and teachers in working with them.

Dr. Marcel Perlman earned his B.A., M.A., and Ph.D. from Yeshiva University. He received his Doctorate in 1959. In 1958 he was appointed as an Instructor in Psychology at SCW, and in 1959 he was promoted to the rank of Assistant Professor. He became an Associate Professor in 1966 and attained his Professorship in 1979. Dr. Perlman became Chairman of the Division of Social and Behavioral Sciences in 2003. He has been a Clinical

Supervisor at Ferkauf School of Psychology since 1982. As part of his Forensic Experience he has lectured for the Practicing Law Institute in the Area of Clinical Psychology and the Law. He is currently in limited Private Practice in Clinical and Forensic Psychology. Additionally, he has given numerous lectures and presentations, the latest of which was at the Oxford University (St. Anne's College) Annual Round Table on the topic of the Changing Paradigms of Contemporary Parenting.

Department of Speech Pathology/Audiology

Faculty: Chair: Prof Joseph Danto, PhD; Neva Goldstein Hellman, MS; Susan Wilson, MS; Sydney Horn-Klein, MS; Allison Kaufman, AuD; Ashley Small, MS

The mission of the Department of Speech Pathology/Audiology is to prepare students for admission to advanced graduate programs in the fields of Speech Language Pathology and Audiology. Emphasis is placed upon the student acquiring knowledge of the underlying anatomy, physiology, physics, and philosophies of the mechanisms of speech, hearing, and language and of their development, impairment, and amelioration. As well, the mission includes preparing students to be successful, contributing members of society and the professions.

The students in the Department begin their investigation into speech, hearing, and language at the end of their sophomore year. The course sequence is relatively fixed and is designed to build the more advanced courses upon foundations established in the introductory classes. An active on-campus Speech and Hearing Club coalesces the student body and guides the newer students through an array of extracurricular options. Such extracurricular exposures enhance student appreciation of the practical and clinical applications of their academic preparation, and as well opening the door to questioning and investigating, as a prelude to research.

Students in the program have developed two initiatives to enhance and enrich their involvement in speech language pathology and audiology. The first initiative is the Speech and Hearing Journal, authored, edited, and published by students. The topics vary and have included language, speech and hearing issues related to autism and mutism, the effects of high sound levels on hearing, room acoustic resonance on speech, bilingual effects on non-fluent speech...among others.

The second initiative is a newsletter, providing the students with a less-formal format to share clinical and professional experiences with their peers, to update academic, administrative, and student-related issues, and, of course, to communicate social factors, as well. Students form a close association and relationship during their residence in the program. As the course sequence is "lock-stepped," students are class colleagues for over two years, with an association enhanced by several projects that encourage team working.

The Speech and Hearing Club provides another opportunity to expand their experience in speech pathology and audiology. Renowned speakers from outside the university, including former students, address the student body on clinical, administrative, and other professional topics. A highlight of the

academic year is a series on "Grad School Nights," in which representatives from several graduate programs - either faculty or graduate students - address our students as to the requirements, the advantages of each program, and the application processes.

One of the more recent primary research projects in which our students participated was an analysis of the effects of cervical spine surgery on dysphagia and dysphonia. The project, completed at North Shore University Hospital, presented the students with a very different view of the hospital environment. Whereas most of their experiences are in the clinical area, this gave the students an opportunity to work with an anesthesiologist and to observe patient record evaluation.

In addition to involvements with Speech Pathology/Audiology services at local institutions, our students had opportunities to observe surgery of the spine and of the brain, as they shadowed audiologists involved in this subspecialty.

The entry level degree for Speech Pathology is a Masters and for Audiology it is a Doctorate. Traditionally, our students are accepted into graduate school at an impressive high percentage of those applying. Most have continued to clinical positions, others have become academicians and some have returned to Stern College as adjunct faculty. Students graduating in May, 2017, continued in graduate programs in speech pathology/audiology at Touro College, Lehman College, and CUNY – Aud.

Stern College for Women Combined Programs

The following are the basic elements of combined degree programs in the sciences available to Stern College students in cooperation with other universities. Students interested in these programs generally apply to the cooperating institution during their junior year and are given a special shaped major so that they can complete all of the necessary prerequisites within the required time frame. The indicated years of study at Stern College includes the year of study abroad in Israel for those pursuing that option after high school. These programs are competitive and final admissions decisions are made by the cooperating institutions.

Engineering - B.A. /B.E. /B.S. or B.A. /M.S.

Yeshiva University offers combined plans in engineering with Columbia University School of Engineering and Applied Science (CU) as well as with the State University of New York at Stony Brook College of Engineering and Applied Sciences (SBU).

Under the BA/BS plan with Columbia, a student who maintains a 3.3 average overall as well as in Program-required courses (with no grade lower than a B in courses required by Columbia), and receives the recommendation of the pre-engineering adviser is admitted to Columbia University School of Engineering and Applied Science. Upon successful completion of the two-year program at Columbia, YU confers the Bachelor of Arts degree and Columbia confers the Bachelor of Science degree.

Under the combined plan with Stony Brook University, a student can earn both a B.A. degree from YU and a B.E. degree in engineering (or, in some cases, an M.E.) from Stony Brook University. Students in combined plans must maintain registration at Yeshiva University by filing a Leave of Absence Form until they receive the B.A. degree. They must meet all specific graduation requirements (other than completing the 128 credits required for graduation) before continuing in the school of engineering.

Nursing - B.A./B.S.N./M.S.N.

Stern College offers a combined program in nursing with New York University's College of Nursing (NYUCN). In this program, students complete 7 semesters of required course work with a minimum of 119 credits at Stern College (5 semesters and 84 credits in residence at Stern College for those students studying in Israel for a year). Eligible students may then be admitted to a 15-month accelerated program at NYUCN which begins in January of their senior year. Students receive a B.A. degree from Stern College for Women after successfully completing one semester at NYUCN. They are awarded the BSN from NYU at the successful completion of the nursing program and officially become a registered nurse (RN) upon passing the licensing exam. Students who maintain a 3.0 GPA

while at the NYUCN are guaranteed a spot in their MSN program to become a nurse practitioner, which they may apply to after a short period of working as a RN.

Occupational Therapy - B.A./M.S.

Stern College offers a combined program in Occupational Therapy with Columbia University (CU). During the first 3 years at SCW, students complete college requirements and prerequisites for CU's OT program. They apply to the 2-year CU program during the fall semester of their junior year. Students are awarded the B.A. from Stern College after their first year at CU, and the M.S. upon completion of the program.

Optometry - B.A./O.D.

Stern College and the State University of New York (SUNY) College of Optometry offer an affiliation program to qualified students through which they can receive an undergraduate degree and a Doctor of Optometry degree in seven years. Students accepted into this program attend SCW for three years while they complete college requirements and prerequisites for the College of Optometry. After the first year at SUNY College of Optometry, students receive the B.A. degree. The O.D. degree is awarded after completing the four years at SUNY College of Optometry

Physical Therapy - B.A./DPT

Stern College offers combined program in Physical Therapy with Rutgers, the State University of New Jersey. During their first three years at Stern College (two years for those studying in Israel for a year), students complete college requirements and the prerequisites for entry into Rutgers' Doctorate of Physical Therapy Program. Students are awarded a B.A. from Stern College after completing their first year at Rutgers and the DPT upon successful completion of the 3-year doctoral program.

In addition, though an Articulation Agreement with the New York Medical College Graduate School of Health Sciences (NYMC), students may apply to NYMC's Early Acceptance Program. Qualified students receive provisional acceptance to the 3-year DPT Program after their junior year, while final acceptance is granted upon satisfactory completion of their senior year at SCW.

Physician Assistant - B.A./M.S.

Stern College offers a combined program in Physician Assistant Studies with Mercy College. During their first three years at Stern (two years for those studying in Israel for a year), students complete college requirements and the prerequisites for Mercy College's M.S. program. After completing 111 credits with a minimum overall GPA of 3.0, a minimum 3.2 GPA in the

designated science courses and with at least a "B" in prerequisite courses, accepted applicants to the program continue at Mercy College during what would have been their senior year at Stern. After the first year at Mercy College, students receive a B.A. degree from Stern College. The M.S. degree is awarded after successfully completing two years and three months at Mercy and the student becomes a PA after passing her licensing exam.

Podiatry - B.A./D.P.M.

Stern College and the New York College of Podiatric Medicine offer a combined program in Podiatry. During the first three years, students recommended to the program complete college requirements and prerequisites for the NY College of Podiatric Medicine. After the first year at NYCPM, SCW awards the B.A. NYCPM awards the D.P.M. at the completion of the program.

Teaching, Math and Science - B.A./M.A.

Through an articulation agreement with the NYU Steinhardt School of Culture, Education, and Human Development, Yeshiva University juniors and seniors may enroll in selected math or science education courses at NYU. These courses will count both toward the undergraduate degree at SCW and will reduce the number of credits needed for a M.S. degree in math education or in science education from NYU Steinhardt. Students pay NYU directly for these credits.

Nutrition

Through an articulation agreement, SCW students may take selected courses in nutrition at NYU during their senior year at SCW and thus accelerate the time required to complete a subsequent degree in nutrition at NYU.

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
Diane Algava
Ariella Applebaum
Kayla Applebaum
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
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
Caryn Gamss
Eden Gelman
Julie Gilbert
Avigayil Ginsberg
Aviva Ginsburg
Ariella Glueck
Elizabeth Goldberger
Tova Goldstein
Dina Golfeiz
Sharon Gordon
Reena Gottesman
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
Hadassah Klerman
Lea Kozirovsky
Aimee Krausz
Malka Krupka
Yosefa Lerner
Rikah Lerer

Elisheva Levine
Elana Levy
Emily Liebling
Elizabeth Lobell
Shira Marder
Alexandra Michalowski
Rachel Mirsky
Esther Mizrachi
Sara Mizrachi
Ariella Nadler
Sarah Nattel
Helen Nissim
Saran Noble
Chana Gila Ovitz
Chaya Pinson
Yardanna Platt
Tehilla Raviv
Yael Raymon
Shuli Roditi-Kulak
Shira Roszler
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
Nechama Mina Shoshani
Malki Silverman
Michelle Simpser
Rose Snyder
Shani Snyder
Tirtza Spiegel
Miriam Steinberger
Tehilla Stepansky
Chana Stern
Temima Strauss
Jessica Tugetman
Tamar Riegel Weinberger
Yehudit Weinberger
Amanda Weiss
Meredith Weiss
Rebecca Weiss
Bella Wolf
Sahar Zaghi

Student Accomplishments

Academic Year 2016-2017 and Summer 2017
Departments of Biology, Chemistry and Biochemistry, Physics, Psychology, and Speech Pathology/Audiology

Grad/Professional Program	Institutions; Number of Attendees
Allopathic medical school	Albert Einstein College of Medicine (7 students); additional 12 students in various American (incl. Temple Univ.; Hofstra; Jefferson; Downstate; NY Medical; Drexel; Univ. Tennessee) and Israeli (Technion; Ben Gurion) schools.
Osteopathic medical school	NYITCOM; Touro (5 students)
Dental school	NYU; Rutgers; Touro; Temple Univ. (11 students)
Biomedical sciences (Ph.D.)	Tri-Institutional Program in Chemical Biology –The Rockefeller Univ.; Memorial Sloan Kettering; Weill Cornell; AECOM; Technion (6 students)
Veterinary medicine (DVM)	Cornell Univ.; Univ of Minnesota (2 students)
Clinical psychology (Ph.D.)	Ferkauf Graduate School (1 student)
Clinical psychology (PsyD)	Hofstra Univ.; St. John's Univ.; Pace; Ferkauf (6 students)
Sch. clin.-child psychol. (Psy.D.)	Ferkauf Graduate School (2 students)
Clinical sch. psychology (PsyD)	Kean Univ.; Rutgers (2 students)
Physical therapy (DPT)	Hunter; NYU (2 students)
Speech path./audiology	CUNY (1 student)
Pharmacy (PharmD)	Creighton Sch. Pharmacy (1 student)
Genetic counseling (M.S.)	Sarah Lawrence; Mt. Sinai Sch. Med.; LIU (3 students)
Physician Assistant	Touro; Mercy; Pace; York (9 students)
Speech language pathology (M.S.)	Touro; Lehman; St. John's; Adelphi; YU (8 students)
Biomedical engineering (M.S.)	Univ. Pennsylvania; Rutgers (2 students)
Occupational therapy	Seton Hall; Touro; Maryville Univ.; NYU; Columbia Univ. (8 students)
Nutrition (M.S.)	Aldephi (1 student)
Nursing	NYU; Pace; Downstate; Hunter; College of New Rochelle; Santa Monica (22 students)
Comp. sci. engineering (M.S.)	Columbia Univ. (1 student)
Chemical engineering (B.S.)	Columbia Univ. (1 student)
Public health (M.P.H.)	NY Med. College (1 student)
Biomedical engineering (M.S.)	NJ Institute of Technology (1 student)
Art therapy (M.A.)	Pratt (1 student)
Elementary education (M.A.)	Bank Street (1 student)

Awards

Commendable Chapter Award, American Chemical Society (ACS)

The SCW Chemistry Club, a student affiliate chapter of the American Chemical Society (ACS), has been awarded a travel grant to subsidize student travel to the spring ACS national meeting in San Francisco. The two winners of the College's annual poster competition, Lior Levy and Miriam Saffern, will attend and present at the meeting. The SCW student affiliate chapter will also be honored at the undergraduate awards ceremony.

In-house Scientific Poster Presentation Contest: Winners

Lior Levy, Estrone and hydroprogesterone regulate human endothelial nitric oxide synthase system through the modulation of cationic amino acid transporter-1

Miriam Saffern, The role of IL-17α on fecal microbiota transplant-mediated clearance of *C. difficile* infection

Kressel Scholarships for 2017- 2018 Academic Year

Yael Eisenberg (Math major)
Yardena Katz (Biology major)

Summer 2017 Internships

Elisa Alweis: Bar-Ilan University; YU-BIU Program

Elana Apfelbaum: NYU Med.

