WOMEN

IN SCIENCE

Stern College
Stern College for Women

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WOMEN IN SCIENCE

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Yeshiva University
STERN COLLEGE FOR WOMEN

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YU Undergraduate Admissions for its dedication to Yeshiva University.

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Introductory Remarks

A STEM education at Stern College for Women (SCW) prepares students for varied careers in biomedicine, health, natural sciences, physical sciences, and behavioral sciences. The Departments of Biology, Chemistry/Biochemistry, Computer Science, Mathematical Sciences, Physics, Psychology and Speech Pathology/Audiology, each unique in its specific discipline, share a proactive approach in promoting the academic and social/emotional success of students at SCW and in helping our students achieve their career goals. Our students leave SCW prepared for their graduate programs in medicine, dentistry, osteopathy, optometry, veterinary science, psychology, physical therapy, occupational therapy, physician assistant, nursing, genetic counseling, pharmacy, nutrition, speech pathology, audiology, education, social work, and law; masters programs in biotechnology, bioethics, public health, engineering, architecture, and bioinformatics; and doctoral programs in the biomedical sciences, computational biology, chemistry, physics, computer science, mathematics, neuropsychology, clinical psychology, and school psychology. Students have pursued doctorates at some of the most prestigious institutions in the country, including The Rockefeller University, Tri-institute, Columbia, Cornell, to name a few and graduates have been employed at Google, Goldman Sachs, Facebook and Microsoft, among others. A science education at SCW is a stepping-stone to various careers and a cornerstone of our students' successes.

Our faculty directs students to stretch beyond the classroom experience by involvement in scientific research. Both during the academic year and the summer, students may work one-on-one with on-campus faculty. Beginning in the Summer of 2011, an ongoing collaboration between Bar Ilan University and Yeshiva University (YU) enabled SCW and Yeshiva College (YC) undergraduates to intern in research laboratories in Bar Ilan University and, thereby, to spend a summer in Israel. During the summer 2023, 7 SCW undergraduates participated in this summer

laboratory experience, now termed the YU/Bar Ilan Summer Research Program. Our science faculties actively encourage students to apply for competitive undergraduate research internships, locally, nationally, and internationally. An additional 21 SCW students were involved in research in a variety of laboratory facilities, including on-campus at SCW and Yeshiva College, and at Albert Einstein College of Medicine (AECOM), among others.

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

The mission of the Department of Computer Science is to prepare students for employment in various fields of computer science and/or to pursue advanced studies in computer science. In addition to covering fundamentals of Computer Science theory and practice, department courses help students maximize their portfolios of significant coding projects. The courses are structured to expose students to a variety of programming languages in a broad range of application areas. Students who complete this program are well versed in the disciplines of object-oriented design and

development, the architectures of software and hardware systems, the theory and practice of programming language technology, the construction and use of data structures and algorithms for the solution of large-scale computing problems, and the theory and application of database systems. There is a strong emphasis in the Department of Computer Sciences on preparation for challenging jobs in industry - our faculty and adjuncts come from positions of intensive industrial experience and leadership. Students are involved in Computer Science outside the classroom - through an active ACM-W chapter, by participating in regional and national hackathons, and by working in internships at well-known firms, such as Google, Facebook, Microsoft, Palantir, Goldman Sachs, and many others. Honors students in our program work with faculty on computational research projects, preparing them for graduate level work, and/or prime industrial positions.

The Department of Psychology offers an Honor's Research Seminar for upper-level psychology majors. As part of this seminar, students are involved in ongoing research projects, either at SCW or at off-campus sites, such as the Ferkauf Graduate School, NYU Medical Center, and Mount 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 neuroscience, 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 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 an Au.D. in audiology. Students obtain the required American Speech and Hearing Association (ASHA) clinical observation hours as part of their coursework. This allows them to experience actual therapeutic sessions and be prepared to become clinicians themselves. In addition to the academic curriculum, students have edited, managed and published 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. Also, some students have research and clinical opportunities in Israel. The Speech Pathology/Audiology Club hosted renowned professionals to address clinical experiences, research projects, and career issues. The Club also hosts educational events on inclusion to help the greater student community learn more about individuals who live with disabilities. Students also participate in the National Student Speech Language and Hearing Association (NSSLHA) as part of the YU chapter. One student is serving as the AuD Student State Office (SSO) for New York for the National Student Speech Language Hearing Association (National NSSLHA) for the 2023-24 school year.

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 Physical Therapy Club, the Psychology Club, the PreMed Club, the PreDent Club, the Nursing Club, the Optometry Club, the Occupational Therapy Club, the Pharmacology Club, the Genetics Club, the Nutrition Club, the Global Health Club, the Pre-Engineering Club, the Nutrition Club, the Public Health Club, the Bikur Cholim Club, *etc*., provide opportunities for students to gain skills in organizing events and in coordinating social functions.

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 peers 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 student presenters. Faculty members also use these meetings to inform students of upcoming internships and fellowship opportunities. The meetings have also featured guest speakers, such as Nobel laureate Dr. Harvey Alter, who played an integral role in the discovery of hepatitis C.

In the Spring semester, 2022, undergraduates at SCW and YC initiated a new publication, The Yeshiva University Journal of Medicine and Science. According to their mission statement, the journal was created "for the student body and faculty of Yeshiva University, as well as for the broader communities with which the university is associated and for the world at large." Articles can be found on the journal's website: yumeddentjournal.com.

Several avenues are available for students who have conducted research to present their findings at poster presentations. In the early Fall semester, the Departments of Biology and Chemistry/Biochemistry at SCW organize a poster competition in which SCW undergraduates compete in a poster presentation event. Standing by their posters, faculty, serving as judges, circulate and evaluate the presentations. The three presenters selected as

"winners" of the competition are provided funding to attend a national meeting of the American Chemical Society, at which they participate with hundreds of other collegiates presenting posters of their research. The summer is a popular time for on-campus research, both at SCW and at YC. Through funding provided by Provost Botman and Dean Bacon, on-campus student research flourishes in the summer, with sufficient interns to permit a poster presentation symposium representing undergraduates at SCW and YC and organized by Dr. Margarita Vigodner, SCW/Biology. In the Spring semester, 2023, Dr. Marian Gidea, Department of Mathematical Sciences, organized the first STEM EXPO event held on the YC campus. The event featured poster presentations by SCW and YC students, dinner, an alumni panel and a short STEM trivia game with prizes.

The Stern College Chemistry Club is a student affiliate chapter of the American Chemistry Society and is advised by Drs. Don Estes and Chaya Rapp. The club received a Certificate of Achievement Chapter Award for its 2021-2022 activities from the American Chemical Society. In addition to hosting an ice cream making event, the club members attended the College's STEM Expo, where some members presented and others listened to fellow students talking about their research activities. In addition, two students attended the national ACS meeting in Indianapolis and presented posters at the undergraduate research session.

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 27).

Post Graduation Opportunities:
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"). This award has been granted to over 150 graduates of SCW.

Students considering careers in the various allied health fields (for example, physician assistant, occupational therapy, and physical therapy) or in engineering may wish to consider the YU Pathways Program, designed to streamline their educational progression to graduate school, including the Katz School of Science and Health and the Ferkauf Graduate School of Psychology, among others or one of our several combined degree programs with other universities. Two Pathway Programs are offered: (a) the Dual Degree Program and (b) the Early Assurance Health Science Programs.

In the Dual Degree Program, in their junior or senior year, SCW undergraduates can begin taking graduate level courses which count both towards their bachelor's undergraduate and master's graduate degrees. The programs specifically relevant to STEM undergraduates include Artificial Intelligence, Biotechnology, Cybersecurity, Data Analytics, Math, Mental Health Counseling, and Physics.

The Early Assurance Health Science Programs gives SCW undergraduates in their junior year the opportunity to secure a spot in the graduate program of their choice. The graduate programs in the Katz School that are participating in the Assurance Program include Occupational Therapy (doctorate), Physician Assistant (M.S.) and Speech-Language Pathology (M.S.). Information on both Pathway Programs is on the web: https://www.yu.edu/pathways.

During the fall of 2010, Stern College signed an articulation agreement to implement a combined program with the NYU Rory Meyers College of Nursing. Students interested in this program pursue a shaped major that leads to the completion of the necessary prerequisites within five semesters for those who study for a year abroad in Israel (or seven semesters for those who come directly to SCW after high school). If they are accepted to the program, they receive a B.A. from SCW upon completion of their first semester at the NYU Rory Meyers College of Nursing. Once they have successfully completed the 15-month accelerated program at NYU, they are awarded a B.S.N. from their nursing school. This excellent new program has already admitted more than ten classes of SCW students and has been the basis of a productive and long-term partnership between SCW and the NYU Rory Meyers College of Nursing" (see "Combined Programs").

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 D.P.D. sequence requirements at NYU should the student continue in that program after completing her B.A. degree.

Pre-health Mentorship and Advisement:

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, together with Dr. Chaya Rapp, assist those students interested in careers in medicine, dentistry, optometry, veterinary medicine, and pharmacy. Mr. Jeffrey Mollin's focus is those students interested in careers in physical therapy, occupational therapy, physician assistant, nursing, and nutrition and Dr. Harvey Babich assists those interested in a career in genetic counseling.

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

Dr. Loewy organized several seminars in which guest speakers provided valuable insights into the various professions, as well as information on the admissions process to their graduate and professional programs. For several years SCW and YC Pre-med Clubs organized an annual Medical/Dental School Fair in which admission directors and officers from allopathic and osteopathic medical schools, as well as from American medical student programs in Israel, and Dental Schools and Pharmacy Schools attended. After two years of hiatus, due to the COVID pandemic we were able to reinitiate the 8th annual fair. This was the first time we held the event virtually. Schools chose a fifteen-minute presentation slot within the three-hour time frame of the Fair. During this time, schools were given the opportunity to present to students, as well as to answer students' questions. A moderator filtered the virtual chat for questions, as well as presented questions submitted in advance by students. The Fair was a great opportunity for the students to learn more about the various schools and learn about what unique attributes each school has to offer, as well as the details pertaining to the application process.