Alyssa (Michal) Auerbach: Stern College Biology Department (Dr. Holz)

Gabriela Baruch: SUNY College of Optometry

Saruch Baruch: Memorial Sloan Kettering Cancer Center

Tehilla Berger: Bar-Ilan University; YU-BIU Program

Rebecca Burack: Bar-Ilan University; YU-BIU Program

Chana Bushee: BloodCenter of Wisconsin

Shanee Carmel: NYU Rusk Health Career Opportunity Program (OT)

Aleeza Dessau: Bar-Ilan University; YU-BIU Program

Chani Dubin: Bar-Ilan University; YU-BIU Program

Dena Edelman: University of Pittsburgh

Yael Eisenberg: Bar-Ilan University; YU-BIU Program

Abby Epstein: Bar-Ilan University; YU-BIU Program

Jennifer Gardner: Bar-Ilan University (Dr. Eitan Okun, Alzheimer's disease Research); YU- BIU Program

Abigail Goldberger: Yeshiva College

Ariella Hecht: NYU Rusk Health Career Opportunity Program (Nursing)

Bracha Jachter: Kidney Transplant Program, Montefiore Medical Center (Dr. Stuart Greenstein)

Tali Kluk: Feinberg School of Medicine, Northwestern University

Lea Lefkowitz: Bar-Ilan University; YU-BIU Program

Tova Lejtman: NYU Fertility Center (Yael Gun-Kramer, Senior Embryologist)

Judy Leserman: Bar-Ilan University; YU-BIU Program

Lior Levy: Sickkids Hospital, University of Toronto Institute of Medical Science Summer Undergraduate Research Program

Aderet Liss: Boston Children's Hospital (Nephrology Lab)

Miriam Liebling: SURP, AECOM (Dr. Jessica Mar)

Tzivia Linfield: University of Maryland Medical School

Yonina Loskove: AECOM (Dr. Bernice Morrow)

Yael Jessica Mayer: CUNY Summer Undergraduate Research Program (Dr. Patrizia Casaccia, Neuroscience)

Jasmine Naim: Bar-Ilan University (Dr. Ron Unger, Computational Biology); YU-BIU Program

Rachel Nass: Stony Brook Univ. (Dr. Jonathan Sokolov)

Tzipi Roffe: Bar-Ilan University; YU-BIU Program

Miriam Rosen: Bar-Ilan University; YU-BIU Program

Rivka Sahalnick: NYU Rusk Health Career Opportunity Program (PA)

Talia Sanicoff: Bar-Ilan University (Dr. Sarid, Cancer Research); YU-BIU Program

Allison Schachter: Weill Cornell Medical College

Emily Schwartz: Bar-Ilan University (Dr. Ehud Banin, Biofilms); YU-BIU Program

Neda Shokrian: Columbia University Medical Center

Rachel Somorov: Kidney transplant Program, Montefiore Medical Center (Dr. Stuart Greenstein)

Malka (Rachéli) Topp: Bar-Ilan University (Dr. Ayar Hendel, Genomics); YU-BIU Program

Rachel Weil: AECOM (Dr. Theresa Bowman)

Rebecca Weitz: AECOM

Student Publications and Presentations

Scientific Journals

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

Berman, A.Y., Manna, S., **Schwartz, N.S., Katz, Y.E.,** Sun, Y., Behrmann, C.A., Yu, J.J., Plas, D.R., Alayev, A., Holz, M.K., 2017, ERRα regulates the growth of triple-negative breast cancer cells via S6K1-dependent mechanism, *Signal Transduct. Targeted Ther., Nature* (*in press*).

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Li. Y., Kraynis, O., Kas, J., Weng, T. C., Sokaras, D., **Zacharowicz, R.**, Lubomirsky, I. Frenkel A. I., 2016. Geometry of electromechanically active structures in gadolinium-doped cerium oxides, AIP Advances (*in press*).

Alayev, A., Salamon, R.S., **Schwartz, N.S**, **Berman, A.Y., Wiener, S.L.**, and Holz, M.K., 2017, Combination of rapamycin and resveratrol for treatment of bladder cancer. J. Cell Physiol., 232:436-446.

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Pereira, A.C., Gray, J.D., Kogan, J.F., **Davidson, R.L.**, Rubin, T.G., Okamoto, M., Morrison, J.H., and McEwen, B.S., 2016, Age and Alzheimer's disease gene expression profiles reversed by the glutamate modulator riluzole, Mol. Psychiat. [published online ahead of print].

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Alayev, A., Salamon, R.S., Manna, S., **Schwartz, N.S., Berman, A.Y.**, and Holz, M.K., 2016, Estrogen induces RAD51C expression and localization to sites of DNA damage. Cell Cycle 15:3230-3239.

Peter, C. J., Fischer L. K., Kudakovic, M., Garg, P., Jakovcevski, M., Dincer, A., Amaral, A.C., Ginns, E.I., Galdzicka, M., Bryce, C. P., **Ratner, C.**, Mokler, D., Medford, G., Champagne, F. A., Rosene, D.L., McGaughy, J.A., Sharp, A. J., Galler, J. R., Akbarian, S., 2015, DNA methylation signatures of early childhood malnutrition associated with impairments in attention and cognition, Biol. Psychiat. [published online ahead of print].

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Alayev, A., Salamon, R.S., Sun, Y., **Schwartz, N.S**, Yu, J.J, and Holz, M.K., 2015, The combination of rapamycin and resveratrol causes apoptosis and reduces .growth of TSC2-deficient xenograft tumors, Am. J. Respir. Cell Mol. Biol., Apr 6 {Epub ahead of print].

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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. 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.

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, XXIst 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, 101st 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. 10th 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.

Liebling, E.J., Gottesman, R.T., Citrin, N.S., and H. Babich, 2008, Prooxidant ability of black tea flavin monogallates: studies with carcinoma and normal cells, Columbia University Spring Undergraduate Research Symposium.

Oxman, H., and T. DiLorenzo, 2008, Validity of MMPI-2 L scores in Orthodox Jewish undergraduate females. National Meeting of the American Psychology Association, Boston, MA.

Raviv, T., Digilova, A., and A. Schuck, 2008, Synergistic interactions between black tea theaflavins and chemotherapeutics in oral cancer cells, Columbia University Spring Undergraduate Research Symposium. (Note: **Tehilla Raviv and Alla Digilova** also presented this research as an oral presentation).

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.

Bacon J, Fromm J, **Neuhaus R**, and J. Herbert, 2007, Cognitive interventions to improve cognitive functioning in patients with multiple sclerosis, Mult. Scler. (Suppl 2). 13:S232.

Fromm, J.T., Bacon, J., **Adelman, M.**, Steinberg, C., Weiss, B., Vendola, M., **Neuhaus, R.**, Haus, J, Pham, V., Hawkins, A., Paul, T., and J. Herbert, 2007, Improving quality of life through participation in self-management interventions. Int. J. MS Care. 9: S41.

Fromm, J.T., Bacon, J., **Adelman, M.**, Steinberg, C., and J. Herbert, 2007, Clutter management in MS: Integrated occupational therapy approach. Int. J. MS Care. 9: S40.

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

Oxman, H. and T. DiLorenzo, 2007, Associating word meaning to their ink color in an adaptation of the Stroop Effect, Yeshiva University Behavioral Sciences Student Research Conference

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.

Bensoussan, M. and R. Freyberg, 2007, The nature of fragrance preferences in young women. Chem. Senses. 32:A115.

Zimmerman, R. and R. Freyberg, 2007, Effects of Ken Doll on body image of preadolescent males, Yeshiva University Behavioral Sciences Student Research Conference

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).

Eisner, R., Schonbrun, C., Huang, N., and C. Rapp, 2007, Force field based receptor ligand rescoring, Mid-Atlantic Regional Meeting of the American Chemical Society (poster presentation/abstract).

Frenkel, A.I., Menard, L.D., Northrup, P., Rodriquez, J.A., Zypman, F., **Glasner, D.**, Gao, S.-P., Xu, H., Yang, J.C., and R.G. Nuzzo, 2006, Geometry and charge state of mixed-ligand Au13 nanoclusters , XAFS XIII Conference, Stanford, CA.

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

Etengoff, C., and R. Freyberg, 2006, Judeo-Christian values and the female body image, Yeshiva University Behavioral Sciences Student Research Conference

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.

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1995: **Lauren Insel** and **Judy Ehrenberg**
1994: **Yaffa Cheslow**, **Debbie Friedman**, and **Stacey Tuckman**

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WOMEN IN SCIENCE: ABSTRACT JOURNAL

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Stern College for Women
Yeshiva University

The Sensitivity of the Developing Microbiome: Archaea Relative Abundance in Mothers and Babies

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A microbiome is a collection of bacteria, viruses, and fungi that live in and on the human body. The gut, for example, serves as such an environment, hosting many microbes that interact with the host. The most critical stage of the development of the microbiome occurs during early childhood. Factors such as delivery mode, antibiotic exposure, and diet can severely impact this foundational growth and negatively affect individuals later in life. Antibiotic exposure, in particular, demonstrate the sensitivity of the microbiome to disruptions. In most societies, children under the age of two commonly receive courses of antibiotics, which can easily affect the growth of their intestinal microbiota. Exposure at this critical age has been associated with the development of many disorders, including inflammatory bowel disease and allergies. Babies born through Caesarian-section develop similar conditions, which can potentially be attributed to the lack of exposure to maternal microbes that infants typically encounter during vaginal birth. Since these long-term clinical outcomes may result from early life disturbances, examining the microbiome during this initial stage can highlight important factors that tie microbiota development and host physiology together.

While many microorganisms present in mothers and babies from birth onwards have been studied, the small presence of the Archaea kingdom has received little attention. Similar in structure to bacteria, Archaea form a kingdom of prokaryotic single-celled microorganisms. Because of the critical nature of this stage of microbiome development in influencing human health, all microorganisms present can severely impact the host, both positively and negatively. Therefore, careful examination of Archaea abundance in infant microbiomes is necessary in order to ascertain their role in child development and identify whether these bacteria-like microorganisms are helpful, harmful or neutral to the host.

To do this, we used previously collected microbial samples which were taken from three different mother-baby cohorts. These subjects from American homebirths, American hospitals, and Puerto Rican hospitals cover a range in birth mode and geographic areas.

These babies and mothers were followed and continuously sampled monthly for approximately two years, reporting any minor disturbance regarding antibiotics, delivery mode, diet, and other clinical factors, in order to model the intestinal microbiota development. The mother's results are integral to

the understanding of the infant's microbiota, as microbial colonies present early in the infant likely originate from the mother's own microbiome and are transferred during birth, while breastfeeding, or through skin contact.

Our results show two distinct tendencies observed between the cohorts. Puerto Rican mothers exhibited a high presence of vaginal Archaea, while American and home birth moms, which were collected in New York, did not. Similarly, babies in the American cohort were found to have more Archaea later in their first year, while the Puerto Rican and home birthed babies tested more positively for Archaea during the strict lactation period, during which the babies are fed only breastmilk. Although any conclusions have yet to be determined, we are continuing to examine the results and understand the significance of these trends.

Observation of the Ganglion Cell Layer to Diagnose Patients with Glaucoma

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Background and Significance:
Glaucoma is a disease that affects the optic nerve and is generally associated with a reduction in one's peripheral vision. This is most commonly due to a buildup of the aqueous humor fluid that is secreted by hair like structures called the ciliary body. For reasons unknown, the liquid may not flow properly causing an increase of pressure onto a collagen sieve called the lamina cribrosa through which the optic nerve fibers leave the eye. The remodeling of the lamina cribrosa in response to the pressure squeezes the optic nerve fibers leading to their degeneration (Figure 1). Damage to the optic nerve impedes on the transfer of information to the brain. Furthermore, the damage to the optic nerve fibers also causes a retrograde degeneration of their cell bodies at the level of the ganglion cell layer in the retina.

Application of the Ocular Coherence Tomographic technique allows visualization of the retinal ganglion cell layer in the living human eye and measurement of the thickness of this layer will be useful in the assessment of neural damage in glaucoma patients. Currently, only manual techniques are available for the assessment of the retinal ganglion cell layer thickness. The purpose of this study was to examine inter-examiner differences in the measurement of retinal ganglion cell layer thickness.

Purpose: To assess the inter-examiner variability of the OCT retinal ganglion cell layer thickness.

Methods: OCT scans were utilized to measure the thickness of the retinal layer amongst 10 normal and glaucoma subjects. Specifically, the ganglion cell layer was measured every 200 μm across 25 scans, observed as the first darker layer. Once the measurements were taken, the data was recorded onto an excel sheet for each patient. Following this, averages measurements were calculated for the lower (inferior) and upper (superior) and whole retinas using excel. The lower field consisted of scans 1-13 and upper field consisted of scans 13-25. A paired student t-test was used to compare the values obtained by two examiners. The two examiners had received standard set of instructions on how to perform these measurements.

Results: The mean values of the superior, inferior and whole retina of the normal subjects for the first examiner was 67.78529754, 66.7467783, and 67.11289245 microns respectively and for the second examiner these values were 68.96995844, 67.89350645, and 68.04247912 microns respectively. The mean values of the superior, inferior and whole retina of the glaucoma

subjects for the first examiner was 56.99815923, 53.63051057, and 55.22295053 microns respectively and for the second examiner these values were 58.74113369, 54.65513329, and 56.2734635 microns respectively. The differences in measurements obtained by the two examiners were not statistically different for both the normal (p=0.79) subjects as well as the glaucoma patients (p=0.61).

Conclusion:
Inter examiner differences in OCT retinal ganglion cell layer thickness measurements are reproducible with minimal difference.

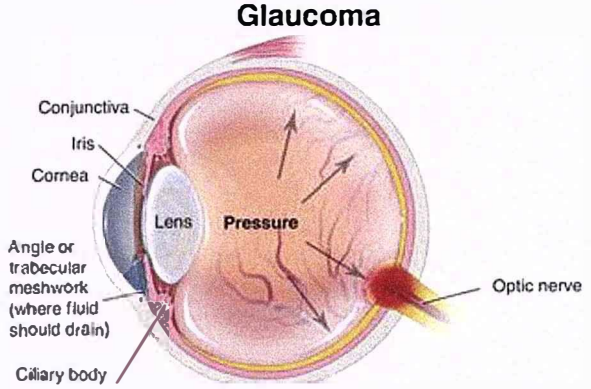

Figure 1. An increase in pressure on the optic nerve. Ciliary body releases the aqueous humor into around the lens, to the anterior chamber and into the drainage system. A failure to do so causes the fluid to build up where the cornea meet the iris, and increasing the pressure in the retina and optic nerve.

American Brachytherapy Society Task Group Report: Use of androgen deprivation therapy with prostate brachytherapy—A systematic literature review

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Prostate brachytherapy (PB) has well-documented excellent long-term outcomes in all risk groups. There are significant uncertainties regarding the role of androgen deprivation therapy (ADT) with brachytherapy. The purpose of this report was to review systemically the published literature and summarize present knowledge regarding the impact of ADT on biochemical progression-free survival (bPFS), cause-specific survival (CSS), and overall survival (OS).

A literature search was conducted in Medline and Embase covering the years 1996–2016. Selected were articles with >100 patients, minimum follow up 3 years, defined risk stratification, and directly examining the role and impact of ADT on bPFS, CSS, and OS. The studies were grouped to reflect disease risk stratification. We also reviewed the impact of ADT on OS, cardiovascular morbidity, mortality, and on-going brachytherapy randomized controlled trials (RCTs).

Fifty-two selected studies (43,303 patients) were included in this review; 7 high-dose rate and 45 low-dose rate; 25 studies were multi-institutional and 27 single institution (retrospective review or prospective data collection) and 2 were RCTs. The studies were heterogeneous in patient population, risk categories, risk factors, follow-up time, and treatment administered, including ADT administration and duration (median, 3–12 months);71% of the studies reported a lack of benefit, whereas 28% showed improvement in bPFS with addition of ADT to PB. The lack of benefit was seen in low-risk and favorable intermediate-risk (IR) disease and most high–dose rate studies. A bPFS benefit of up to 15% was seen with ADT use in patients with suboptimal dosimetry, those with multiple adverse risk factors (unfavorable IR [uIR]), and most high-risk (HR) studies. Four studies reported very small benefit to CSS (2%). None of the studies showed OS advantage; however, three studies reported an absolute 5–20% OS detriment with ADT. Literature suggests that OS detriment is more likely in older patients or those with pre-existing cardiovascular disease. Four RCTs with an adequate number of patients and well-defined risk stratification are in progress. One RCT will

answer the question regarding the role of ADT with PB in favorable IR patients and the other three RCTs will focus on optimal duration of ADT in the uIR and favorable HR population.

Patients treated with brachytherapy have excellent long-term disease outcomes. Existing evidence shows no benefit of adding ADT to PB in low-risk and favorable IR patients. UIR and HR patients and those with suboptimal dosimetry may have up to 15% improvement in bPFS with addition of 3–12 months of ADT, with uncertain impact on CSS and a potential detriment on OS. To minimize morbidity, one should exercise caution in prescribing ADT together with PB, in particular to older men and those with existing cardiovascular disease. Due to the retrospective nature of this evidence, significant selection, and treatment bias, no definitive conclusions are possible. RCT is urgently needed to define the potential role and optimal duration of ADT in uIR and favorable HR disease.

Real-time intraoperative evaluation of implant quality and dose correction during prostate brachytherapy consistently improves target coverage using a novel image fusion and optimization program.

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Our purpose was to describe the process and outcome of performing post-implantation dosimetric assessment and intraoperative dose correction during prostate brachytherapy using a novel image fusion-based treatment-planning program.

Twenty-six consecutive patients underwent intraoperative real-time corrections of their dose distributions at the end of their permanent seed interstitial procedures. After intraoperatively planned seeds were implanted and while the patient remained in the lithotomy position, a cone beam computed tomography scan was obtained to assess adequacy of the prescription dose coverage. The implanted seed positions were automatically segmented from the cone-beam images, fused onto a new set of acquired ultrasound images, reimported into the planning system, and recontoured. Dose distributions were recalculated based upon actual implanted seed coordinates and recontoured ultrasound images and were reviewed. If any dose deficiencies within the prostate target were identified, additional needles and seeds were added. Once an implant was deemed acceptable, the procedure was completed, and anesthesia was reversed.

When the intraoperative ultrasound-based quality assurance assessment was performed after seed placement, the median volume receiving 100% of the dose (V100) was 93% (range, 74% to 98%). Before seed correction, 23% (6/26) of cases were noted to have V100 <90%. Based on this intraoperative assessment and replanning, additional seeds were placed into dose-deficient regions within the target to improve target dose distributions. Post correction, the median V100 was 97% (range, 93% to 99%). Following intraoperative dose corrections, all implants achieved V100 >90%.
In these patients, post implantation evaluation during the actual prostate seed implant procedure was successfully applied to determine the need for additional seeds to correct dose deficiencies before anesthesia reversal. When applied, this approach should significantly reduce intraoperative errors and chances for suboptimal dose delivery during prostate brachytherapy.

The Structural Characterization of the CueR Metalloregulator

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Maintaining homeostasis is arguably the most indispensable characteristic requisite to ensure survival and prosperity to all organisms, prokaryotic and eukaryotic alike. Metal ions, in proper levels of concentration, facilitate essential biological processes. Copper plays a significant and multifaceted role in the human system, such as in aiding the production of red blood cells, in sustaining human systems such as the immune and nervous systems, and perhaps most significantly, in regulating DNA transcription. However, in excess, like all metals, its toxicity can prove to be lethal to all organisms. The Ruthstein Lab is working on exploring the biological pathways of copper, in hopes to develop a drug that will aide in maintaining copper homeostasis in humans. To do so, it studied the pathways of copper in *E. coli*, which is significant, due to its presence in the human body.

Under the auspices of Dr. Hila Sameach, we worked on examining the function and efficacy of the copper metalloregulator, CueR. Metalloregulators are cytoplasmic or transmembrane proteins, that upon perceiving specific metal substances in high concentrations, induce a reaction. CueR is a negative repressor, as when it discerns high concentrations of Cu(I), the toxic form of copper, it induces RNA transcription of two proteins, which aide in regulating copper levels in the cell. The proposed mechanism of CueR's conformation, shockingly, is retained both while bound and unbound to DNA.

However, when CueR comes in contact with copper, it undergoes conformational changes, allowing the unraveling of DNA, which in turn allows for RNA polymerase to induce transcription. However, in the absence of copper, the protein conformation does not allow for the unraveling of its DNA, and as such, RNA polymerase cannot bind, and thus, transcription cannot ensue. We studied the CueR protein in various states; isolated, bound to copper, bound to DNA, and bound to DNA with copper. All states induced a miniscule change in conformation relative to that which we observed in the DNA with copper. Thus, we can ascertain that copper serves as an activator for the CueR metalloregulator by inducing a change in the crystal structure of the CueR metalloregulator.

To better understand this, we utilized the Double Electron Electron Resonance (DEER) technique as a means to study the conformational changes implicit in CueR in the presence of copper. DEER is a form of EPR, which, through isolating the dipolar interaction between two spin probes incited by a set of pulses, we can retain data from which we can extrapolate calculations that can measure miniscule distances between 1.5 and 8 nm. The implementation of this technique allows us to explore the structural makeup of the CueR metalloregulator, which is indispensable, as it allows for the survival of *E. coli*. This technique is unique and advantageous in that it can study protein samples infinitesimal in size, and provides accurate molecular information regarding the substance, as the substance is tested in solution. However, this method is only capable of depicting a two-dimensional model of the protein.

Longevity and Proteostasis upon Germline Removal in *C. elegans*

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The removal of the germline in *C. elegans* is one method used to slow aging. The hermaphrodite reproductive system of *C. elegans* consists of the somatic gonad, the germ line, and the egg-laying apparatus. Combinations of the gonadal primordium containing Z1-Z4 are removed extending the lifespan of the worm up to 60%. Germline ablation is achieved by mutations in the genes necessary for the proliferation of germ cells. Previous research has shown that the exact transformation from the changes in the reproductive system into the physiological changes, represented as increased lifespan, are unclear.

In this study, endogenous siRNA molecules are found to be associated with the reproductive longevity pathway. It was found that the reduced production of siRNA molecules, shortens the lifespan of those animals. This confirms the importance of siRNAs for the longevity of germless animals. A protein tyrosine-phosphatase (ptp-5) enzyme whose expression is downregulated in germlineless animals and may be a direct siRNA target was identified. The reduced expression of ptp-5 restores longevity, improves proteostatsis in germlineless animals with defective endogenous siRNA, and increases survival under heat shock.

Multiple experiments were preformed to demonstrate these findings. First, the survival of the strains was tested after heat shock. The strains, in addition to the strains with ptp-5, were placed over night in heat shock at thirty-seven degrees for nine-hours, followed by a five-hour recovery period. We found that siRNA production is critical for their resistance to heat shock in long lived animals. Dcr-1 glp-1 has a lower percent survival than that of glp-1. The strains with ptp-5, shows an improved survival when comparing dcr-1 glp-1 to glp-1. Additionally, a p value of 0.003 was observed, verifying its significance.

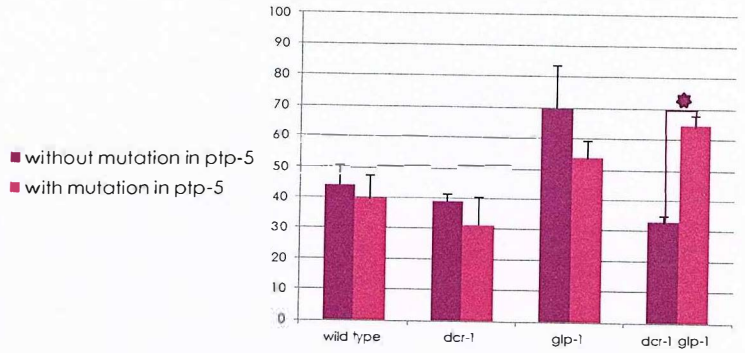

Figure 1. The survival of the strains, in addition to the strains with ptp-5, tested after heat shock.

Second, the number of aggregates formed after heat shock were counted. A ten-minute heat shock was applied to the strains at thirty-seven degrees. Our research had previously shown that introducing ptp-5 to the dcr-1 glp-1 mutation increases the amount of aggregates formed. Furthermore, when comparing wild type and dcr-1 strains with and without the ptp-5 mutation, no significant change was present in the amount of aggregates formed. This new information signifies the specificity of the ptp-5 to the dcr-1 glp-1 mutation.

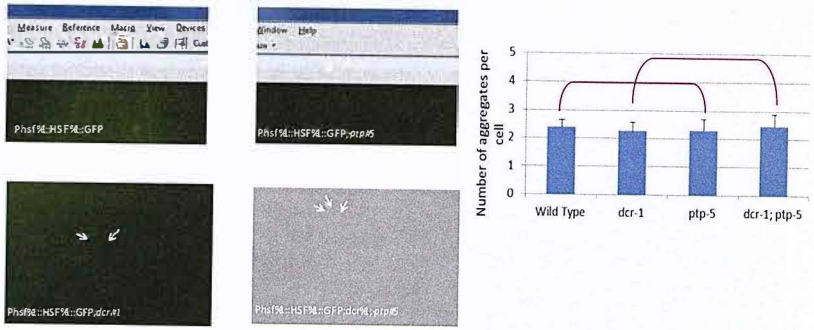

Figure 2. Pictures of the aggregate formation after heat shock in wild type and dcr-1 strains with and without the ptp-5 mutation. No significant change in the amount of aggregates formed was observed.

Third, a proteostasis stress was introduced in this assay. The stress, Q35, causes an accumulation of aggregates in the muscles, similar to Parkinson's Disease. If the worm cannot degrade those aggregates, the animal becomes paralyzed. Q35 was added to day-five glp-1 and dcr-1 glp-1 strains. It was found that the glp-1 mutation, in comparison to the dcr-1 glp-1 mutation, had a greater amount of bends per minute, exhibiting an improvement in paralysis.

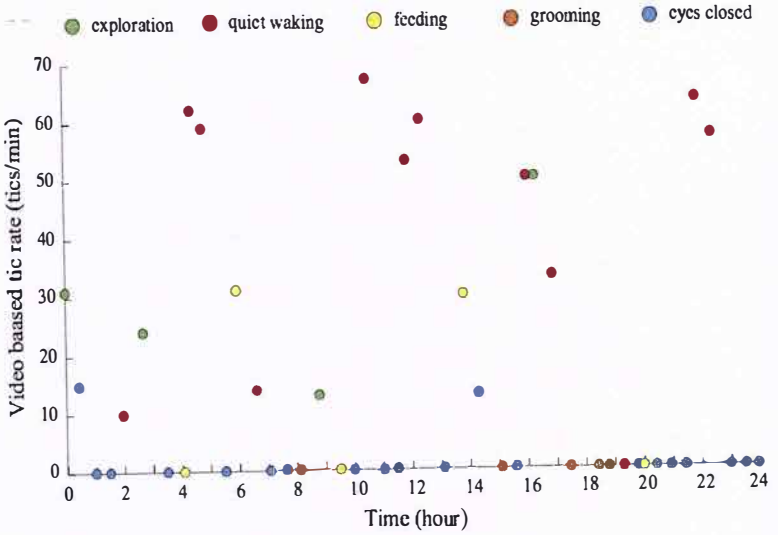

Figure B. Tics expressed in each behavioral state. Tics were more frequently present per minute in the "quiet waking" state than any other state recorded.

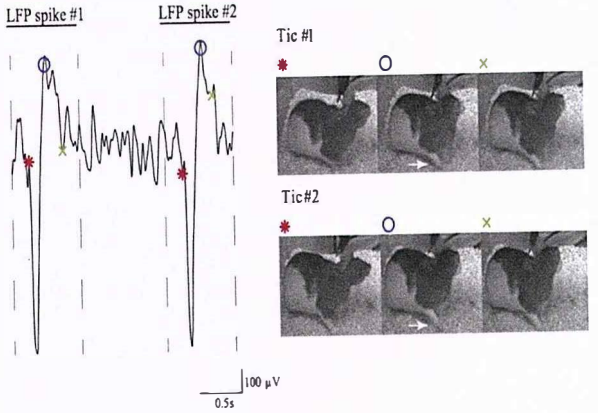

Figure C. The LFP spikes of neural activity within the striatum are correlated with the outward appearance of tic expression in the rat.

We hope that in the future we can better understand the mechanism behind Tourette's syndrome and tic expression and can ultimately create a sufficient cure to suppress tic expression.