The following schools attended the fair this past year:

Philadelphia College of Osteopathic Medicine;
Upstate Medical University;
Touro College of Pharmacy;
American Medical Program-Sackler;
Temple University School of Podiatric

Medicine;
NYITCOM;
Ben Gurion University Medical School for International Health;
Zucker School of Medicine at Hofstra/Northwell;
Boston University Henry M Goldman School of Dental Medicine;
Touro College of Osteopathic Medicine;
Rutgers Robert Wood Johnson Medical School;
Touro College of Dental Medicine;
NYU College of Dentistry;
Rowan University School of Osteopathic Medicine.

The Fair has become an invaluable opportunity for our students to learn about pursuing a medical/dental education and career.

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

and to show students how the field's practitioners evaluate and address current societal issues using the science of psychology.

The Jewish Foundation for Education of Women (JFEW) Fellowship Program now marks its fourteenth year, with over 120 graduates of the program. The JFEW Program was inaugurated in the 2009-2010 academic year, with a select group of 10 participating science students. Each subsequent year, an additional cohort of students joined the program. The 2017-18 academic year marked the first in which the JFEW Program was expanded to support both science- and liberal arts-focused students. Highlights of the JFEW Program include a partial scholarship, stipends for summer research internships and professional conference attendance, one-on-one mentoring by a faculty member, and an enrichment program that provides workshops on academic and professional development. Since its inception, JFEW Fellows have obtained internships in a variety of fields, including psychology, cancer cell biology, veterinary medicine, neurobiology, healthcare, molecular biology, computer science, biochemistry, and sociology. JFEW fellows have interned in prestigious institutions, including the University of Chicago, Emory University, AECOM, The Rockefeller University, Johns Hopkins University, Harvard Medical School, Rutgers University, New York University, Yale University, Barrow Neurological Institute, Hadassah Hospital, Bar Ilan University, Weizmann Institute, Tel Aviv University, and in industry, Citromax. Several of the JFEW students have taken leadership roles in forming and/or leading the Neurobiology Club, the Genetics Club, the Optometry Club, and the Medical Ethics Society. Graduates of the program are currently pursuing careers in various science and health-related fields: medicine, dentistry, physical therapy, occupational therapy, nursing, public health, biomedical engineering, math education, food science, psychology, and veterinary medicine. The JFEW Program provides participants with, in addition to the above, a built-in network and support system of like-minded peers, graduates, and faculty.

Department of Biology

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

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

The Biology Department offers 3 tracks leading to a B.A. in Biology. Track #1 is the traditional course load for a B.A. in biology and requires completion of Principles of Biology I and II and 20 credits of advanced courses in Biology, of which four of the courses must be 4-credit lecture/laboratory courses. Also offered by the Biology Department are rigorous programs focusing on a "concentration in molecular and cellular biology" (track #2) and on a "concentration in neurobiology" (track #3). Upon completion of the appropriate track of study, either the phrase "concentration in cell and molecular biology" or the phrase "concentration in the neurosciences" is noted on the college transcript. Beginning in Spring semester, 2015, a Journal Club course was incorporated into the offerings in the Biology Department. Journal Club courses are taught by Stern alumni, usually 4th year medical students at Albert

Einstein College of Medicine (AECOM) or doctoral students in the Ph.D. program at Sue Golding Graduate Division of Biomedical Sciences, AECOM. The topics of the Journal Club course are varied and have included "Infectious Diseases and Vaccinations," "Preventive Medicine," Women's Health: Epidemiology Studies," "Oncology," "Immunology and Disease," and "Biomechanics." For the Fall semester, 2023 the topic is "Preventive Health."

Dr. Brenda Loewy, a faculty member of the Biology Department and the recipient of the 2008, Dean Karen Bacon Award for a Senior Faculty Member, is the college's Pre-Health Advisor. Her directive is to guide students interested in medicine, dentistry, optometry, podiatry, and veterinary medicine through the application process. To accomplish these goals, Dr. Loewy organizes a series of wide-ranging seminars. The overwhelming number of students interested in medicine, dentistry, and optometry, necessitated the recruiting of Dr. Chaya Rapp, Department of Chemistry and Biochemistry, to join the **Office of Pre-Health Advisement**. An important addition to the pre-health advisement staff was the appointment of Mr. Jeffrey Mollin, a member of the Biology Department, to guide students with career goals in nursing, physical therapy, occupational therapy, physician assistant, and nutrition. Mr. Mollin was the recipient of the 2017 Dean Karen Bacon Award for a Senior Faculty Member and of the 2023 Silber Award for Professor of the Year. Dr. Harvey Babich guides those undergraduates interested in a career as a genetic counselor. Dr. Alyssa Schuck, recipient of the 2023 Senior Class Professor Award for General Studies, heads the **Jewish Foundation for Education of Women (JFEW) Science Fellowship** and guides students participating in this program.

Volume 27 of ***Derech HaTeva, a Journal of Torah and Science*****,** was published in the Spring semester, 2023. This issue included manuscripts authored by 13 undergraduates, as well as the article,

"The science behind some Mishnaic and Talmudic passages," pp 55-65. In the Spring semester, 2019, Dr. Babich was a recipient of the Senior Class Professor Award of graduating class of May, 2019 and of the Professor of the Year Award, May, 2022.

Rabbi Dr. Richard Weiss hosted several presentations on the topic of Jewish Bioethics. These presentations included: (a) "Embryo selection," Olami's Jewish Health Club/NYU, Hunter College, 11/8/2022; (b) "Ethical and halachic risks associated with harvesting organs," Young Israel/Talmud Torah of Flatbush, 12/3/2022; (c) "Infertility *halachic* approaches," Health Education for Students Society/SCW (HESS), 2/22/2023; and (d) "Ethical dilemmas in transplant medicine," Israel Bonds Metro NJ Health Professionals Division/Chabad of SE Morris County-Jewish Ethics Academy, 3/16/2023.

Rabbi Weiss, an M.D., is Director of the new Yeshiva University/Albert Einstein College of Medicine joint initiative, the Medicine Scholars Program (MSP). Initiated in 2021-2022 as part of the YU Honors Program, the MSP offers high school seniors across the United States early assurance to AECOM once they graduate from Yeshiva College or Stern College.

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

Dr. Vigodner strong research record is matched by her equally as significant funding from external sources. **Recently, Dr. Vigodner was the recipient of the NIH grant, R15**
"Sumoylation and its regulation in testicular Sertoli cells," 2023-2026; $450,000. Prior funding included the NIH, NICHD: Academic Research Enhancement Award 1R15HD067944-01A1; "Regulation of Spermatogenesis by sumoylation;" extended until 1/11/2015 as an NIH; NICHD Administrative Supplements to Recover Losses Due to Hurricane Sandy. Through support by the Mitrani Foundation, in the Summer, 2015, the Vigodner laboratory was fully renovated. In addition, the Mitrani Foundation provided a small grant to support student research. In June, 2019, the Biology Department was extremely proud to congratulate Professor Vigodner on receiving a 3-year R15 grant in the amount of $450,000 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development. The title of the research project is "Cell-type specific inactivation of sumoylation during mouse spermatogenesis." This grant was extended for 2022-2023 with a supplement received in July of 2022. Dr. Vigodner has also received a faculty research award from YU to support undergraduate students in 2021 and with Rana Khan in 2022. In the Fall semester, 2018, Dr. Vigodner was awarded the Doris and Ira Kukin Chair in Biology. In 2020, Dr. Vigodner authored the manuscript, "Identification of sumoylated targets in proliferating mouse spermatogonia and human testicular seminomas, *Asian J. Urol*., 22:569-577. T. Schwartz and R. Levy, SCW undergraduates, were listed as coauthors. In 2021, the Vigodner lab published "Sumoylation and its regulation in testicular Sertoli cells," coauthored by Sengupta, A., Nanda, M., Tariq, S.B., Kiesel, T., Perlmutter, K., and Vigodner, M., *Biochem. Biophys. Res. Commun*., 580:56-62. T. Kiesel and K. Perlmutter are SCW undergraduates. Dr. Vigodner was the recipient of the 2023–2024 in-house Chelst, Schreiber, and Zwas Book Grant, $1,500, towards student research.

Dr. Vigodner serves as NICHD *Ad Hoc* Reviewer since 2016, and a Reviewer for Nature protocols, Development, Human Reproduction, FASEB, Toxicology Letters, Andrology, Gene (ELS), Theriogenology Insight, and other journals. She serves as a Chair of the Membership Committee of the American Society of Andrology (ASA) since 2021 and is on the Board of Directors of the ASA. Dr. Vigodner presented the talk, "Inactivation of sumoylation in mouse germ cells," Developmental and Molecular Biology, AECOM, May 15, 2023.

Dr. Vigodner was a recipient of the 2023-2024 Faculty Research Fund award through the YU Office of the Provost.

Dr. Anya Alayev oversaw the NIH grant, 1R15CA220021-01: "Targeting estrogen related receptor alpha in triple negative breast cancer. At the 2021 AACR annual meeting, Dr. Alayev presented an abstract of her research, "Ras-Raf-MEK-ERK signaling pathway: A novel target of ERRα and tamoxifen in TNBC cells," coauthored with Dr. David Musheyev and the SCW undergraduates, Adi Ronen, and Miriam Lattin. Other publications include: (a) Musheyev, D, and Alayev, A., 2022, "Endocrine therapy resistance: What we know and future directions," *Explor. Target Antitumor Ther.* 3(4):480-496. and (b) Musheyev, D., Miller, E., Birnbaum, N., Miller, E., Erblich, S., Schuck, A., and Alayev, A., 2023, Inhibition of ERK signaling for treatment of ERRα positive TNBC. *PLoS One*, 18(5):e0283047. Miller, E., Birnbaum, N., and Miller, E. are SCW undergraduates. Dr. Alayev is on the advisory board for the Jewish Orthodox Women's Medical Association (JOWMA) and is the Chair of JOWMA's peer-review committee.