Generation of Molecular Biological Tools to Study G-Protein-Coupled Receptor (GPCR) Internalization

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G-protein-coupled receptors (GPCRs) are a large, diverse group of seven-transmembrane domain receptors that are highly conserved throughout eukaryotes. GPCRs respond to a variety of extracellular stimuli (*e.g.* hormones, ions, neurotransmitters, etc.) and are involved in a wide range of physiological processes. GPCRs are expressed in the central nervous system and in the periphery, and are considered ideal targets for drug and therapeutic development.

We are studying the role of GPCRs in metabolism; more specifically we are interested in assessing class-A GPCRs, such as the α-2 and β-2-adrenergic receptors, and their internalization. The internalization of GPCRs which occurs upon agonist activation, plays an important role in the regulation of receptor signaling and function, preventing excessive receptor stimulation or periods of prolonged inactivity.

Our approach to studying receptor internalization includes the use of a bioluminescence-based technique involving the enzyme luciferase. The technique utilizes two parts of a split luciferase, the HiBit and the LgBit proteins (developed by Promega). The HiBit protein is used to tag the receptor at the N-terminus and upon complementation with the added LgBit a functional luciferase enzyme is generated. Upon the addition of substrate, furimazine, ligand-induced changes in bioluminescence can be measured.

We successfully sub-cloned the cDNA fragments corresponding to the α-2 and β-2 adrenergic receptors into the entry vector pRG229 CMV-IL6-HiBit, downstream the HiBit encoding sequence. Cloning involved a process of digesting DNA, gel extraction and DNA purification, ligations, transformations, and isolation of plasmid DNA. The constructs will be used to transiently transfect INS-1E cells, which are immortalized rat insulinoma beta-cells.

The long-term goal of this project is to assess the ligand-induced internalization of the α-2 and β-2-adrenergic receptors in this insulin secreting cell line. Ultimately, gaining a greater insight into the role and mechanisms of GPCR signaling, which may lead to the generation of more effective pharmaceutical and therapeutic interventions.

Using MEG to Analyze Brain Activity Correlated with Counting and Number Recognition

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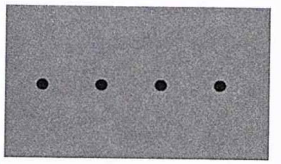
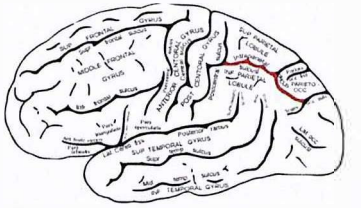
Magnetoecephalography (MEG) is a non-invasive brain imaging device which detects electromagnetic fields of the neurons close to the surface of the head. As this device uses different techniques than other brain imaging devices such as functional magnetic resonance imaging (fMRI), it is useful to use the MEG for studying specific sections of the brain which may be difficult to monitor using other devices. In our lab, we are interested in the identifying where people count in the brain, as a preliminary study. The eventual goal is to figure out where in the brain people think about algebra vs. geometry questions.

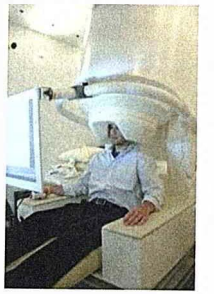
Previous fMRI studies [1] have shown that the IPS (Intraparietal Sulcus) area of the brain is stimulated when people see numbers – whether in digit form (such as: 4) or word form (such as: four). We are trying to take the subject of numerical representation in the brain a step forward. We are researching where in the brain people count for small numbers (up to 5). The goal of our experiment is to compare which areas in the brain are stimulated when people count circles vs. sounds vs. taps, and where the brain is stimulated when digits are shown (for the control). Our hypothesis is that the subject's initial reaction to the stimuli will stimulate the area in the brain responsible for visual/audio/sensory, and then the same area in the brain, probably in the IPS will be stimulated. This is because it is clear to the subject that the three as in three circles is identical to three as in three sounds. We will analyze the data we receive from the MEG device using advanced mathematical methods, such as PCA (Principal Component Analysis).

The experiment procedure is as follows: the subject is put in the MEG machine (as pictured). In part A of the experiment, the subject is shown 2-5 circles (as below), and asked to press a button indicating how many circles he/she sees. Between clicking the amount of circles and the next group of circles shown there is a 0.7 second break. For part B, the subject listens to 2-5 beeps, and indicates how many beeps he/she hears. In part C, the subject is tapped 2-5 times, and indicates the amount of taps. Lastly, in part D, the control part, the subject is shown a digit 2-5, and indicates the digit. Each part of the experiment is repeated 50 times, with part D being repeated just 10 times.





Intraparietal Sulcus (in red)



[1] Probing the Neural Correlates of Number Processing, Andre Knops, 2016

The TEV Protease and its Ability to Aid in the Study of the Slit-Robo Cell Signaling Pathway

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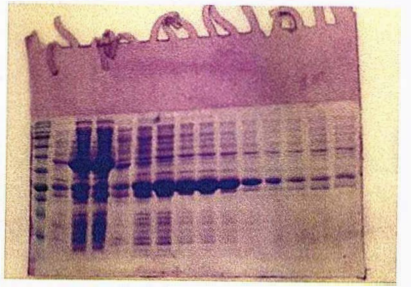
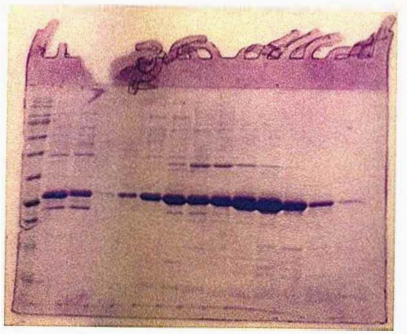
The Slit- Robo cell signaling pathway is widely recognized for mediating axon repulsion in the nervous system. Though it is best known for axon guidance, new functions of this pathway are being discovered each day such as angiogenesis, organ development, and the advancement of cancer. The Slit protein is secreted as a ligand that binds to a Roundabout (Robo) transmembrane receptor. The Slit protein was first identified in Drosophila and was found to contain three genes, Slit 1-3 that encode ~200 kDa proteins. Within these proteins, four Leucine Rich Repeat(LRR) domains were discovered that act as the functional region of the Slit proteins. The Robo protein contains an extracellular domain of five immunoglobulin-like(IG) domains. The LRR2 domain of Slits bind to the IG2 domain of Robo.

Dr. Opatowsky's lab is studying Slit and Robo proteins, in order to gain a better understanding of their structure and biochemical behavior with the ultimate goal of engineering cures for neurodegenerative diseases. In order to work with insoluble proteins like Robo, it is necessary to attach a protein tag that will increase the solubility of these recombinant proteins. After the target protein, like Robo, becomes soluble the tag is removed because it has completed its function. The TEV Protease, from the Tobacco Etch Virus and derived from E. Coli, is used to cleave fusion proteins from target proteins. TEV is often utilized to conduct the cleavage due to its high sequence specificity.

We purified TEV proteins and made them available for use. Protein purification began with the transformation of TEV using an expression vector carrying amp resistance. LB/amp plates were used to seed the transformed cells. Then cell growth began after preparing two Liters of 2xYT media. A starter culture was then created through inoculating LB/amp with a colony of the previously prepared transformed cells. After growing the starter overnight, it was centrifuged and the supernatant liquid was removed. The leftover pellet was resuspended in a new 2xYT media, and then it was inoculated into 2 Liters of 2xYT/amp/Cam. It was grown for 4 hours at 35 degrees Celsius while shaking until the OD reached anywhere from 0.5-0.7. The flask was then induced with 1 mM of IPTG which is used to induce expression. The flask was transferred to a shaker that was 30 degrees Celsius where growth continued for five hours. The cells were then harvested for centrifugation and were placed in the freezer that was -80 degrees Celsius. Some of these cells were taken from the freezer and used in lysis, the next step in the purification process. Lysis was then conducted in an ice basket. Two Nickel buffers were prepared for the Nickel Column. Due to the 6 histidine tag on the TEV protein it is attracted to the Nickel column, which helps filter other proteins out that do not have a his-tag. Buffer A was used to bind the protein to the column, while Buffer B was used to elute the protein from the column. Three SP-Sepharose buffers were also prepared for the second purification in the column. The SP-Sepharose buffers have a low pH and therefore a positive charge which attracts TEV because it has a negative charge, and this positive charge helps filter extraneous parts. Buffer A bound the protein to the column while Buffer B eluted the protein, and Buffer C diluted the protein. The cells were resuspended until they were thawed and then lysed using a Microfluidizer. TEV was then diluted using SP-Sepharose buffer C and was then loaded onto the column of the AKTA Purifier machine. The flow through was collected. The column was then washed with Nickel Buffer A until no protein was left on the column. Tev was eluted from the column, using Nickel buffer B, and the column was washed again. The protein was run on an SDS Page gel to see if the elution was successful. Then the purification was run a second time using SP Sepharose buffers. Another SDS Page gel was run, to make sure that the second elution was successful and no proteins were left over on the column. Then TEV was concentrated by a Viva Spin column. Glycerol and DDT were added and the protein was put in liquid nitrogen. Then it was stored in -80 degrees Celsius, to be used when needed.



SDS Page gel after first purification



SDS Page gel after second purification

Molecular Mechanisms of Neurogenesis in the Hippocampal Dentate Gyrus

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Neurogenesis is the growth and development of nervous tissue. When one exercises, his or her muscles burn because lactic acid is being secreted. There are many articles that state the connection between exercise and neurogenesis. Dr. Eitan Okun's lab hypothesized that maybe the lactate was affecting the neurogenesis when one exercised. They found that lactate does in fact have an effect on neurogenesis; the lactate makes the new neurons survive for longer. Now in the lab they are testing the behavioral aspect and mechanism of the pathway to see how the lactate affects the neurogenesis.

About a year ago, at the start of this section of research, the lab acquired two groups of mice, one group for the behavioral testing, and one group for the mechanism aspect. Both groups were identical, all male, the same age, and the same species. The group used for the behavioral testing was broken into two groups, each lasting five months. Each of the two groups were broken into five groups, in order to check for five different things: PBS, the control group; Lactate; DHBA, agonist for the GPR81 receptor, the receptor for lactate in the brain; 4CIN, antagonist for MCT-2, the transporter that transports lactate; and 4CIN & Lactate, antagonist to see if the antagonist is working in order to tell if lactate is the mechanism or not.

The behavioral group was injected every day, and then put through a series of tests throughout the five-month period. Some tests were to study long term memory, such as the Barnes Maze, Radial Arm Maze, and Reversal Radial Arm Maze. Other tests were to study short term memory, such as the T Maze and Y Maze. At the end of the five-month period of behavioral tests, they take all of the body parts out of the mouse and freeze it, just in case a body part is needed for the future for further testing.

The mechanism group was given injections every day for six weeks and then their brains were taken out for investigation on September twenty-ninth, two thousand and sixteen. The brains are prepared as forty micrometer slices, and then an intensive two-day BrdU and NeuN staining is done to them. After picking the first slice containing the dentate gyrus, the part of the hippocampus that is responsible for memory, every fifth slice is taken in order to get a good sampling.

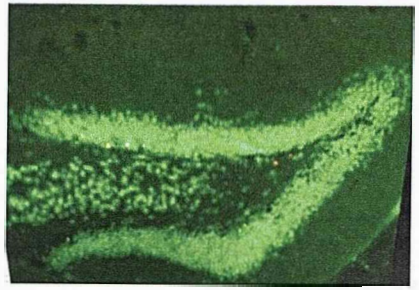
On the first day, the slices are washed five times with PBST, phosphate buffered saline with point one percent Triton, and then the slices sit for five minutes each on the shaker. Then HCl is put into the wells and incubated in

thirty-seven degrees Celsius for thirty minutes. HCl is added to increase the surface area, allowing the slice to absorb more antibody. After thirty minutes, Borat Buffer is put into the wells for ten minutes in room temperature in order to neutralize the slices.

Next, the slices are washed again with PBST, but this time, two washes are done without shaking in between, and then four more washes with shaking. Next, the blocking, a mixture of twenty percent Normal Horse Serum and eighty percent PBST, is put in and set for an hour to shaking. The purpose of the blocking is to make a more specific bonding between the antibody and its target. The last step for day one is to put in the primary antibody, a mixture of 1:1000 anti-BrdU and 1:10,000 NeuN, Neuronal specific marker, diluted in PBST and two percent Normal Horse Serum. This sits in the slices for three days while shaking in four degrees Celsius.

Day two begins with washing the slices five times with PBST and then shaking each time for five minutes. Then the second antibody, a mixture of 1:1000 Goat anti-rat 568 and 1:1000 goat anti-mouse 488 diluted in PBST, is put in. Because these two antibodies are fluorescents, they need to be protected from the light as much as possible, so the well is covered in a tin foil covering while incubating for an hour. After an hour, the samples are washed five times with shaking for five minutes each. The last step of the staining process is placing the slices on slides, and then gluing on a cover.

To check the results of the injections and staining, the slides are put into an MBF Stereology microscope and pictures are taken via the SRS imaging system. When looking at the coloring on the microscope, BrdU brings out red coloring, indicating new cells, and NeuN brings out green coloring, indicating neurons. The best is when there are spots that are both red and green, indicating new neurons have formed and that the lactate was successful.



LRP6 Antibody Inhibits Tumor Growth and Metastasis in Breast Cancer Mouse Models

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Although breast cancer has become increasingly curable, approximately 40,000 patients still die yearly due to metastasis or acquired drug resistance. Doxorubicin, one of several conventional chemotherapy drugs, is known to reduce tumor size through inhibition of topoisomerase II, an enzyme integral to proper DNA synthesis. The Doxorubicin treatment, however, only targets terminally differentiated cancer cells, not cancer stem cells (CSCs). Those CSCs have the capacity to break free from the primary tumor and to serve as the progenitors of secondary cancer sites, frequently in the lung or bone marrow. In addition, these CSCs are inherently resistant to conventional chemo and radiation therapy.

CSCs' metastatic capacity is driven by excessive stimulation of the WNT pathway, a signaling pathway implicated in cell proliferation. The WNT ligand binds to an extracellular membrane region which includes the LRP6 co-receptor, activating tyrosine kinase and initiating signal transduction. Using LRP6 antibodies to prevent the receptor's ability to bind WNT and transmit the signal can therefore inhibit the pathway's activity, dampening the molecular mechanism fueling metastatic potential. We sought to ascertain the efficacy of the LRP6 antibody when used in conjunction with Doxorubicin. If the combination proved more successful at reducing tumor size and incidence of secondary tumor growth than Doxorubicin alone, it could change the face of breast cancer treatment for those remaining patients who fall through the cracks.

To test this hypothesis, twenty severe compromised immunodeficiency (SCID) mice were injected with MDA-MB-231 human breast cancer cells in the mammary fat pad. We waited approximately four weeks until the resulting tumors were externally quantifiable. At that point, five control mice were treated with the vehicle, five received only Doxorubicin injections, five received Doxorubicin along with Salinomycin (a small molecule drug that blocks the tyrosine kinase activity of the LRP6 protein), and five received Doxorubicin along with the LRP6 antibody. They were to be given weekly injections for a duration of six weeks. Since the animals lacked immune systems, any salutary effect could be entirely attributed to the drug treatment without any aide from natural immune responses.

While the SCID mice experiment is currently still in progress, we have clear indication that the primary tumors are significantly reduced in Salinomycin and antibody treated animals when compared to control or Doxorubicin

treated ones. An identical experimental set-up was previously conducted using FVB mice. FVB mice do possess regular immune systems, and they provide a useful barometer to predict potential outcome in the SCID mice trial. In those animals, Met-1 cells (syngeneic to FVB) were injected in the mammary fat pad to form tumors by six weeks. The treated animals showed a clear primary tumor reduction in the animals treated with a combination of Doxorubicin and Salinomycin or LRP6 antibody. Bone marrow and lung tissue samples were obtained from the treated FVB mice upon the experiment's conclusion. DNA was extracted from the samples and amplified through polymerase chain reaction (PCR) using the polyoma middle T (PyMT) primer, designed to amplify specifically the PyMT DNA sequence present only in the injected Met-1 cells.

The PyMT primers amplified as expected in the samples obtained from both the control and Doxorubicin cages, indicating that Met-1 cells had, in fact, metastasized from the mammary fat bed injection site to the lungs and bone marrow. In samples from the Doxorubicin + Salinomycin and the Doxorubicin + LRP6 antibody treated animals, however, the PyMT primer was unable to detect a single cell with the corresponding PyMT DNA sequence, indicating that no metastasis had occurred.

These results demonstrate that Doxorubicin administered in tandem with the LRP6 antibody is more effective at preventing metastasis than Doxorubicin given in isolation. When the SCID mice trial concludes, tumor sizes and tissue samples will be similarly analyzed to further substantiate the data from the FVB trial. If the data remains consistent, as expected, the LRP6 antibody will be humanized, and the treatment will proceed to clinical trials.

Predictors of Allograft Loss After Kidney Transplantation - A Single Center Study

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With further improvements in immunosuppressive medications and the greater care of transplant recipients, 1-year patient and graft survival have increased to over 95% and serious rejection rates have decreased to 10-15% [1]. However, graft half-life has not improved and is still around 10-15 years [2]. A common injury found after a kidney transplant is Chronic allograft injury (CAI) and has been found in more than 50% of kidney receiver's 1-year protocol biopsies and is the leading cause of graft loss after a patient's death. CAI is a multifactorial process in which immunologic (e.g. acute and chronic cellular and antibody-mediated rejection) [3] and nonimmunologic factors (e.g. donor-related factors, ischemia/reperfusion injury, polyoma virus, hypertension, and calcineurin inhibitor nephrotoxicity) play roles [4]. However, these factors are not mutually exclusive and CAI most likely results from the combination of many different aspects.

We did our research on adult kidney transplant recipients over the age of 21 who got kidney transplantation at Montefiore Kidney Transplant Center between the years 2009 and 2014. We got our information from electronic medical records which were used for recipient-related factors and the donor factors were taken from the United Network of Organ Sharing (UNOS), where we got results from both living or deceased kidney transplant recipients. Kidney recipients under the age of 21 were not used since these are considered pediatric cases at the Montefiore Kidney Transplant Center and recipients of dual-kidney transplants as well were not part of this study. We gathered the age at transplant, donor age, KDPI, obsolete/Total Glomeruli (%), final resistive index, arteries intimal fibrous narrowing, sex, race, locality of donor kidney, CDC high risk, donation after cardiac death (DCD), expanded-criteria donors (ECD), cold ischemic time (min), transplant type, previous transplantation, acute rejection, BK nephropathy, recurrent glomerulonephritis (rGN), noncompliance, recipient HCVAB, BKV viremia, CMV viremia, fungal infection, donor HCV, donor final creatinine, and induction type in order to get our final results for the study.

All statistical analyses will be performed using STATA version 11.2 (College Park, TX). Demographic and clinical data will be compared using the Mann-Whitney or Kruskal-Wallis test for continuous variables and the c2 or Fisher's exact test for categorical variables. A p-value of <0.05 was considered statistically significant. Survival analysis will be performed by Kaplan-Meier analysis with statistical difference calculated using the log-rank test. To obtain Kaplan-Meier death-censored survival estimates, survival time will be defined as the times between the date of transplantation and death (with a functioning graft), graft failure and the most recent follow up date. Graft failure is defined as return to dialysis after transplantation. Cox-proportional Hazards will be used to determine hazard ratios and tested using Martingale Residuals.

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The Pathogenesis of an Autoimmune Disease: Rheumatoid Arthritis

Tali Kluk[1] and Dr. Harris Perlman[2]

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Rheumatoid Arthritis (RA) is a severely painful disease in which a person's immune system erroneously attacks its own healthy and functional joints. Different from osteoarthritis, initial symptoms of RA include synovial inflammation, chronic pain, and loss of physical function; long term RA can lead to joint damage. There are various treatments and therapies for patients with RA, but there is no cure for the disease. The current research aim is to track the disease pathways to prevent further progression. It has been found that macrophages – a kind of monocytes – play a significant role in the synovium of the swollen joints. Therefore, researchers are attempting to determine what is happening to the macrophages during the autoimmune attacks.

A high quantity of macrophages is present in joints affected by RA. There are multiple research methods that are used to study the role of macrophages, each with its own gains and deficits. For example, the mouse model of arthritis simulates RA present in humans but is not identical; serum arthritis from K/BxN mice is induced to normal mice. Serum Transfer Arthritis (STA) closely mimics the pathways of RA. The development of the arthritis can be studied in a wide range of strain backgrounds mice with different gene deletions, both during the mice's life and once the organs and blood are extracted.

As expected, STA is temporary as the mice's antibodies learn to combat the disease. The mice are observed over four weeks and scored depending on the severity of the inflammation. A limb will score a one if the digits are swollen, two if the wrist or ankle is swollen, and three if it has lost its shape. At the peak of development, mice can score up to twelve points if all four of the extremities are severely inflamed. Eventually, the joints return to normal size as STA is not autoimmune. Each strand of mice, with the different gene deletions, responds differently to the disease. STA is not exactly like RA as it is temporary, not autoimmune, but as it simulates RA closely, it is a suitable model to study the disease's development in a living organism.

STA mice organs are also examined for disease development. Flow machines are used to sort the cells in the mouse antibodies. Each antibody has a corresponding colored fluorophore that can be traced on the machines. Each genome can be studied to learn about its response to STA.
Another form of studying the disease's pathways is by studying tissue taken from human biopsies. This approach is advantageous as it contains proper RA. Again macrophage populations are closely examined. White blood cells are initially isolated from the rest of the sample, and then sorted into

dendritic cells, classical monocytes, non-classical monocytes, and intermediate monocytes, using flow cytometry. The various cell populations are analyzed using RNA sequencing to determine their transcriptional profile.

Biopsy samples are also analyzed by staining the tissue to confirm the presence of the synovial lining, and then histologically scoring them according to the different cell populations using microscopy.
Lastly, patients with RA may be monitored, but experimentation is very limited.

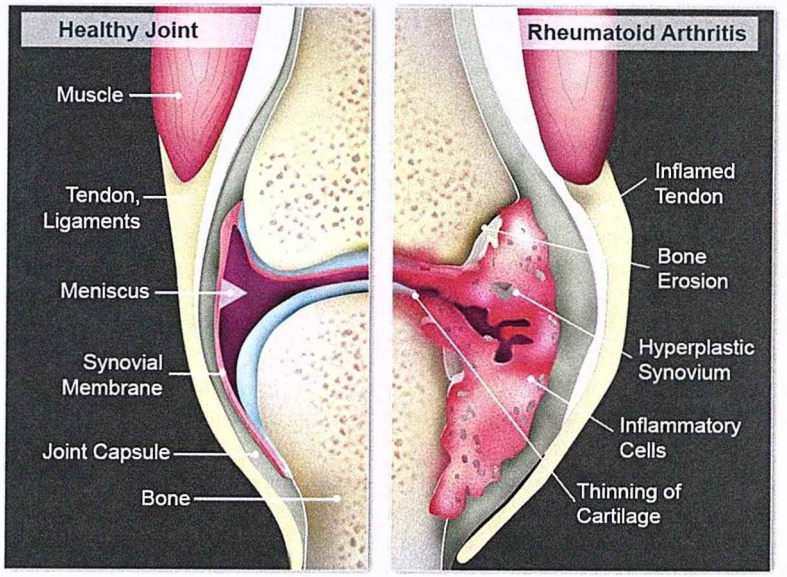

Diagram of a healthy knee joint versus an impacted RA knee joint

mTOR inhibition increases lifespan in Li-Fraumeni Syndrome fibroblasts by positively influencing the DNA Damage Response

Lior Levy[1,2,3,4], Ran Kafri[2,5] and David Malkin[2,3,4]

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Li-Fraumeni syndrome (LFS) is a classic cancer predisposition disorder commonly associated with germline mutations of the TP53 tumor suppressor gene. TP53 mutation carriers are at risk to develop a wide spectrum of early onset cancers with a 75% lifetime risk in males and 93% in females. Interestingly, evidence shows that inhibition of the mTOR signal transduction pathway delays or eliminates tumour onset and increases lifespan in murine models of p53 deficiency. The mTOR pathway is responsible for processes such as the cell cycle, protein synthesis and metabolism. The role of p53-mediated DNA Damage Response (DDR) in LFS patients on the mTOR pathway and the mechanism for this mTOR-mediated increase in lifespan is currently unknown.

We test the hypothesis that mTOR inhibition increases lifespan of individuals that are predisposed to cancer by positively influencing the DNA damage response (DDR), hence decreasing the rate of the secondary spontaneous mutations responsible for the malignant transformation.

To explore this possibility, we make single cell measurements on LFS patient-derived skin fibroblasts. We quantify the correlation between DDR (p-H2AX, p-Chk2, p21) and mTOR activity (p-S6) after 24hr of Doxorubicin-induced DNA damage, and Rapamycin-induced mTOR inhibition.

The results demonstrate that Doxorubicin-induced DDR inhibits mTOR activity in wildtype skin fibroblast cells (Figure 1). Li-Fraumeni Syndrome patient-derived skin fibroblast cells lack the negative correlation between DDR and mTOR activity. MTOR inhibition by Rapamycin partially restores the DDR in DNA damaged LFS fibroblasts. These results suggest that the pharmacological inhibition of mTOR by Rapamycin may serve as a preventative intervention in individuals with cancer predisposition.

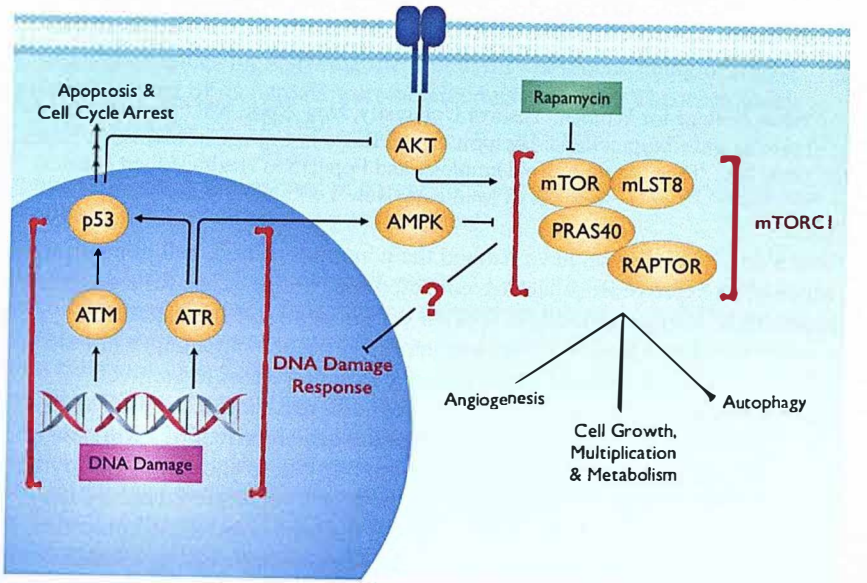

Figure 1: The DNA damage response inhibits mTOR through p53 downstream targets.

Understanding Bayesian Networks for Single Cell Transcriptomic Data

Marjorie C. Liebling[1], Shuonan Chen[2], Samuel E. Zimmerman[2], Daniel Piqué[2], and Jessica C. Mar[2,3]

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Traditionally, biologists have studied the genomics of bulk cell population in which gene expression values are collected for various genes for a number of individuals. While this method is often very informative of patterns of genetic behavior across various populations, it has the potential to fail to recognize any heterogeneity that may or may not exist within a given population of cells [1]. To understand the biological ramifications of many diseases, it is crucial to study the genetics of such abnormalities with single cells as much of the heterogeneity lies from one cell to another. By studying single cell population data in addition to bulk cell population data, we may gain insight into the heterogeneity in which the transcriptome is controlled, not just from one individual to another, but from a single cell to another single cell in the same population.

Single cell data, however, can be difficult to interpret at the transcriptome level because of the newness of the field and the slow emergence of bioinformatic tools, which is especially the case for genetic networks. The goal of this study is to produce an interactive interface to describe the behavior of single cell genetic relationships through stage specific networks. Through this network visualization method, the user can interpret how the genes in the dataset work together across various stages of cell development.