Dr. Alyssa Schuck's research interests involve the response of human oral cancer cells to nutraceuticals, with numerous students participating and developing skills in handling human cells in culture. Dr. Schuck was selected as the Senior Class Professor of the Year, 2013, 2014, 2016, 2018, 2022, and 2023 and received the Professor Recognition Award for General Studies in May, 2019. In 2016, Dr. Schuck received the Dean Karen Bacon Faculty Award. In the summer, 2022, Dr. Schuck developed and taught a novel 2-credit college course in biological laboratory techniques for students from Manhattan High School for Girls.

Dr. John Golin recently joined the Biology Department as adjunct faculty, teaching Human Genetics, a 3-credit course tailored to non-science students. The course has received rave reviews. Dr. Golin published the manuscript, "How fungal transporters mediate hyper-resistance through DNA amplification and mutation," coauthored with Banerjee, A., Rahman, H., Prasad, R., in *Molecular Microbiology* (2022), Doi.10:1111/mini.34947. Dr. More recently, he coauthored the research article, "Residues forming the gating regions of asymmetric multidrug transporter Pdr5 also play roles in conformational switching and protein folding, J. Biol.Chem., 298 (12):102689.

In the Fall semester, 2023, Dr. Amanda Katz introduced the course, Biology and Public Health, which, in conjunction with her other course, The Biology of Cancer, bolsters the course offerings for a minor in Public Health.

Drs. Vigodner, Alayev, and Schuck actively recruit SCW undergraduates to join their on-campus 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. The college has confidence in the continued excellence of its research faculty and has recently invested funds

for purchase of a camera for Dr. Vigodner's epifluorescence Nikon microscope, a Biorad gel documentation station, a flow cytometer, and a GloMax® navigator microplate luminometer. For the Alayev lab, the following items were purchased: an upright freezer, a sliding door refrigerator, an upright fridge/freezer, an Eppendorf 4°C benchtop centrifuge, and a Keyence microscope with fluorescence.

The Vigodner Lab: Meira Strauss (SCW student), Hanna Weisen (SCW student), Molly Nasiri (Great Neck North High School), Jacqueline Levy (SCW student), Dr. Amitabha Sengupta (research associate), and Dr. Margarita Vigodner.

The well-functioning of the teaching laboratories in Biology is due to the excellent support staff. Devorah Chasen (Laboratory Technician), Tatyana Kievsky (Laboratory Specialist), and Avishai Samouha (Laboratory Technician).

Department of Chemistry and Biochemistry

Anderson de Oliveira, Ph.D., Alan Burger, Ph.D., James Camara, Ph.D.; Ran Drori, Ph.D; Donald Estes, Ph.D.; Jianfeng Jiang, Ph.D.; Chaya Rapp, Ph.D.; Anshu Sharma, 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 offers two majors, Chemistry and Biochemistry.

Graduates of Chemistry and Biochemistry majors have gone on to medical, dental, optometry, and law schools, and careers in science education. Several have entered prestigious Ph.D. programs in the biomedical sciences, at the Tri-institutional Weil Cornell/Rockefeller/Sloan Kettering program, Sloan Kettering graduate program, and the Sue Golding graduate division of the Albert Einstein College of Medicine (AECOM).

The courses in our department are continuously being updated to keep pace with current scientific discovery and new technology. The general chemistry lab was recently revised and is now a one semester, 2 credit course (CHEM 1047L) including pre-lab videos and formal lab reports giving students experience in scientific writing. A course called Biochemistry and Molecular Biology was added to the Biochemistry major to provide students with a more focused and thorough background in Biochemistry. Finally, a new research-based course, Biophysics, was added to departmental offerings for our majors. Students learn principles of biophysics through lectures and research, with a focus on designing and conducting experiments, analyzing results, and presenting their work in oral and written presentations. Eight students are registered

in Biophysics in the fall semester and will work in the Drori and Oliveira labs.

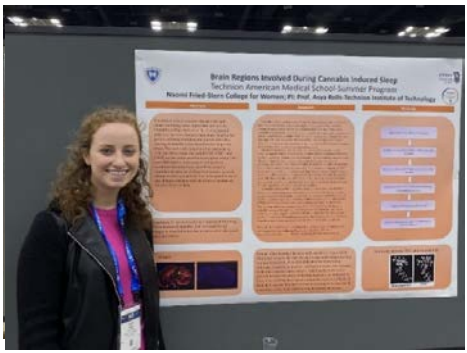
Courses in analytical chemistry and biochemistry incorporate experiments that are related to the instructors' research interests allowing content to be taught in the context of current, cutting edge, and biologically relevant research. State of the art instrumentation including a nuclear magnetic resonance 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 has recently added a Waters AutoPure preparative LC-MS system, complete with UV-VIS and ELS detectors, to its inventory. This system presents a significant hands-on opportunity for engaging students with modern analytical techniques, covering the isolation, identification, and quantitative analysis of a wide range of substances in complex matrices.

Video shooting in the Drori lab, August 2022.

The Drori laboratory's main focus is the study of ice-binding proteins (or antifreeze proteins), which aid a variety of organisms to survive in subfreezing temperatures. A unique combination of sensitive temperature control and a fluidic system allows for the cutting-edge capability to study the interaction of molecules with microscopic ice crystals. The lab has recently awarded a research grant from the USDA to develop ways to improve the quality of frozen food. A novel technique that combines thermal imaging and temperature control will provide a unique tool to study frozen food. A master's student

in the lab (Yitzhar Shalom) has graduated with an MA in Physics, and has participated in a video article (Journal of Visualized Experiments) to be published soon (see picture from the filming day in August 2022). Another student (Eliana Lebowitz) was involved in a book chapter titled "Investigating the interaction between ice-binding proteins and ice surfaces using microfluidic devices and cold stages" to be published later this year. Finally, a new postdoctoral researcher, Dr. Martin Zalazar, joined the Drori lab in September 2022.

A new faculty member, Anderson Garbuglio de Oliveira, has joined our department and has started setting up a research lab studying the fundamental understanding of bioluminescent systems' molecular mechanism and the direct application of the isolated luciferases and photoproteins as reporters in analytical detection systems, imaging, diagnostics and in preclinical trials of pathologies. Projects, in which students will be involved, will use genetic engineering to enhance the properties of new isolated luciferases and photoproteins, such as detection limits, thermostability, and modulation of spectral emission, creating more efficient luminescent proteins for a range of non-invasive studies and applications.



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 chapter of the American Chemistry society and is advised by Don Estes and Chaya Rapp. The club received a Certificate of Achievement Chapter Award for its 2021-2022 activities from the

American Chemical Society. In addition to hosting an ice cream making event, the club members attended the College's STEM Expo, where some members presented and others listened to their fellow students talking about and presenting their research activities. In addition, two student members, Naomi Fried and Leora Kronenberg, attended the national ACS meeting in Indianapolis and presented posters at the undergraduate research session. Below are Naomi and Leora with their posters at the spring ACS conference.

Department of Computer Science

Chair: Alan Broder, Clinical Professor

Joshua Waxman, Assistant Professor

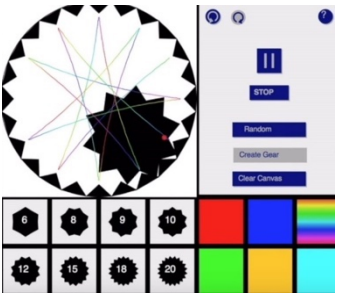
Ari Shamash, Adjunct Assistant Professor

Lawrence Teitelman, Clinical Assistant Professor

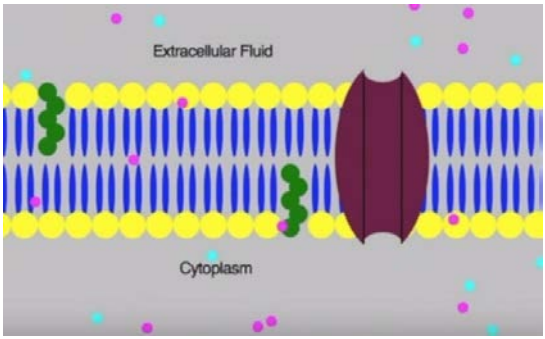
The Computer Science program at Stern College for Women stresses both the practical and theoretical aspects of computing, preparing students for employment in various fields of computer science and to pursue graduate studies. There is a strong emphasis in the department on preparation for challenging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

For highlights of a few notable semester capstone projects from our COMP 1300 – Introduction to Computer Science course see the screen shots below, and the videos linked at www.sterncs.net

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



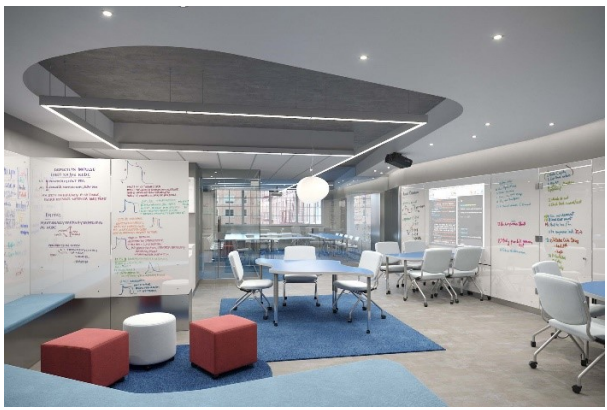
Spirograph Simulator
Tzirliya Plotkin



Simulation of Diffusion Across a Cell Membrane
Tova Narrowe

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

In 2018, the CS department was the recipient of major private and public grants to build a collaboration lab and technology classrooms for Computer Science students at the Beren campus. The new spaces, operational in the Fall of 2021, emulate similar collaboration spaces in top technology companies, including floor-to-ceiling writable and projectable glass walls, flexible furnishings, and large screen displays.


The new Mitrani collaboration lab – Fall 2021 (architect rendering)

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

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

Students in the department run a chapter of ACM-W, the international Association of Computing Machinery - Women's division. In the 2022 academic year, Stern ACM-W members ran a "tech Shabbat" bringing together CS students and Stern faculty for community building and tech-themed Torah learning. Stern students are key members of the operation of the city-wide Invent YU hackathon and have also been participants in other regional and national hackathons and coding competitions.