This particular qPCR dataset originates from murine mesoderm cells which have blood forming potential. Mesoderm cells form in the early stages of embryonic development known as gastrulation and have the capacity to evolve into endothelial, smooth muscle, or blood cells. The presence of blood is an important marker for embryogenesis, as it is necessary to support the developing organs. Gene expression values of 33 genes were collected from 3,934 samples between the E7.0 and E8.5 stages of cell development [2].

The R package, bnlearn, which uses a sampling method called bootstrapping to learn the network from the data was applied after discretization of expression values into off and on states. A thousand different networks are produced to model the behavior of the dataset by randomly choosing a root gene. Each individual network is scored according to its likelihood of its truly representing the data. These steps are repeated thousands of times until a sufficient tally of highest scoring networks is obtained. All edges that ranked higher than the assigned threshold are chosen as the edges to be used in the final learned network.

Contingency tables representing the probability of a gene being off or on given the status of its parents were obtained using Bayes Theorem which states, $P(B|A) = \frac{P(B \cap A)}{P(A)}$. The frequency of a child gene being off or on given different combinations of parent gene states in each of the stages and in all of the stages combined was computed.

To determine the strength of two connected genes, a contingency table for each edge was produced representing the probability of the child being off or on given the status of a single parent gene. The interaction was inhibitory and activation-based using an odds ratio statistic which determined the rank of the edges by variability across stages. Edge heterogeneity was plotted in a histogram to reveal the percent edges in just one, two, three, four, five, or all of the stages of cell development. Overall, activating edges remain activating through five of the stages, whereas inhibiting edges remain inhibiting for only two of the stages. Thus, it becomes clear that there is more heterogeneity across the stages among the inhibiting edges.

In conclusion, the data was put through many statistical tests to reveal significant edges of the network and the relationship that exists between the parent and child genes. We created a real-time visualization of gene-gene interaction across various stages of the cell development using single cell data which allowed us to gain insight into the workings of cells from a single population. The majority of significant edges had an activation relationship and maintained this relationship throughout five stages. Few significant edges were inhibiting. Those that were, however, generally maintained this relationship throughout only two stages of cell development. We deduce that while inhibiting edges are highly heterogeneous across the stages, activating edges are not and maintain this relationship. Future directions of this project include generalization of the application so any scientist researching Bayesian networks may upload and interactively visualize the distinguishing characteristics of his network.

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Angiopoietin-like 4 Promotes Lymphangiogenesis in Head and Neck Squamous Cell Carcinoma

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Head and neck squamous cell carcinoma (HNSCC) is the most common head and neck cancer. HNSCC can metastasize through the blood vessels or lymphatic vessels (Noguti, Juliana, et al., 2012). Thus, formation of new blood vessels (angiogenesis) and lymphatic vessels (lymphangiogenesis) are two key events that promote metastasis of HNSCC. Signaling events that promote lymphangiogenesis are of particular significance, as majority of HNSCCs metastasize through the lymphatic system (Noguti, Juliana, et al., 2012).

HNSCCs secrete factors to aid the development of lymphatic system around tumors, thereby allowing the cancer cells to migrate to secondary sites. In this study, we plan to look at relationship between expression and lymphangiogenic activity of Angiopoietin-like 4 (ANGPTL4) in HNSCCs. ANGPTL4 is a 45 kDa glycosylated protein with an N-terminal coiled domain and a C-terminal fibrinogen like domain. Upon secretion, ANGPTL4 is cleaved into a 38 kDa C-terminal and 15 kDa N-terminal fragment. The N-terminal domain plays a role in inhibiting the activity of blood lipoprotein lipase, an enzyme that converts triglycerides into monoglycerides. The C-terminal domain plays a role in angiogenesis and tumor metastasis, as well as regulates endothelial permeability (Grootaert, Charlotte, et al., 2012).

We evaluated the cellular expression of ANGPTL4 in a panel of HNSCC cell lines using a western blot. We found that the HNSCC cells (HN-4, HN-6, HN-12, and HN-13) express higher levels of ANGPTL4 protein in comparison to Normal Oral Keratinocyte-Spontaneously Immortalized (NOK-SI) and Leukoplakia (Leuk-1) cell lines. Upon evaluating the conditioned media, we found that HNSCC cells secrete higher levels of ANGPTL4 as compared to NOK-SI and Leuk-1 cells.

Hypoxia, a key regulator of lymphangiogenesis, has been shown to upregulate ANGPTL4 expression through stabilization of hypoxia inducible factor 1-alpha (HIF-1α) (Ji, Rui-Cheng, 2014). We did not observe major differences in cellular expression of ANGPTL4 when cells were placed under hypoxic conditions. However, an increase in secretion of the full-length ANGPTL4 occurred under hypoxic conditions in all of the cell lines. We also detected an increase in the cleaved C-terminal fragment in the conditioned media.

Epidermal growth factor (EGF) signaling is important for HNSCC cell proliferation and metastasis (Herbst, Roy S, 2004). However, mechanism-EGF-induced lymphangiogenesis in HNSCC is unknown. We investigated the role of EGFR pathway in expression of ANGPTL4 using two known inhibitors of EGFR signaling – Cetuximab, a monoclonal antibody that blocks the EGFR receptor, and AG1478, a tyrosine kinase inhibitor. We found that ANGPTL4 expression was reduced in HN-6 and HN-13 cell lines upon use of these inhibitors. Thus, preliminary data suggests that ANGPTL4 expression is dependent on EGF signaling pathway in HNSCC cells.

We hypothesized that ANGPTL4 secreted by HNSCC cells promotes lymphangiogenesis through promotion of cellular survival, proliferation, and migration of lymphatic endothelial cells (LECs). Preliminary data showed that the addition of recombinant full-length ANGPTL4 and C-terminal ANGPTL4 induced the migration of LECs. We are currently investigating the ability of secreted ANGPTL4 from HNSCC cells in promoting proliferation of LECs.

In summary, our data shows that ANGPTL4 expression and secretion is elevated in HNSCC. ANGPTL4 expression is dependent on EGF signaling and its secretion is elevated under hypoxia. Furthermore, ANGPTL4 promotes lymphangiogenesis by promoting migration of LECs. This makes ANGPTL4 a potential diagnostic marker and a viable target in treatment of highly metastatic HNSCCs.

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The Effects of Sema3F on the Cytoskeleton of U87MG

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Semaphorin 3F (Sema3F) is a protein that has significant biological effects in many cell types. It has the ability to bind neuropilin 2 (NRP2) and this Sema3F-NRP2 interaction has wide implications within cells. One important consequence is that the cytoskeleton stability is severely inhibited. For this particular research, Sema3F was generated in the lab. Experiments were done *in vitro* by treating U87MG cells with Sema3F in order to test the biologic activity of the protein.

U87MG is a cell line that originates from a glioblastoma. It has epithelial morphology. These cells were treated at different concentrations of Sema3F for 30 minutes. They were subsequently stained with phalloidin in order to detect the actin fibers making up the cytoskeleton and next stained with Hoechst to identify the nuclei of the cells.

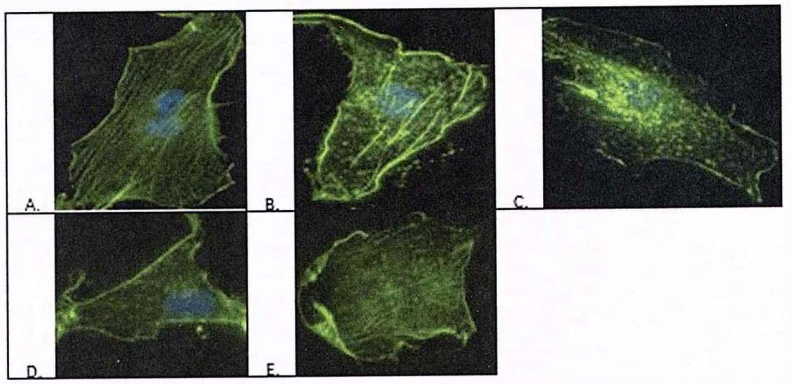

Figure 1: A) Untreated U87MG. B) U87MG treated with 640 ng/mL of Sema3F. C) U87MG treated with 320 ng/mL of Sema3F. D) U87MG treated with 160 ng/mL of Sema3F. E) U87MG treated with 80 ng/mL of Sema3F.

From the figures above, it is clear that Sema3F induced cytoskeletal collapse within U87MG cells. As compared to untreated cells, the Sema3F caused considerable breakage of the actin fibers making up the cell cytoskeleton. This can even be visualized slightly within the cell that was treated at the lowest concentration of Sema3F (figure 1E).

This linkage between Sema3F activity and cytoskeletal collapse can have a major effect within tumor therapy. This experiment demonstrated that Sema3F can reduce and weaken tumor progression.

The Role of the Ndrg1 Protein in Oligodendrocyte Remyelination

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Multiple sclerosis (MS) is a debilitating inflammatory neurodegenerative disease, affecting roughly 2.5 million people worldwide. The pathology of multiple sclerosis includes inflammation of the central nervous system, oligodendrocyte death and demyelination. Oligodendrocytes myelinate neurons in the central nervous system, facilitating saltatory conduction; destruction of oligodendrocytes therefore manifests in loss of motor control.

In a postmortem whole genome comparison, the NDRG1 gene was found to be hypermethylated, and therefore downregulated, in multiple sclerosis patients as compared to healthy individuals. Ndrg1 protein levels were identified to be absent in the normal appearing white matter of these patients. These findings suggest that the downregulation of Ndrg1 may impact pathology, inhibiting remyelination. However, literature on Ndrg1 is scarce, and its mechanism of action unclear. To investigate the role of the Ndrg1 protein in remyelination, NDRG1 mutant and control mice were analyzed. The administration of cuprizone, a neurodegenerative toxin that selectively kills oligodendrocytes, was used to mimic the demyelinated conditions of multiple sclerosis in treated mouse models. We analyzed inflammation in the corpus callosum after 3 weeks of cuprizone treatment and quantified oligodendrocyte numbers.

Further research will attempt to discover the mechanism of Ndrg1's function, and how environmental factors might modulate MS pathology.

I'd like to thank Julia Patzig and Patrizia Cassacia for their assistance and guidance on this project.

Searching for gRNA Editing in the Nuclear DNA of Trypanosoma Brucei

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The guide RNA (gRNA) editing process is the insertion or deletion of U residues in the mitochondrial mRNA transcripts of kinetoplastid Trypanosomes. Before gRNA editing, the mitochondrial DNA is untranslatable and useless to the Trypanosome. Tripanosoma Brucei, also known as the African sleeping sickness, is a parasitic kinetoplastid belonging to the genus Trypanosoma. Guide RNA heavily edits of the 18 mitochondrial proteins, creating an abnormal base pair distribution among the proteins. We wanted to see if U-editing also occurs in the nuclear DNA of T. Brucei by analyzing all sequences that mapped to the T. Brucei genome, as well as 133 genes that code for proteins relating specifically to mitochondrial functions. In comparison to the tally of all the static genes in Tripanosoma Brucei, mapped or unmapped, the mapped sequences contain a slightly higher percentage of A's and G's on average while the mitochondrial genes contain a higher percentage of A's and T's. While the complete genome contains a relatively even distribution of nucleic acids (represented by the blue bars in figure 1), the mapped mitochondrial related sequences (red) are composed of 29.74% A and 27.05% T.

The mapped mitochondrial-related genes are T-rich, but in order to test the validity of this result, we chose 100 samples of 133 random mapped genes and tallied their nucleic acid compositions. After comparing the RMS values of all sets, we came to the conclusion that the T- rich distribution is not unique to the mitochondrial- related sequences. In order to see if U- editing occurred between the static genome and the mapped sequences, we checked the mapped sequences for an abnormal percentage of insertions and deletions of T's. The percentages of deletions of single nucleic acids in the general mapped tally noticeably differed from the percentages of single nucleic acids deleted in the mitochondrial- related sequences. **More** singular T's and G's were deleted in the mitochondrial- related mapped sequences in comparison to all the mapped sequences.

In order to check whether the deletion of T's was significant, we compared RMS values of random sets once more. The RMS of the percentages of single base deletions in the mitochondrial-related sequences lied well within the range of RMS's of the random sets at 35.45, proving that the heavy concentration of single T- deletions is coincidental.
In conclusion, while the distributions of the mitochondrial- related sequences seems unique, there is no proof of U- editing in nuclear DNA that is related to the mitochondria, nor in the nuclear DNA in general.

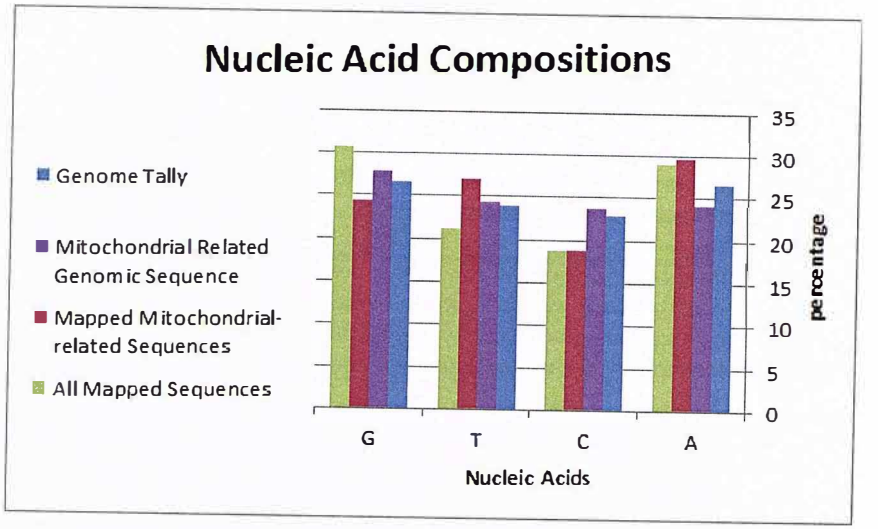

Figure I

M-280 Dynabeads' Treatment Optimization

Stephanie Roffe[1,3], Dr. Yehudit Michaelson[2,3], Dr. Amos Danielli[2,3]

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Background: Fluorescent bio-sensing is a method that was developed to detect a target analyte at low concentrations. The challenge of detecting molecules at ultra-low concentrations has many limitations, primarily because the laser beam hits only a few molecules. The Magnetic Modulation Biosensor (MMB) system was designed to overcome this challenge, by using magnets to aggregate the fluorescently tagged beads and then measure the signal. This technology is a useful diagnostic tool.

Zika virus comes from the genus Flavivirus. There are many other diseases in this genus such as, West Nile, Yellow Fever, and Dengue. It was first identified in Africa during the 1940s, and was named after the forest it was found it, the Zika Forest. The most recent outbreak is in the Americas- beginning with Brazil in 2015 and moving all the way up towards the United States. The Zika virus vector is transmitted through the daytime biting of an urban mosquito known as the Aedesaegypti. Diagnosing Zika is a challenge because the outer proteins are similar to other flavirviruses and are therefore it is difficult to differentiate them. The most effective way to identify this specific flavivirus is to test for the inside NS1 proteins.

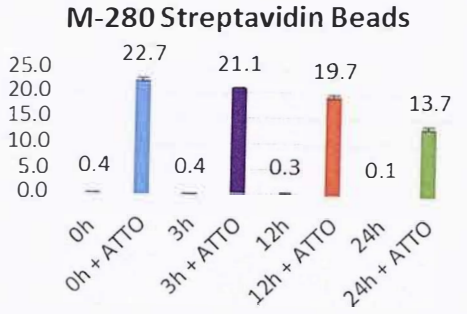
To create a rapid NS1 diagnostic test it is necessary to make the technology as effective as possible. By optimizing the binding capacity of the beads and lowering the background noise the method will have a lower baseline and therefore an increased sensitivity.

Aim: The aim of this study is to reduce the background noise coming from the beads while maintaining the binding capacity, increasing measurement sensitivity.

Method: The method is done in four stages. In stage one, the beads are treated for 0-hour, 3-hour, 12-hour, and 24-hour. My hypothesis is, the longer treatments will lower the background florescence, however, in doing that the binding capacity will be decreased. In stage two, the samples are split we perform an assay. The assay for the M-280 Streptavidin beads is the M-280 dynabead coupled to ATTO 523 Biotin. For the M-280 Tosylactivated beads it is M-280 dynabead coupled to the Zika Virus coupled to human anti NS1 coupled to Anti human 532. After the assay, in stage three, the samples will be measured by the MMB system. Stage four is the analysis where the data is run through an algorithm.

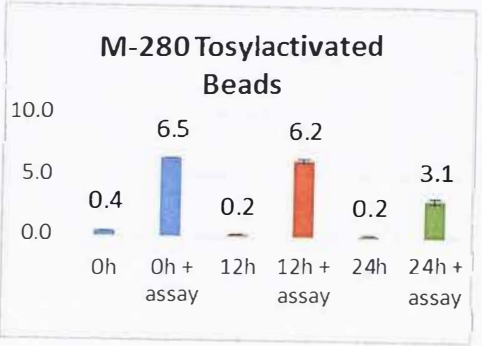
Results: In experiment 1 the 24-hour treatment is most useful because the signal to noise ratio is 100.0%.

SA Beads	signal/noise
Non-treated beads	55.6
3h treatment	56.3
12h treatment	68.4
24h treatment	100.0



In experiment 2 the 12-hour is most useful because the signal to noise ratio is the highest.

TA Beads	Signal/noise
0hr	14.4
12hr	34.5
24hr	17.3



Conclusions: In conclusion, the most effective treatment to reduce background noise is the longest treatment, 24-hours. The M-280 Streptavidin beads had a reduction of 75%, while the M-280 Tosylactivated beads had a reduction of 50%. However, based on the signal/noise ratio the most effective treatment for the TA is 12-hour, not the 24-hour. The 12-hour treatment have a signal/noise ratio of 34% in contrast to the 24-hours 17%, but it only drops the binding capacity by 5%, and the background noise by 50%, while the 24-hour drops it by almost 50%.

Pediatric Delirium in the Post Anesthesia Care Unit

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Delirium, an acute disturbance in mental functioning that can result in confusion, lack of awareness, irritability and behavioral changes, is a known problematic complication that can accompany critical illness in pediatric patients. Subtypes of delirium include hyperactive, hypoactive, and mixed delirium, and can be missed without routine screening, especially with the more common hypoactive and mixed symptoms. Studies in pediatric intensive care units show that over 20% of critically ill pediatric patients develop delirium [1], and demonstrate a correlation between delirium and increased length of stay [2], increased mortality and increased cost [3]. There are many known risk factors associated with delirium, one of which is anesthesia in adult patients. In order to analyze the prevalence of pediatric delirium after undergoing general anesthesia, our study focused on pediatric patients recovering in the post anesthesia care unit, or PACU, where patients recover from short elective procedures requiring general anesthetics. We hypothesize delirium symptoms will be prevalent among pediatric patients recovering in the PACU, affecting more than 15% of patients, and that certain risk factors will be associated with the development of these symptoms.

In order to observe the prevalence of delirium symptoms in pediatric patients in the post anesthesia care unit, each patient between the age of 0 and 18 recovering in the PACU was screened by the bedside nurse for delirium using the CAPD, the Cornell Assessment of Pediatric Delirium, a verified delirium screening consisting of 8 questions on a Likert type scale. The screening was completed 30 minutes after the patient's arrival in the PACU or upon first awakening, and again before the patient's discharge. Additional data such as demographics, intra-operative medications, anesthesia exposure time, time to emergence, PACU medications, and pain scores were extracted by the research team from the electronic medical records.

Of the 366 patients screened over the course of the study, 33.7% presented symptoms of delirium at 30 minutes, and 7.9% of patients displayed symptoms of delirium at discharge. The median age of those with a positive CAPD at discharge was 34 months compared to a median of 39.5 months for the patients with delirium symptoms only at 30 minutes and a median of 85.5 months for the patients who never displayed any signs of delirium. Younger patients were therefore at higher risk for developing symptoms of delirium, consistent with previous studies of pediatric ICU patients. Patients who displayed symptoms of delirium also had a higher percentage of ENT procedures and endo-tracheal tubes, more commonly received sevoflourine,

fentanyl, and dexmedetomidine during procedures, and had higher pain scores on average in the PACU. Additional statistical analyses are required to determine whether there is statistical significance to these findings. Despite meeting all discharge criteria, which includes the absence of lasting anesthesia effects, and a median discharge time of 83 minutes after arrival in the PACU, 7.9% of patients had persistent delirium symptoms upon discharge, suggesting that the positive CAPD scores were not merely indications of regular emergence from anesthesia. Without the use of this screening tool in the PACU, these symptoms would not have been recognized.

Further studies are required to determine whether these symptoms of delirium are correlated with additional negative effects similar to those observed in PICU patients, such as increased length of stay, and to examine the correlation between PACU delirium and the risk factors recognized in this study.

	Never Delirious	Delirious at 30 Min	Delirious at Discharge
Number of Patients	244 (66.7%)	120 (33.7%)*	29 (7.9%)
Median Age	85.5 months	39.5 months	34 months
Number of ETTs	106 patients (43.4%)	84 patients (70.0%)	21 patients (72.4%)
Received Sevoflourine	203 patients (83.2%)	112 patients (93.3%)	28 patients (96.6%)
Received Fentanyl	171 patients (70.1%)	95 patients (79.2%)	25 patients (86.2%)
Received Dexmedetomidine	54 patients (22.1%)	44 patients (36.7%)	12 patients (41.4%)
Median Pain Score**	0	2	2

*10 patients' 30 minute screenings were not able to be included, so the percentage is out of 356 available 30 minute screenings.
** Pain scores are given on 3 scales, all of which range from a lowest of 0 to a high of 10.

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Antibiotic Resistance in *Pseudomonas aeruginosa* Examined by the Identification of the Toxin Target Through Gyr A Knockout

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Pseudomonas aeruginosa is a versatile gram-negative bacterial pathogen that targets a variety of hosts. It is most commonly known for causing chronic infections in patients with cystic fibrosis and is associated with increased morbidity and mortality rates within these patients. Its ability to form a biofilm exacerbates its pathogenic qualities, mainly its resistance to antibiotics. A biofilm is a colonization of bacterial cells that attach within an extracellular matrix, secrete an extracellular polymer substance (EPS) and eventually form a protective physical structure. The EPS mainly consists of water, proteins, polysaccharides and nucleic acids that help provide a number of advantages for bacteria such as: protection from harsh environmental conditions, proper nutrition and sustenance, maintaining a consistent population and providing resistance against antimicrobial agents. Although the biofilm helps the bacteria attain numerous virulent factors and antibiotic resistant mechanisms, it does not generate a high genomic diversity among the bacterial strains.

Most of the genomic variation is due to prophages, also known as viruses, which can infect a bacterial host and proceed in one of the following courses: lytic or lysogenic cycle. In the lytic cycle, the virus infects the bacterial host and overpowers the host cell's machinery to produce nucleic acids and proteins required for the production of new virions. This eventually leads to the death and lysis of the cell followed by the dispersal of new virions to infect new host cells and reproduce. However, in the lysogenic cycle, the bacterial host cell usually remains alive while the virus integrates its DNA within the host cell's DNA and becomes duplicated together during cell division. The viral DNA can either remain in the host cell as a plasmid or can spontaneously switch back to the lytic cycle and lyse the host cell and produce new virions.

In addition to a greater genomic diversity, the prophages that infect the host cells result in different levels of pathogenicity between the varying *P. aeruginosa* strains. This project focused on a toxin-antitoxin system within the PA01 wild type strain of the *P. aeruginosa* to help explain the difference between the variations among the strains. Toxin-antitoxin systems are small genetic modules usually composed of a toxin and an antitoxin counteracting the activity of the toxic protein. For the PA01 strain, a type II toxin-antitoxin system was revealed in which the antitoxins are proteins that sequester, counterbalance toxin activity, or inhibit toxin synthesis. Based on the literature, we proposed the toxin's target is the Gyr A component of the gyrase, which is responsible for uncoiling the tightly wound DNA for

replication. Thus, when there is an overexpression of Gyr A, the Gyr A binds to the toxin and prevents the toxin from inhibiting cell growth, and eventually after the cell compensates growth will occur. To test this hypothesis, a growth curve was performed with two different plasmids: PJN, an empty plasmid to serve as the control, and PSSP which is the plasmid containing the toxin. When Gyr A was overexpressed with both of these plasmids there was growth, as we would expect. However, when we deleted the Gyr A box sequence in the gene, the toxin had no target to bind to, thus allowing toxic activity to occur and preventing cell growth of the host bacteria. As a result, our initial hypothesis was correct that the Gyr A is the target site for the toxin that enables the bacterial host cell to continue growing and possess pathogenic qualities.

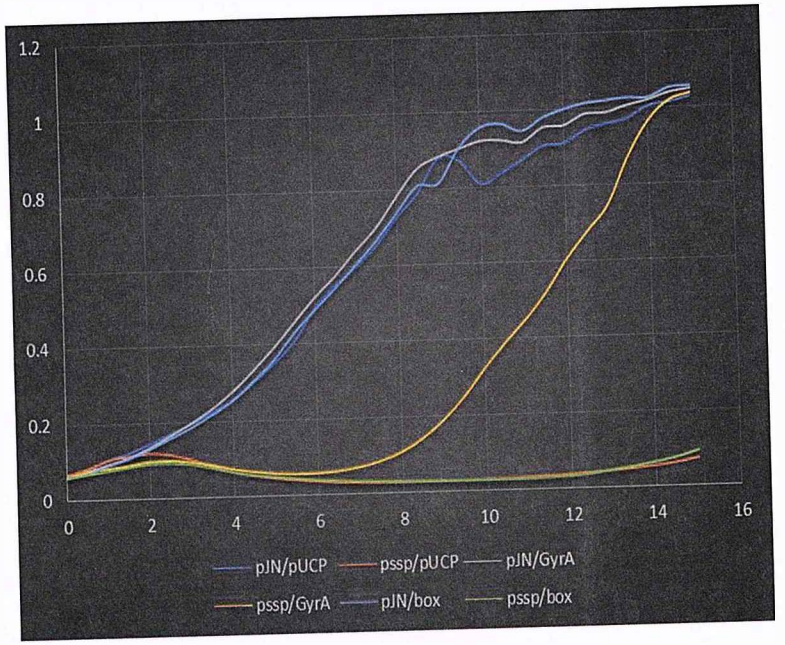

Figure 1. Growth curve results display that without the Gyr A Box sequence to inhibit toxic activity, there was no growth.

Cloning and Protein Expression of LOXL1 in Cells

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Exfoliation glaucoma (XFG) is characterized by progressive accumulation of abnormal microfibrillar material throughout the anterior segment of the eye and various ocular tissues. XFG occurs in the context of exfoliation syndrome (XFS), which is characterized by microscopic flakes of protein-rich material being deposited in both ocular and non-ocular tissues. The risk of developing glaucoma in patients with XFS is increased with longer duration. Through the use of mass spectrometry, lysyl oxidase-like 1 (LOXL1) was identified as a component of the exfoliative material surgically isolated from XFG patients, and a complete understanding of the connection between the two is essential to the treatment of XFG.

Lysyl oxidases are copper-dependent amine oxidase responsible for the lysine-derived cross-links in collagen and elastin, modulating the essential step for the biogenesis of fibrillar extracellular matrix in most tissues. LOXL1 is a member of the lysyl oxidase gene family, and is particularly important in the renewal of elastic tissues. A study found that LOXL1 mice had significantly reduced levels of desmosine in various tissues, indicating that LOXL1 serves as the primary cross-linking enzyme for formation, maintenance, and remodeling of elastic fibers. We aimed to clone LOXL1 and study its protein expression in cells.

In order to make the LOXL1 expression construct, the DNA fragment that codes for LOXL1 and the vector that would hold the fragment for bacterial transformation had to be prepared separately. Through PCR amplification, the coding region of the DNA sample that contained the LOXL1 gene was amplified using specifically designed primers. Also using PCR, a V5 epitope tag and a His tag were engineered onto the DNA. The V5 tag serves for identification purposes, such as western blots, or immunocytochemistry, and the His tag is used for purification by affinity chromatography. Next, an analytical gel was run to verify the size of the DNA fragment.