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

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

Department of Physics, Stern College for Women
Mark Edelman, Ph.D., Clinical Associate Professor
Emil Prodan, Ph.D., Professor

The Physics Department at Stern College for Women (SCW) aims at educating its students of education through research. All faculties pursue an active research agenda, being constantly invited to present their findings in conferences and workshops, and having their articles published in prestigious scientific journals. Their works have been highlighted on several occasions and awarded major research grants. The exposure to such cutting-edge science and the atmosphere of discovery both play a major role in the formation of our undergraduate students and their future career plans.

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

Below are the highlights of the research activities at Stern Physics Department (2022-2023):

Stern College Physics: Research

Summary of Research (2022-2023)

- 2 NSF grants + 1 ARO grant: US$ 1,011,229
- 13 peer-reviewed articles
- 21 invited talks + 5 contributions by undergraduate students
- 2 postdoctoral fellows
- 8 research undergraduate students
- 1 Kressel student

Dr. Mark Edelman

Publications

1. M. Edelman, Avigayil B. Helman, and Rasa Smidtaite, "Bifurcations and transition to chaos in generalized fractional maps of the orders $0 < \alpha < 1$", Chaos 33, 063123 (2023).
   - https://doi.org/10.1063/5.0151812
2. M. Edelman, "Stability of fixed points in generalized fractional maps of the orders $0 < \alpha < 1$", Nonlinear Dynamics, 111, 10247–10254 (2023). https://doi.org/10.1007/s11071-023-08359-0
3. M. Edelman, "Comments on A note on stability of fractional logistic maps, Appl. Math. Lett. 125 (2022) 107787", App. Math. Lett, 107892 (2022); https://doi.org/10.1016/j.aml.2021.107892.
4. M. Edelman and A. B. Helman, "Asymptotic cycles in fractional maps of arbitrary positive orders", Fract. Calc. Appl. Anal. (2022). https://doi.org/10.1007/s13540-021-00008-w
5. M. Edelman, "Cycles in Asymptotically Stable and Chaotic Fractional Maps", Nonlinear Dynamics, 104, 2829–2841 (2021); https://doi.org/10.1007/s11071-021-06379-2, 2021; arXiv:2010.12924.
6. M. Edelman, "Evolution of Systems with Power-Law Memory: Do We Have to Die? (Dedicated to the Memory of Valentin Afraimovich)" in C. H. Skiadas and C. Skiadas (eds.), *Demography of Population Health, Aging and Health Expenditures*, 65-85, Springer, August 23, 2020.

Invited talks

1. July 10-15, 2023; International Conference on Nonlinear Science and Complexity, Istanbul, Turkey, https://ntmsci.com/Conferences/ICNSC2023, Plenary talk "Stability, Periodic Points, and Bifurcations in Generalized Fractional Maps"; Co-Organizer of a symposium Discrete

Fractional Calculus and its Applications; Symposium talk: "History of the Development of the Notion of Generalized Fractional Maps".

2. May 30 - Jun 1, 2023, Workshop Trends in Hamiltonian systems, chaos and its applications Marseille, France, https://chats2023.sciencesconf.org/program, Invited talk "General properties of discrete fractional dynamics".
3. Mar. 8, 2023; Drakhlin's Seminar at Ariel University, Israel, Talk "Evolution, stability, bifurcations, and transition to chaos in nonlinear fractional maps". https://www.ariel.ac.il/wp/math/en/2023/03/08/evolution-stability-bifurcations-and-transition-to-chaos-in-nonlinear-fractional-maps/
4. Sep 26-29, 2022; Online Conference on Nonlinear Science and Complexity, Thessaloniki, Greece, https://nsc2022.physics.auth.gr/?page_id=231, Invited Talk "Regular and chaotic dynamics of discrete general fractional (with power-like memory) systems".
5. June 14-17, 2022, Co-Organizer of a special session Fractional Dynamics; "Asymptotically periodic points in arbitrary positive order fractional maps" (Invited talk). CHAOS 2022, Athens, Greece, http://www.cmsim.org/chaos2022.html.
6. July 24-26, 2021, ICVE 2021, 8th International Conference on Vibration Engineering
   Invited talk. "Asymptotically cyclic sinks of fractional maps" (Invited Talk).
7. May 25-25, 2021; International joint meeting on Recent Advances in Nonlinear Science Marseille, France (online) (https://nscct20.sciencesconf.org/program); Plenary talk "Cycles in integrable and chaotic fractional systems".
8. March 20-21 AMS Spring Eastern Sectional Meeting. Co-organizer and moderator of the Special Session on Fractional Calculus and Fractional Differential/Difference Equations. 50 min talk: "Chaos and asymptotically cyclic sinks in fractional maps". https://www.ams.org/meetings/sectional/2284_program_ss19.html#title

9. March 15–19, 2021, APS March Meeting, Session L14: Evolutionary and Ecological Dynamics; M. Edelman and R. Jacobi, Oral presentation "Power-Law Memory in Living Species and the Distribution of Lifespans".
10. Nov 23-25, 2020, The 1st Online Conference on Nonlinear Dynamics and Complexity (http://ndc.lhscientificpublishing.com/), Invited talk "Stability of discrete fractional systems and lifespan of living species".
11. Nov 22, Co-organizer of the on-line mini-symposium Discrete Fractional Dynamics and Its Applications (http://ndc.lhscientificpublishing.com/program/, Symposium 10), The introductory talk "Asymptotically cyclic sinks of fractional maps".
12. Jun 9-12, 2020; 13th CHAOS 2020 International Conference, Florence, Italy (online) (http://www.cmsim.org/committeesplenary2020.html), Plenary talk "Evolution of Systems with Power-Law Memory: Do We Have to Die?"

Editorial Boards

Fractional Calculus and Applied Analysis

Journal of Applied Nonlinear Dynamics.

Communications in Nonlinear Science and Numerical Simulations.

Fractal and Fractional

Students involved in research

1. Rachel Jacobi,
2. Jonathan Mamet,
3. Avigayil Helman,
4. Chaya Meltzer

Students' presentations

March 15–19, 2021, APS March Meeting, Session L14: Evolutionary and Ecological Dynamics; M. Edelman and R. Jacobi, Oral presentation "Power-Law Memory in Living Species and the Distribution of Lifespans".

Dr. Emil Prodan

External funding

External funding

Funder: Army Research Office (W911NF-23-1-0127)
Period: **5/2023-5/2026**
Title: **Topological Phases in Extreme Aperiodic and Correlated Regimes: A View from Noncommutative Geometry**

Amount: **$355,271**

Funder: National Science Foundation (CMMI-2131760)
Period: **10/2021-10/2024**
Title: **Collaborative Research: Topological Dynamics of Hyperbolic and Fractal Lattices**
Amount: **$277,958**

Funder: National Science Foundation (DMR-1823800)
Period: **08/2019-08/2024**
Title: **Topological Aperiodic Materials and Meta-Materials**
Amount: **$378,000**

Peer-reviewed articles

7. S. Wang, Z. Hu, Q. Wu, H. Chen, E. Prodan, R. Zhu, G. Huang, Smart patterning for topological pumping of elastic surface waves, to appear in Science Advances.
6. B. Leung, E. Prodan, Sources of quantized excitations via dichotomic topological cycles, Phys. Rev. B **107**, 165159 (2023).
5. E. Prodan, Cyclic cocycles and quantized pairings in materials science, Proceedings of Symposia in Pure Mathematics **105**, 397-433 (2023).
4. W. Cheng, A. Cerjan, S.-Y. Chen, E. Prodan, T. A. Loring, C. Prodan, Revealing Topology in Metals using Experimental Protocols Inspired by K-Theory, Nature Communications **14**, 3071 (2023).

3. V. Laude1, J. A. I. Martınez, N. Laforge, M. Kadic, E. Prodan, Glide-reflection symmetric phononic crystal interface: variation on a theme, Acta Mech. Sin. **39**, 723016 (2023).
2. Y. Liu, L. F. Santos, E. Prodan, Topological gaps in quasi-periodic spin chains: A numerical and K-theoretic analysis, Phys. Rev. B **105**, 035115 (2022).

*1. B. Mesland, E. Prodan, A groupoid approach to interacting fermions, Commun. Math. Phys. **394**, 143–213 (2022).*

Invited talks

9. 'Bulk-Defect Correspondence Principle via Groupoid and KK-Theoretic Methods,' a lecture for the conference Noncommutative Geometry Festival, Washington U. at St. Louis, June 2023.
8. 'Architected Materials by Groupoids Methods,' a lecture for the mini-workshop Applied Baum-Connes Conjecture, Penn State U., April 2023.
7. 'Disordered Crystals from First Principles', Colloquium for the Physics Department of Rutgers University, Feb 2023.
6. 'Metamaterials by Groupoid Methods and Kasparov's K-Theory', lecture for the Non-Commutative Geometry seminar, Mathematics Department, University of Colorado, Boulder, Nov. 2022.
5. 'Phason Engineering, Enrichment of Topological Phases and Topological Pumping of Metamaterials', lecture for the virtual international seminars ``Mechanics and Physics of Advanced Materials and Structures", Sept. 2022.
4. 'Spectral Engineering with K-Theory', lecture for the workshop Solid Math 2022, Trieste (Italy), Sept. 2022.
3. 'Applications of K-Theory in Materials Science', lecture for the virtual international seminars MetaMat.org, July 2022.
2. 'Spectral and Topological Engineering with Space Groups,' lecture for the 12th International Conference on Elastic, Electrical, Transport, and Optical Properties of Inhomogeneous Media, Besancon (France), July 2022.
1. 'Design strategies for topological metamaterials,' lecture for the 19th U.S. National Congress on Theoretical and Applied Mechanics, Austin, June 2022.