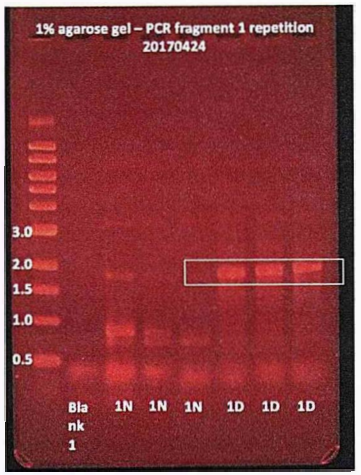

Figure 1: Analytical gel on 1% agarose to verify size of PCR DNA fragment

A large amount of the PCR sample was run on a prep gel to separate the desired fragment from the rest of the DNA sample. The gel was placed on UV light, and the fragment was cut out from the gel and purified using a gel purification kit. Finally, restriction enzyme digestion was done using the enzymes Nhel and BamHI to make the ends of the DNA fragment "sticky" for the ligation to the vector.

The vector used in this experiment is pcDNA5FRT. This vector notably contains an ampicillin resistance gene.

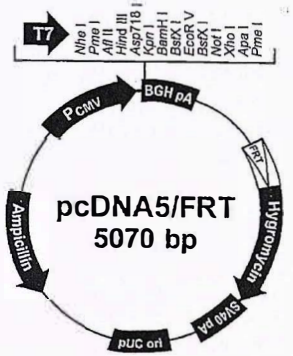

Figure 2: pcDNA5FRT vector diagram

Just as with the DNA fragment, restriction enzyme digestion was done using the enzymes Nhel and BamHI to make the ends of the vector "sticky" for the ligation to the fragment. In order to prevent self-ligation, the 5' end of the digested DNA required for ligation was dephosphorylated using ClP (Calf Intestinal Alkaline Phosphatase).

The DNA fragment and vector were ligated, and Escherichia coli cells were transformed with the ligation product. The bacterial cells with the complete LOXL1 construct successfully grew on the petri dishes containing ampicillin.

The plasmid DNA containing the LOXL1 gene was isolated from a large culture obtained from a single bacterial colony and Chinese Hamster Ovary (CHO) cells were transfected with it to express LOXL1. Immunocytochemistry was used to show that we had successfully made LOXL1.

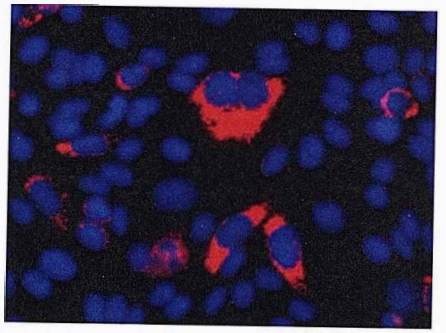

Figure 3: LOXL1 (red) expressed in CHO cells

How Nonimmunological Factors Predict Allograft Survival and Function Up to Three Years Post Transplantation

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Improvements in transplant patient care and immunosuppressant drugs over the last decade resulted in major increases in one-year allograft survival. However, long term graft failure, Chronic Allograft Injury (CAI), remains a leading problem following renal transplantation. Combined, both immunological (sensitization, HLA incompatibility, and acute or chronic antibody mediated rejection) and nonimmunological factors (donor-related factors, ischemia/reperfusion injury, polyoma virus, calcineurin toxicity, infections and hypertension) contribute to CAI [1].

This study serves as a predictive analysis of nonimmunological factors for CAI. Identification of risk factors enables physicians and patients to make informed decisions when electing to use a specific donor kidney for transplantation, and for early intervention after transplantation [1].

This retrospective cohort study looked at graft survival and function in adult kidney transplant recipients. Pediatric transplants (recipients below age twenty-one) and dual kidney transplants were excluded from the study. All surgeries were performed at Montefiore Medical Center between 2009-2014.

Data collected for this study include: recipient age at transplantation, donor age, kidney donor profile index, percent glomerular sclerosis, final resistive index, arteries intimal fibrous narrowing, sex, race, locality of donor kidney, CDC high risk, donation after cardiac death (DCD), expanded-criteria donors (ECD), cold ischemic time (min), transplant type, previous transplantation, acute rejection, BK nephropathy, recurrent glomerulonephritis (rGN), noncompliance, recipient HCVAB, BKV viremia, CMV viremia, fungal infection, donor HCV, donor final creatinine, induction type, and annual recipient glomerular filtration rate (GFR) and creatinine levels up to three years following transplant. Electronic hospital records provided recipient related factors. Donor related factors were obtained through United Network of Organ Sharing (UNOS).

All statistical analyses will be performed using STATA version 11.2 (College Park, TX). Demographic and clinical data will be compared using the Mann-Whitney or Kruskal-Wallis test for continuous variables and the c2 or Fisher's exact test for categorical variables. A p-value of <0.05 was considered statistically significant. Survival analysis will be performed by Kaplan-Meier analysis with statistical difference calculated using the log-rank test. To obtain Kaplan-Meier death-censored survival estimates, survival time will be defined as the times between the date of transplantation and death (with a functioning graft), graft failure and the most recent follow up date. Graft failure is defined as return to dialysis after transplantation. Cox-proportional Hazards will be used to determine hazard ratios and tested using Martingale Residuals.

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Improving Efficacy of Gene Editing with CRISPR

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Background: Gene editing is a powerful new tool for curing genetic diseases. CRISPR, clustered regularly interspaced short palindromic repeats, is a gene editing system made up of a guide RNA and the Cas9 nuclease protein. Its goal is to cut out a mutated gene and replace it with healthy DNA. The guide RNA is about one hundred base pairs long; it is the twenty base pairs at the 5' end of the guide RNA that directs the cleaving Cas9 protein to a specific location on the genome. The guide RNA hybridizes to a gene by Watson-Creek base pairing near a known point mutation in the gene. The target twenty base pairs can be anywhere on the genome where there is an NGG sequence, the sequence necessary for CRISPR execution. The Cas9 protein makes a double strand break in the genome three base pairs away from the NGG sequence.

The cell then repairs the DNA in one of two ways, non homologues end joining (NHEJ) or homologous recombination (HR). In non homologous end joining, the cell repairs the break by inserting and deleting random nucleotides to re-form the gene. This is an effective gene knockout method. Homologous recombination involves the incorporation of new healthy DNA to replace the mutation. This is achieved by administering healthy DNA to the cell simultaneous to insertion of the CRISPR system. It is the CRISPR and HR systems that will together heal genetic mutation.

The CRISPR system is not 100% effective at cutting the gene. Different guide RNAs can achieve different levels of efficacy, which can only be determined experimentally. Severe Combined Immunodeficiency is a genetic disease caused by two point mutations on the RAG2 gene on chromosome eleven. Five Guide RNA for the E480X mutation were tested to determine which guide was most effective at cutting out the mutation.

Method: Five guides surrounding the E480X mutation were designed. They were designed as oligos, and annealed using PCR into plasmids containing the genes for the Cas9 protein. These plasmids were inserted into bacteria using electroporation with a 4D Nucleofector System. The bacteria were grown for two days and the plasmids procreated inside. The plasmids were then extracted from the bacteria, purified, and sent for sequencing to ensure that they contained the designed twenty base pair guide. When their sequence was confirmed, the plasmids were electroplated into two different cell lines, K562 and Hek293 cells. The cells were grown for three days to allow for CRISPR activity. After that period, the cell's genomic DNA was extracted and then amplified using PCR. The amplified DNA was run on a gel to ensure that the correct gene was amplified. The PCR product is then purified and sequenced using Sanger sequencing. The sequence of the cell that underwent CRISPR was compared to a wild type genome using TIDE Analysis. TIDE analysis measures the frequency of insertions and deletions in the genome.

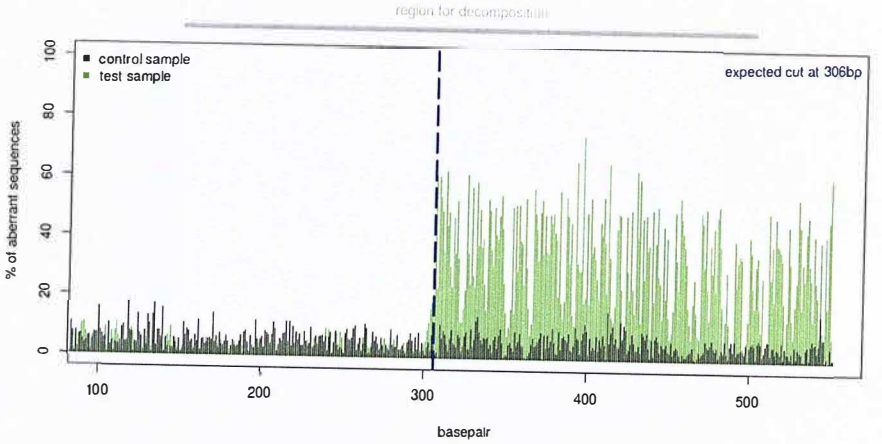

Figure 1: Guide 3 TIDE Analysis. The nucleotide sequence of guide 3 is in green; this is compared to the control sample in black. The blue line indicates the cut site of the CRISPR system. To the left of the line is the area of the gene unaffected by CRISPR; the green and the black are indistinguishable. To the right of the line is the gene after it has been cut with CRISPR. The green is very different from the black, indicating high frequency of insertions and deletions; this illustrates Guide 3's effectiveness.

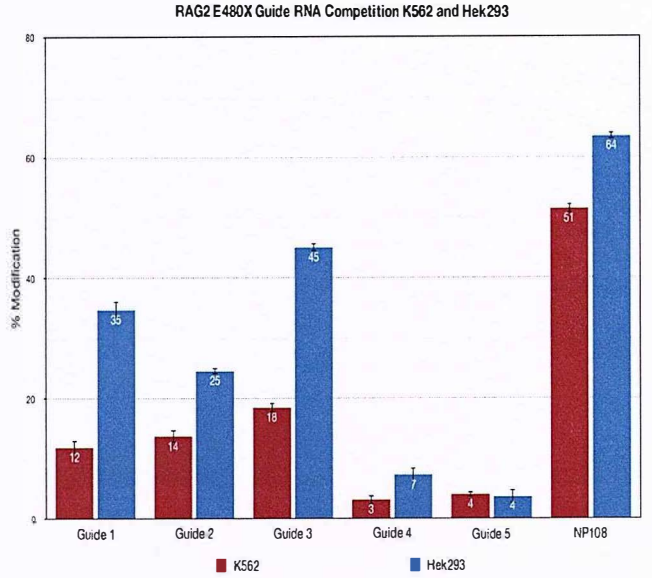

Figure 2: Percent Modification achieved by each of the 5 tested guides plus the NP108 positive control. Guide 3 was the most effective at cutting the genome in both Hek293 and K562 cell lines.

Results: Guide 3 was the most effective at cutting out the E480X mutation on the RAG2 gene. This is seen in Figure 1 and 2. Guide 3 will be used in future experiments to administer CRISPR along with a healthy gene in order to achieve homologues recombination and ultimately correct the E480X mutation.

skn-1, *src-1*, *src-2* Knockout in *C. Elegans* Alter Susceptibility to MeHg Toxicity

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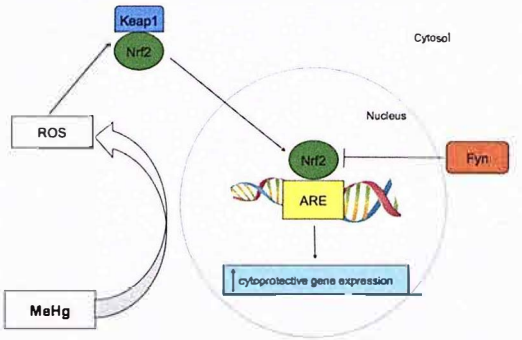
Methylmercury (MeHg) is a highly toxic organometal found in the environment. Humans are exposed to MeHg through consumption of contaminated fish and plants, as well as through occupational exposure and anthropogenic mercury emissions. It has been previously shown that MeHg causes an oxidative stress response in our cells. The transcription factor, nuclear factor erythroid 2-related factor 2 (Nrf2), acts to combat this oxidative stress by moving into the nucleus and promoting cytoprotective gene expression. When Nrf2 levels are high, Fyn and other Src family kinases move into the nucleus and phosphorylate Nrf2. This results in Nrf2 export out of the nucleus and a subsequent down regulation of the oxidative stress response.



The animal model *C. elegans* has homologs for these genes and has many conserved molecular pathways shared across species. In this study, we examined strains that had mutations for *skn-1* (Nrf2 homolog), *src-1* (Src homolog), and *src-2* (Fyn homolog). We hypothesized that without *src-1* or *src-2* present, there will be persistent *skn-1* activity, leading to greater protection against MeHg toxicity. To establish relevant dose exposure for our strains, we performed a lethality assay. We exposed L1 stage worms to doses of MeHg ranging from 0 - 100 µM and treated for one hour. After treatment, 20-30 worms were plated in triplicate and the percent of worms alive 48 hours later was recorded. After establishing LD_{50} values for each strain (wildtype: 46.61µM, *skn-1* KO: 39µM, *src-2* KO: 45.23µM, *src-1* KO: 35.68µM), we chose 20µM as the sublethal dosage for subsequent experiments. We performed qPCR assays to examine gene expression levels comparing MeHg treated and untreated worms. This assay was used to

investigate how src family kinases differ between strains and how the cytoprotective genes differ due to treatment and genetic background. We were specifically interested in *gst-4*, *sod-1*, *src-1*, and *src*-2 (*gst-4* and *sod-1* are cytoprotective *skn-1* target genes, while *src-1* and *src-2* are src family kinases). Our results from the qPCR thus far have been inconclusive. Perhaps the dose level is too low and/or the time point is too far from the time of treatment. Additional replicates are needed for this assay. Our results from the lethality assay were consistent with previous research showcasing that knockout of *skn-1* led to increased susceptibility against MeHg toxicity when compared to wildtype. Contrary to our hypothesis, knockout of *src-2* was comparable to wildtype and knockout of *src-1* led to increased susceptibility to MeHg. It is conceivable that knockout of *src-1* or *src-2* led to compensatory upregulation of *src-2* or *src-1*, respectively. Because of the dramatic leftward shift of the *src-1* knockout and the comparability of the lethality curves of the *src-2* knockout to the wildtype, we speculate that *src-2*, the homolog to Fyn, is the stronger *src* family inhibitor of *skn-1*. Further replication of the qPCR, as well as other additional assays, are required to justify our speculation.

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