Editorial Work

- elected in the Editorial Board of Journal of Noncommutative Geometry
-editor of the Elsevier's "Encyclopedia of Mathematical Physics" for the section Condensed Matter & Statistical Physics.
- guest editor for the special issue "Noncommutative Geometry and Physics" hosted by Journal of Physics A: Mathematica and Theoretical.

Undergraduate Students supervised

Rivka Shapiro (Kressel)
Tamar Leisner
Atara Walkenfeld
Chana Werblowsky

Postdoctoral Scholars supervised

Fabian Lux
Tom Stoiber

Department of Mathematical Sciences

Faculty: Edward Belbruno, Ph.D.; Wenxiong Chen, Ph.D.; Michael Dalezman, Ph.D.; Marian Gidea, Ph.D. (Director of the Graduate Program); Miodrag Iovanov, Ph.D; Morton Lowengrub, Ph.D.; Antonella Marini, Ph.D. (Department Chair); Pablo Roldan, Ph.D.

Visiting Professor: Mina Teicher, PhD, Bar Ilan University.

Affiliate, Quantitative Finance: Yuri Katz, Ph.D.

Affiliates, Physics: Sergey Buldyrev, Ph.D.; Gabriel Cwillich, Ph.D.; Mark Edelman, Ph.D.; Emil Prodan, Ph.D; Fredy Zypman, Ph.D.

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

The Stern College Department of Mathematical Sciences is leading the way in Yeshiva University’s efforts to prepare its students for the marketplace of tomorrow. Our mathematics courses provide students with key knowledge in theoretical and applied mathematics and help them enhance their analytical abilities and heighten their creative potential. Students in the mathematics program have the opportunity to choose a concentration in Pre-Actuarial/Financial Mathematics. Advanced coursework is focused on modern mathematics, including differential equations, probability and statistics, mathematics of finance, time series, scientific computing, data analysis, network science, mathematical

biology, and chaos theory. In addition to coursework, students may participate in research projects focusing on specific areas of practice, or industrial applications, under the guidance of highly active research faculty or industry mentors. There is variety of enrichment activities organized at Stern College, including the math club "No Limits", Mathematical Colloquia, and citywide seminars in Dynamical Systems and/or Mathematical Physics, which include speakers from around the world.

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

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

- Prof. Belbruno is the recipient of Humboldt Research Award in 2017, awarded by the Alexander von Humboldt Stiftung/foundation of Germany for lifetime achievements. He designed space missions for NASA and other space agencies, and he created new mathematical models in cosmology, such as for the Big Bang and for black holes.
- Prof. Chen has made significant advances in the theory of nonlinear elliptic partial differential equations and geometric analysis, and some of his articles are among the most cited world-wide in recent scientific literature; he's a rold-wide expert ofn fractional Laplacians.
- Prof. Dalezman has done research in the theory of prime numbers.
- Prof. Gidea provided a solution to a long-standing open problem is mathematics, the *Arnold diffusion conjecture* and is the recipient of two substantial NSF

grants. His research expands also over the topics of dynamical systems, ergodic theory, statistical physics, and classical mechanics.

- Prof. Iovanov, recently hired in the role of Clinical Associate Professor, has developed recent research in the fields of differential operators of path algebras, combinatorial Hopf algebras, representation theory.
- Prof. Katz employs methods rooted in the physics of complex non-equilibrium systems to perform credit risk modeling.
- Prof. Lowengrub is one of the fathers of the WIYN Observatory (Arizona), and a former vice-president of the Association of Universities for Research in Astronomy (AURA). The asteroid 4045 Lowengrub is named after him.
- Prof. Marini discovered new boundary conditions for gauge-invariant partial differential equations describing the standard model of the universe; those are called “Marini conditions” in the scientific literature; she’s been applying her expertise to the *mass gap millennium problem*; her scientific interests include mathematical modeling and fluid dynamics. She’s currently a member of the AWM (American Women in Mathematics) Sadosky Prize committee.
- Prof. Prodan’s expertise at the intersection of topology, operator theory, physics, and engineering, obtained him a Keck Foundation research award for a collaborative project involving the engineering of new materials based on topological arguments. He published a monograph titled "Bulk and Boundary Invariants for Complex Topological Insulators: From K-Theory to Physics”. He’s been Interim Director of the Graduate Program in Mathematics for the academic year 2021-2022.
- Prof. Roldan developed a new mathematical theory to explain the existence of “Kirkwood gaps" in the Main Asteroid belt.

- Prof. Mina Teicher is an internationally renowned scientist, with a broad expertise in algebraic geometry, algebra, applied mathematics, and neuroscience. She is a faculty in the Department of Mathematics and in the Gonda Brain Research Center at Bar Ilan University (Tel Aviv), and the director of the Emmy Noether Institute for Mathematics. She is a VP of International Commission for Mathematical Instruction, a former VP for Research and Development at Bar-Ilan, a former Chief Scientist, and a former chair of USA-Israel Binational Science Foundation.
- Several members of our faculty have written textbooks and monographs in their fields.
- Our faculty members are often featured in the press for the relevance of their research within the scientific community and society en-large; they are active editors of important mathematical journals and they are active members of national mathematical award committees.
- Our faculty research has received funding from the National Science Foundations, National Aeronautics and Space Administration, National Institute of Health, National Cancer Institute, Simons Foundation, Sloan Foundation, Boeing Corporation, etc.
- Our faculty members are frequently invited to lecture at major conferences and workshops in the US as well as other countries in America, Europe, Asia, and Africa.

Department of Psychology

Faculty: Joshua Bacon, Ph.D.; Terry DiLorenzo, Ph.D. (Chair); Rachel Ebner, 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 many of the 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. Courses such as Cognitive Psychology, Learning, and Psychobiology are rooted in the tradition of research and easily fit into the Science framework. Many other courses such as Social Psychology, Developmental Psychology, Personality, and Abnormal Psychology are brought into the arena of science by faculty who are grounded in scientific methodology.

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, Mind, Language, Consciousness and Behavioral Neuroendocrinology. Students who are planning to apply to Ph.D. or Psy.D. programs in Psychology or to pursue careers in other health-related fields such as Physical, Occupational, or Speech Therapy, are encouraged to become

actively engaged in research. Students have gained invaluable experience outside the classroom by learning about the fundamental role of research in the theory and practice of psychology by working with faculty, such as with Dr Joshua Bacon in the M.S. Care Center at NYU. On campus, students have worked on research projects with Dr. Terry DiLorenzo focusing on health-related attitudes and behaviors. Students have also worked with faculty from Yeshiva University's Ferkauf Graduate School of Psychology. Many of these students have coauthored presentations at both national and international conferences.

Other research opportunities are available in a number of academic, hospital, and clinical settings outside the University. Students who conduct research in these settings may have a Stern College faculty member 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. Elizabeth Goldman received her Ph.D. in Developmental Psychology from the University of California, Santa Cruz (UCSC) under the mentorship of Dr. Su-hua Wang. While at UCSC, Elizabeth worked in the Infant and Child Development Lab, where she researched how parents help their young children make meaning out of their interactions with robotic toys. Dr. Goldman's research interests include children's Theory of Mind, children's interactions with robots, and children's understanding of living and non-living things. She completed her postdoctoral training under the guidance of Dr. Diane Poulin-Dubois at Concordia University's Cognitive and Language Development Lab. Her current line of research explores how children's perceptions of robots can be influenced by the robot's behavior and physical appearance. Dr. Goldman is also examining how young children learn from human and non-human agents (e.g., social robots, home assistants, AI). At Stern College for Women, Dr. Goldman runs the Children and Technology (CAT) Lab, which examines how children can learn from different technological devices. Most recently, she has published papers in *the Journal of Cognition and Development, Developmental Psychology, Behavioral and Brain Sciences, and Cognitive Development*. Her research has been funded by Canada's Horizon Postdoctoral

fellowship program, Google, the National Science Foundation (NSF), and the Social Sciences and Humanities Research Council of Canada. Dr. Goldman actively collaborates with colleagues at other universities and presents her scholarly work at research conferences. For more information about Elizabeth's work, please visit her website: https://eljgoldm.wixsite.com/my-site

Dr. Tim Valshtein received a B.A. in psychology from Temple University, an M.A. in psychology from Wake Forest University, a Ph.D. in psychology from New York University, and completed postdoctoral work as a College Fellow in the psychology department at Harvard University. His research lies at the intersection of self-regulation and close relationships and seeks to better understand a.) the process by which individuals pursue and form romantic relationships, and b.) how perturbations in these processes may undergird problematic relationship behaviors. Recent work includes modeling the process of disengagement from romantic courtship, developing a new measure of presumptuousness in the romantic context, and examining how long-distance couples navigated the COVID-19 pandemic. He is also broadly interested in pedagogical best practices, and advanced quantitative methods including issues in measurement, longitudinal data, survival analysis, case-control matching, and innovative ways to use data for justice-oriented research. Dr. Valshtein teaches courses in psychology spanning personality, social, forensic, research methods, statistics, motivation, and close relationships.

Department of Speech-Language Pathology/Audiology
Chair: Elyse R. Granik MS CCC-SLP

Heidi Fuld MS CCC-SLP

Melissa Kessler, M.S., CCC-SLP

Lindsay Markel MS CCC-SLP

Dani Weingarten MS CCC SLP

The mission of the Department of Speech-Language Pathology/Audiology (SPAU) is to prepare students for admission to advanced graduate programs in the fields of Speech-Language Pathology and Audiology. Through coursework and clinical observation, students acquire knowledge of the biology, physics, acoustics and anatomy and physiology of the speech and hearing mechanism as well as typical and atypical development of speech, language, hearing, and swallowing, and (re)habilitation of disorders thereof. Students become familiar with evaluation and therapeutic techniques as well as client counseling and rapport building with clients and families. Graduates of the SPAU Department are equipped with the foundational knowledge to continue with their graduate studies and become clinician-scientists who provide compassionate, evidence-based care to individuals of all ages with communication, hearing, and swallowing disorders and their families.

The SPAU course sequence begins with Survey to Communication Disorders and courses continue in a fixed progression building the cornerstones of the field in earlier courses to more advanced study. Coursework also meets the requirements set forth by the American Speech-Language Hearing Association (ASHA) for eligibility for admission to graduate programs. Students in the SPAU department benefit from expert instruction by professors who are also practicing clinicians, allowing for the infusion of case studies and real-life examples into their coursework.

Outside of the classroom, students have many opportunities to enhance their learning. The student-led SPAU Club brings a variety of speakers to campus, helps students prepare for graduate school admission, and organizes both social and philanthropic opportunities. SPAU students are also invited to join the YU chapter of the National Student Speech Language Hearing Association (NSSHLA) connecting them to students across the country studying communication sciences and disorders. The students also write, edit, and publish an annual Speech and Hearing Journal. Past articles have included topics such as autism, bilingual language learning, stuttering, hearing loss, and more.

We are proud of our students' success both inside and outside of the classroom. Several of our students have been awarded Ben Gurion University summer fellowships and have spent their summers in Israel working in speech, language, and hearing research labs. Our students have been accepted to many high-caliber graduate programs, often with academic scholarships including an ASHA student award. Our graduates have matriculated to both speech-language pathology master's programs and clinical doctorate programs in audiology at institutions such as: Yeshiva University, CUNY, Montclair and Long Island Audiology Consortiums, Columbia University, Queens College, Lehman College, Touro College, Brooklyn College, University of San Diego, Towson University, and others.

YESHIVA UNIVERSITY PATHWAYS PROGRAMS

SCW undergraduates may participate in Yeshiva University's Pathways Programs which offer SCW undergraduates a streamlined path to a graduate degree granted by the Katz School of Science and Health and the Ferkauf Graduate School of Psychology, among others. Two types of Pathway Programs are offered:

(a) **Dual Degree Programs** allow SCW undergraduates, in their junior or senior year, to begin taking graduate level courses that count towards their bachelor's undergraduate and master's graduate degrees. Dual degree programs are offered in several STEM disciplines, including Artificial Intelligence, Biotechnology, Cybersecurity, Data Analytics and Visualization, Mathematics, Mental Health Counseling, and Physics. Each program has its own specific prerequisites; For more information, visit the website: https://www.yu.edu/pathways.

(b) **Early Assurance Health Science Programs** provide SCW undergraduates in their junior year the opportunity to secure a spot in the graduate health science program of their choice at The Katz School of Science Health. Participating programs in Early Assurance include Occupational Therapy (doctorate), Physician Assistant Studies (M.S.) and Speech-Language Pathology (M.S.). Early applicants are encouraged to apply immediately upon completion of their junior (3rd) year of coursework (late May or early June) and must meet the minimum eligibility requirements. For more information, visit the website: https://www.yu.edu/pathways.

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. For more information, visit the website: https://www.yu.edu/external-partnerships

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

Yeshiva University offers a combined plan in engineering with Columbia University School of Engineering and Applied Science. Students interested in the Combined Program, must fulfill all the requirements for graduation, including completing a major, whether it be Pre-Engineering, Natural Sciences, or other, and must continue their studies in engineering at Columbia University.

The Pre-engineering major is open to students who can complete the major, general and **reduced** Jewish Studies requirements in 3 years - usually three years at SCW.

To be eligible to apply for admission to Columbia University through the Combined Program in Engineering, Pre-engineering majors must meet the SCW graduation requirements, other than the 128 credits, as well as all Columbia University requirements listed in the Columbia University Combined-Plan Guide (available at the Academic Advisement Center). Admission is to the two-year program at Columbia University. Columbia University will admit students based upon defined criteria, such as GPA in Columbia University-required courses, overall GPA, recommendations, *etc.* This past academic year, Columbia University admitted 2/2 SCW applicants.

If admitted to Columbia University, students should file a Maintenance of Matriculation Form at SCW. After successfully completing the two-year program at Columbia University, students file for a BA from YU, and a BS from Columbia University.

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 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 their first three years at SCW (two years for those studying in Israel for a year), students complete college requirements and the 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./D.P.T.

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, applicants accepted 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.

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 graduate degree in nutrition at NYU or another school of their choice.

Student accomplishments
Academic year, Fall, 2022 - Spring, 2023
Summer internships, 2023

Departments of Biology, Chemistry/Biochemistry, Computer Sciences, Mathematical Sciences, Physics, Psychology, and Speech-Language Pathology & Audiology

Biomedical/Medical (Ph.D./M.D.): 1 student
Rutgers University/New Jersey Medical School

Allopathic medicine ("med school"): 9 students
Albert Einstein College of Medicine (4); Harvard Medical School (1); SUNY Downstate (1);
Hackensack Meridian School of Medicine (1); Baylor University (1); Ohio State Univ. (1)

Osteopathic medicine: 2 students
Nova Southeastern University College of Osteopathic Medicine (1); Texas College of Osteopathic Medicine (1)

Dental School: 8 students
Columbia University (2); University of Pennsylvania (1); NYU (1); Touro College (4)

Optometry: 1 student
SUNY College of Optometry

Clinical psychology, Psy.D: 3 students
Ferkauf Graduate School of Psychology (1); LIU-Post (1); Illinois School of Professional Psychology (1)

School psychology, Ph.D.: 1 student
Fordham University

School psychology, Psy.D.: 2 students
Rutgers University

School and clinical psychology, Psy.D.: 1 student
Kean University

Audiology, Au.D.: 1 student
CUNY Consortium

Physical therapy, D.P.T.; 3 students
Hunter College (2); Touro (1)

Mechanical engineering, M.S.: 1 student
Rutgers University

Physician assistant, M.S.: 15 students
YU Katz School (6); Touro (3); Mercy College (5); Pace University (1)

Occupational therapy, M.S.: 4 students
Columbia University (2); Touro (1); SUNY Downstate (1)

Speech-language pathology, M.A./M.S.: 8 students
YU Katz School (4); Columbia University (1); Touro College Graduate School (2); McMaster University (Canada) (1)

Neuroscience and education, M.S.: 1 student
Columbia University

Biomedical science, M.S.: 1 student
NY Medical College

Social work, M.S.W: 15 students
Wurzweiler School of Social Work (14); Hunter College (1)

Computer science: placements in industry
Rachel Levy: teaching computer science at the Frisch School
Dahlia Schwartz: Google
Penina Waghalter: Amazon

Computer science: M.A.
Hannah Fischer: CUNY
Avigayil Roffe: New York University

Nursing, B.S.N. (all accelerated program): 22 students
NYU (joint program) (16); SUNY Downstate (2); Mount Sinai Phillips School of Nursing (3);
Mount Saint Mary (L.A.) (1)

Awards:
Tamar Leiser: REU Program "Computational Dynamics and Topology 2023"
Shaina Matveev: Kressel Research Scholars for 2023-2024: Dr. Vigodner's Lab, SCW
Taliah Soleymani: Two-year Postbaccalaureate Intramural Research Training Award (IRTA) Fellow. Experimental Therapeutics and Pathophysiology Branch (ETPB), National Institute of Mental Health (NIMH)

Graduate-level work in Mathematics:
Shai Rahamim: graduate level work in Advanced Calculus II

Summer 2023 internships: 45 students
YU Bar-Ilan University Summer Research Program (7);
AECOM Summer Undergraduate Research Program (3);
NYU Health Career Opportunity Program (8);
on-campus research -Vigodner lab (3), Olivera lab (4);
University of Pittsburgh (1);
ICORE program, Icahn School of Medicine at Mt. Sinai (1);
Weill-Cornell (2);
Summer Institute of Biostatistics and Data Science, Columbia University's Mailman School of Public Health (1);

Child Mind Institute (1);
Trinitas Regional Medical Center - Collegiate Medical Mentorship Program (1);
Boston University Hospital (1);
Pfizer (1);
Centricity Research Laboratory (Montreal) (1);
Hadassah Medical Center (1);
Hebrew University (1);
Misc. (9)

Publications (Names of undergraduate are in **bold** type**)**

Musheyev, D., **Miller, E., Birnbaum, N., Miller, E.,** Erblich, S., Schuck, A., and Alayev, A., 2023, Inhibition of ERK signaling for treatment of ERRα positive TNBC, Plos One 3:480-496.

Soleymani, T., Chen, T.-Y., Gonzalez-Kozlova, E., and Dogra, N., 2023, The human neurosecretome: extracellular vesicles and particles (EVPs) of the brain for intercellular communication, therapy, and liquid-biopsy applications, Front Mol Biosci May 17, 10:1156821, eCollection.

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Abstracts/presentations (Names of undergraduate are in bold type)

Miller, A., Aafjes-van Doorn, K., and Spina, D., 2023, Coping strategies in psychoanalytic treatments. Poster presented at the Society for Psychotherapy Integration, June.

Fried, **N.** and A. Rolls, 2023, Brain Regions Involved During Cannabis Induced Sleep, 265th American Chemical Society Meeting, Indianapolis, IN, March.

Kronenberg, **L**., Harris, P., and Lerner, E., 2023, Producing the Doubly-labeled α-synuclein of Yesteryear: A Pathway to Differentiating the Dynamics of Intrinsically Disordered Proteins", 265th American Chemical Society Meeting, Indianapolis, IN, March.

Student Publications and Presentations

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

Musheyev, D., **Miller, E., Birnbaum, N., Miller, E.,** Erblich, S., Schuck, A., and Alayev, A., 2023, Inhibition of ERK signaling for treatment of ERRα positive TNBC, PlosOne (in press).

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

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

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

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

Levy, L., Chernichovski, T., and Schwartz, I., 2017, Male sex hormones regulate human endothelial nitric oxide synthase system through the modulation of cationic amino acid transporter-

1, 253rd National Meeting of the American Chemical Society, SanFrancisco,CA, April.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Bonner, C., and DiLorenzo, T., 2013, A review of the literature on cognitive-behavioral therapy for anxiety and depression in school

settings. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

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

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

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

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

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

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

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

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

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

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

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

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

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

Snow, S. and Rapp, C., 2013, Role of tyrosine *o*-sulfation in the CXCR4-SDF-1chemokine 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 ResearchConference.

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, Inte*r*actions 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

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

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

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

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

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

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

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

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

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

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

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

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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

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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.

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Pease, D.M., Frenkel, A.I., Shanthakumar, P., Huang, T., Balasubramanian, M., Budnick, J.I., Brewe, D., **Abitbol**, **N.**, and O. Odom, 2006, Performance and improved design of the log spiral of revolution monochromator, XAFS13 Conference, Stanford, CA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Student Presentations at the National Conference of Undergraduate Research

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

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The Anne Scheiber Fellowship Program provides scholarship support to Stern College undergraduates, as well as graduates pursuing 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:

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ABSTRACT BOOKLET 2023-2024

Calcium-Regulated Photoproteins as Novel Probes for Cancer Biomarker Detection

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Bioluminescence, the emission of cold light by living organisms, has been widely employed in examining fundamental biological processes and for bioanalytical purposes. Bioluminescent reactions involve the oxidation of specific substrates, known as luciferins, catalyzed by enzymes called luciferases, generating visible light. Some luminous systems may include a luciferin–luciferase complex that is more stable than its dissociated components, known as a photoprotein. Photoproteins bind to luciferin and oxygen before initializing the biochemical reaction and require the addition of a cofactor to produce light. Remarkably, over 30 different bioluminescent systems are known today, with roughly half incorporating photoproteins. These include types activated by superoxide, H_2O_2, ATP, and Ca^{2+}. For analytical applications, the photoproteins of the calcium-regulated type have been utilized in various biological studies in the last few years.

Most calcium-regulated photoproteins are single-chain globular proteins, approximately 22 kDa in size. They undergo conformational changes when exposed to Ca^{2+}, emitting a flash of light. Over the years, these photoproteins have not only been the subject of fundamental research but have also seen practical applications as sensitive reporters in various bioanalytical assays.

Although bioluminescence is commonplace, only a limited number of photoproteins have been isolated and characterized. Indeed, a vast array of unexplored bioluminescent systems exists where the purification and study of calcium-regulated photoproteins could open new possibilities in fundamental and applied research.

In recent years, efforts have been made to grow the repertoire of calcium-regulated photoproteins-based probes, enhancing their effectiveness as luminescent labels. Among the key goals one can include achieving higher stability in vivo and superior luminescent efficiency for an elevated signal-to-noise ratio.

In this study, we seek to determine the best conditions for the in vitro light emission of new calcium-responsive photoproteins that we recently extracted from bioluminescent marine invertebrates. The ideal Ca^{2+} concentration, temperature, and pH levels are key factors. Initial findings indicate an optimal Ca^{2+} concentration of 1mM and a pH of 8 to achieve the brightest light emission. Moving forward, we'll explore the impact of temperature and potential inhibitors like Mg^{2+}. We aim to harness these photoproteins as luminescent labels in cancer research, specifically for identifying cytokeratin proteins—a biomarker in 30 distinct cancer types.

Quantification of Tumor Virulence Based Upon Competition Between Dissimilar Subcultured Cancer Cell Lines

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A direct quantitative metric that represents the intrinsic virulent properties of a particular tumor is absent. The development of such a numeric modifier would balance the disproportionate weight of qualitative elements that presently monopolize the nomenclature of cancer. To address this shortcoming, an in vitro model was developed to study the competitive nature of dissimilar cancer cell lines. A prospective series of surgically excised and pathologically confirmed malignant tumors were separated from their adherent state and subcultured according to international standards. After a total of 7 different tumor cell lines were established, each cell line was paired with a dissimilar cancer cell line, and by using all possible combinations, a total of 21 unique tumor pairs were assessed over 7 days after plating on diametrically opposed sections of gridded Petri dishes containing enriched growth medium. Each dish was then examined for changes in tumor cell position on the grid, and a scoring system was established that awarded points for aggressive behaviors. Ovarian cancer, lymphoma, and lung cancers demonstrated overall dominance, with wins in at least 2/3 of their matches. Breast and kidney cancers were intermediate in performance, and gastric and colon cancers were subordinate in the majority of their matches. This pilot experiment revealed that intercellular competition exists between previously untreated, subcultured, and dissimilar tumor cells in this in vitro assay. Moreover, such intercellular competition and the unilateral dominance of specific cancer tissue types have not been previously reported in the literature.

Studies on Calcium-Regulated Photoproteins for Immunoassays

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Bioluminescence refers to the natural light emitted by living organisms, produced through a biochemical process. The production of light is facilitated by proteins termed luciferases, which assist in the oxidation of luminogenic subtracts known as luciferins. Some bioluminescent systems employ photoproteins, which are stable complexes of luciferin and luciferase. The inclusion of a cofactor, often calcium, is necessary for these systems to generate light. Most Ca^{2+}-regulated photoproteins (CaPhs) are single-chain globular proteins weighing around 22 kDa. They are associated with the coelenterazine molecule, a common marine light-producing substrate, which attaches to an internal pocket of the protein. When calcium ions bind, they trigger structural changes in the photoprotein, forming an excited state of coelenteramide. As the excited coelenteramide returns to its stable form, it radiates a blue-green visible light.

In fact, CaPhs are some of the most sensitive tools to study Ca^{2+}-specific living processes for basic research and analytical purposes. Basic research and medical diagnostics rely on the ability to detect and quantify specific proteins in biological samples. Enzyme-linked immunosorbent assays (ELISAs) are the foundation for a multitude of diagnostic tests. Although ELISAs are widely utilized, they are subject to limitations such as reduced sensitivity and signal interference leading to high background noise. In our research, we introduce a new bioluminescence immunoassay to detect cytokeratin family proteins, established tumor markers, utilizing newly discovered CaPhs from ctenophore species as labeling agents.

The immunoassay presented in this study is a bioluminescence-based sandwich assay. It employs both a capture and a biotinylated

detection antibody to recognize cytokeratin analytes. This is paired with the streptavidin integrated CaPhs as a marker. The targeted analyte gets sandwiched between two primary antibodies. Each of these antibodies identifies a distinct epitope on the antigen. The antigen's detection can be either direct, using a labeled primary antibody, or indirect through a labeled secondary antibody. Through molecular biology techniques, we constructed streptavidin-CaPhs chimeras. The N terminus of CaPhs was fused to streptavidin via a molecular linker. Our preliminary results show that these chimeras can respond to calcium within a range of 0.1 – 1mM, achieving highest light emission in pH 9.5. We also synthesized chimeras where CaPhs are linked to streptavidin through the C terminus. Notably, certain CaPhs are documented to lose their luminescent capabilities when their C-terminus is modified. Therefore, in our research, we evaluate the effects and constraints of various CaPhs-streptavidin fused chimeras.

Congenital Dyserythropoietic Anemia type 1: Unraveling the enigma of Codanin-1

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Congenital Dyserythropoietic Anemia type 1 is a rare autosomal recessive disorder with macrocytic anemia characterized by pathognomonic abnormalities. Initially found in a Bedouin tribe, the gene responsible for CDA type 1 was found and named Codanin-1. Following this major breakthrough, Professor Benny Motro found CDAN1gene to be lethal as a homozygous null type mutation through cell knockout experiments and that the gene is indispensable for mouse embryonic development even before erythrocyte formation through cell Knockout experiments. Additionally, the experiments demonstrated the widespread presence of Codanin-1 in different mouse cell lines. These findings opened a broader avenue for investigation that is not limited to CDA type 1 disease, but for the infinite biological processes Codanin-1 may be involved with. Focused research on Codanin-1 has suggested a possible relationship between the encoded protein and DNA damage repair system. This conserved protein also serves as a scaffold for C15Orf41 (a nuclease) and ASF1 (chaperone protein), which are involved in DNA damage control, which may reveal other crucial functions of the gene.[1]This research project aimed to elucidate the possible processes or behaviors of Codanin-1 by understanding its localization in the cell and its involvement in DNA damage repair.

To understand Codanin-1's role in DNA damage repair, HeLa cells were subjected to UV light in order to induce DNA damage and the gene was knocked-out using the CRISPR/Cas9 system. Furthermore, Codanin-1 stabilizes C15Orf41, thus Codanin-1 degradation results in C15Orf41 elimination as well. Subsequent to protein extraction, the Western blot experiment was performed to test if the absence of Codanin-1 had any effect on DNA damage response. Additionally, this experiment provided more proof of Codanin-1 and C15Orf41 codependences. The results are shown in figure 1 below.

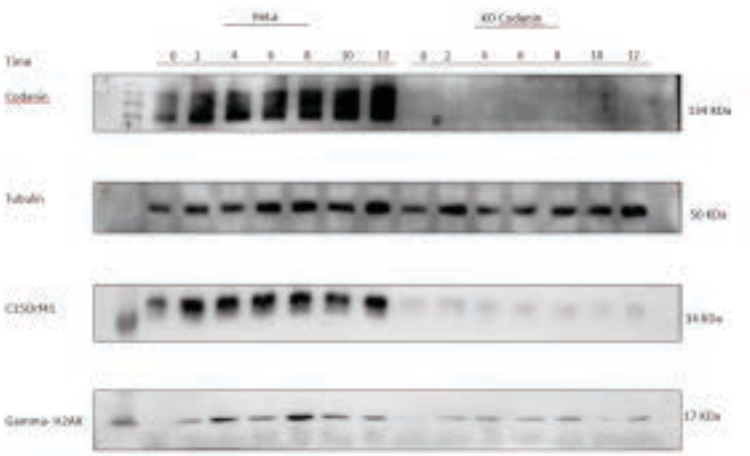

Figure 1. The influence of Codanin-1 degradation on DNA damage response following UV irradiation.

When Codanin-1 is not present in the nucleus as seen in the section titled “KO Codanin”, there is less DNA damage over time compared to untreated cells. Both Codanin-1 and C15Orf41 do not appear after the auxin signaling system was activated. Tubulin is used as a control and Gamma-H2AX is a DNA damage marker. Codanin-1's presence in the nucleus correlates with higher DNA damage, suggesting faster repair rates, which can more likely induce mutations and cellular apoptosis. In the absence of Codanin-1, DNA damage repair is slower, hinting at its regulatory role in this process.

After understanding that Codanin-1 degradation affects the DNA damage response system, investigating the localization of Codanin-1 and C15Orf41 subsequence to UV treatment seemed interesting. Furthermore, we wanted to test if the positive correlation between the two proteins is true for localization as well. To test the effects of UV on the location of the proteins, the immunofluorescence technique was used. After making the slides, two with UV treatment and the latter with no treatment, the results were visualized using a fluorescence microscope as seen in figure 2 below.

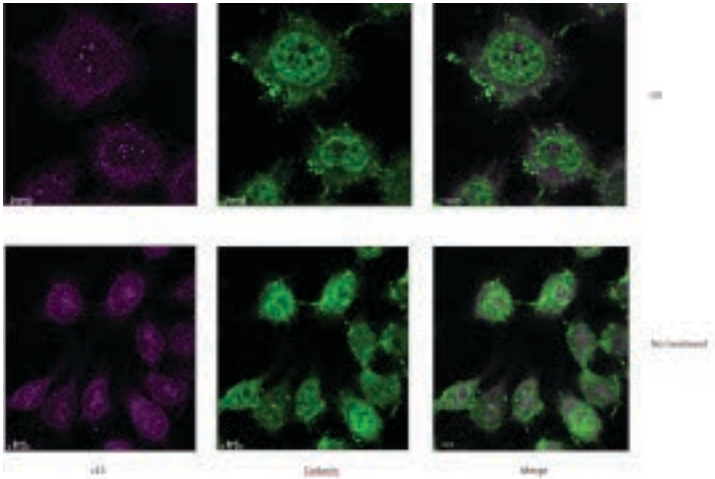

Figure 2. Transducing cells with C15Orf41 and Codanin-1 determining their location after exposure to UV light.

C15Orf41, in green, is primarily found in the nucleolus. After inducing DNA damage by exposure to UV light, C15Orf41 aggregates together, while the untreated cells seem to have the protein dispersed throughout the nucleus and the cell. Codanin-1 is located throughout the cells and exposure to UV does not cause a significant change in its location. It can be concluded that DNA damage affects the localization of C15Orf41 in the cell. Its aggregation in the center may suggest that it participates in DNA damage repair. However, since Codanin-1 does not seem affected, C15 and Codanin-1 may also have distinct functions.

Another investigation, currently in progress, explored the phenotypic effects of Codanin-1. Codanin-1 might play a crucial role in maintaining testes function, particularly in DNA Damage Response. Our interest stems from prior studies involving knockout mice suggesting that heterozygous Codanin-1 knockouts have smaller testes, further hinting at the gene's significance in testicular biology. To execute the experiment, the gene needs to be knocked out using the Cre-lox system. A PCR gel was run to find out which mice could be candidates. Mice homozygotes for Codanin-1-Floxed and carriers for AMH-cre recombinase will recognize the

loxP leading to elimination of Codanin in Sertoli cells. It's evident

from Figure 3 that mice 574, 589, 590, 591, 592, and 593 are carriers of AMH-cre on the right and mouse 591 is the only one homozygous for CodF on the left.

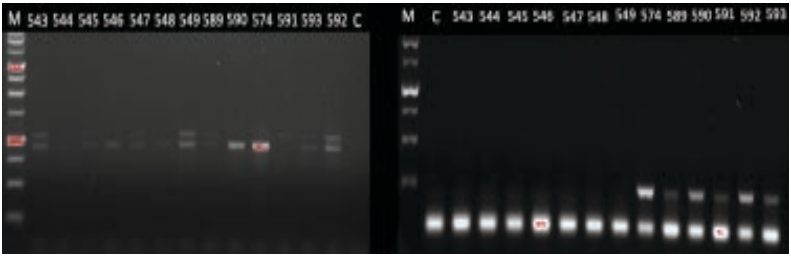

Figure 3. PCR genotyping of mice for AMH-Cre and for Codanin-floxed.

In conclusion, this research project brought us one step closer to unraveling the intricate functions of Codanin-1. These findings highlight Codanin-1's multifaceted nature, ranging from DNA damage repair to potential involvement in testicular biology. This research not only sheds light on the mechanisms underlying specific diseases but also opens up avenues for investigating broader biological processes where Codanin-1 may play a pivotal role. Further research and exploration are required to fully comprehend the complexities of Codanin-1 and its contributions to diverse physiological processes.

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Effect of JP4-039 and Tetryon analogs on Complex-I Deficient Cells Using a Seahorse Cell Mito Stress Test Assay

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Background: Complex I (CI) is the largest multimeric protein complex among the five mitochondrial oxidative phosphorylation complexes. Mutations causing structural perturbations can significantly impact patients, particularly in terms of neurodevelopment and survival. The most common manifestation of complex I deficiency is Leigh syndrome, characterized by progressive neurological abnormalities. The prognosis for patients with complex I deficiency varies widely, ranging from fatal neonatal disease to survival beyond three decades. Mitochondrial CI deficiency can also result from mutations in acyl-CoA dehydrogenase 9 (ACAD9), a flavoenzyme with dual function being a CI assembly factor in addition to its role in initiating the degradation of unsaturated long chain fatty acyl-CoA. Patients with ACAD9 mutations typically present with cardiac dysfunction, which can be life-threatening. While riboflavin supplementation has shown some clinical success in certain patients, it is not a long-term solution. The prognosis for individuals with ACAD9 mutations causing structural dysfunction is generally poor, with life expectancy limited to childhood. There are currently no known treatments or drug interventions that positively influence the course of CI deficiencies.

Methods: We investigated the potential protective effect of JP4-039

and its new generation derivatives Tetryon I, II, and III as reactive oxygen species (ROS) scavengers that target mitochondria, to improve respiration in fibroblasts from CI-deficient patients hence ATP production. To assess the adaptability of CI-deficient cells to an energy source shift from glucose to others including fatty acids, the fibroblasts were cultured in a glucose-free medium for 48 hours. We monitored the effects of JP4-039 and the Tetryon analogs on O_2 consumption rate using a Seahorse Bioanalyzer using the Cell Mito Stress Test kit.

Results: O_2 consumption rate was significantly impaired in CI-deficient cells compared to control cells. JP4-039 and Tetryon III were able to significantly increase basal respiration, maximum respiration, ATP production, and reserve spare capacity in the CI-deficient cells.

Discussion: The results indicate that JP4-039 and Tetryon III have the potential to alleviate mitochondrial dysfunction associated with CI-deficiency. These findings provide the impetus to further investigate the therapeutic potential of these molecules for the treatment of mitochondrial energy disorders.

Utilizing Single-Molecule Imaging to Investigate Hematopoiesis

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Hematopoiesis is a highly regulated process involving the differentiation and proliferation of hematopoietic stem cells into mature blood cells. Transcription factors GATA1 and GATA2 are essential to the regulation of HSC differentiation throughout the maturation process. Mutations in these transcription factors are associated with several hematological malignancies, including acute myeloid leukemia. GATA family transcription factors contain 2 conserved zinc finger domains that bind to DNA at regulatory sites to induce erythroid specific genes as HSPCs progress to mature red blood cells. GATA2 is highly expressed in early-stage multipotent HSPCs, driving their proliferation and maintenance. GATA1 is expressed in both precursor and mature erythroid cells and drives them toward terminally differentiated states. Therefore, GATA2 is thought to "prime" HSPCs at their early stages. As they mature, GATA1 is upregulated and competes with GATA2 binding sites, shutting off the expression of GATA2. This phenomenon is termed the "GATA switch". By combining the expertise of Dr. Robert Coleman in single molecule imaging and Dr. Ulrich Steidl in hematopoiesis research, TF behaviors during the erythroid differentiation process can be characterized. To define GATA factor dynamics and changes in transcription states during erythropoiesis, a fluorescent labeling system and single molecule imaging was utilized, along with Western Blots to measure protein levels as cells are pushed towards a differentiated state.

To determine how GATA1 affects GATA2 dynamics during the GATA switch, we engineered G1E cells containing cytosolic localized GATA1 fused to an ERT domain and GATA2 fused with a HaloTag. HaloTag ligand bound to a fluorescent, cell permeable dye was added to the cell to specifically label the GATA2-Halo protein. This fluorescent dye is 10x brighter than GFP and therefore

vital for detection of GATA2 protein at a single molecule level. Tamoxifen was used to induce maturation of G1E cells, as the addition of the drug causes GATA1-ERT to translocate from the cytosol to the nucleus. This allowed for the exploration of GATA2 binding kinetics on the genome at different timepoints of erythroid differentiation. Live-cell data provided by John Hobbs suggests that the chromatin residence time of GATA2 unexpectedly increased 2 hours post the addition of tamoxifen but decreased after 24 hours.

To visualize how GATA1 and GATA2 protein levels change during the GATA switch, we fractionated the proteins and performed western blotting, including nuclear/cytosolic protein extractions and soluble/chromatin bound protein extractions. Distinct GATA2 bands were visualized in nuclear extraction samples. On the other hand, neither GATA1 nor GATA2 were visible on the chromatin bound Western blot. This is consistent with our live cell imaging data showing that GATA2 dynamically binds chromatin for 6-20 seconds. To further understand TF expression during this process, single molecule imaging was used to simultaneously quantify RNA and GATA2 protein levels at a given time. These quantities were successfully generated for uninduced G1E cells. For future research, RNA and protein counts can be compared throughout the erythropoiesis to further define TF dynamics and their contribution to the cell differentiation process.

Lamp1 Non-Cell Autonomous Regulation of Endolysosomal Acidification

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Many neurodegenerative disorders have been linked to a disruption in the endolysosomal pathway. They are characterized by an accumulation of insoluble protein aggregates, caused by a disruption in proteostasis. Lysosomes have a major role in proteostasis due to their role in cellular catabolism and as signaling hubs that regulate nutritional signaling. A dysfunction in the lysosomal pathway causes a disruption in the breakdown of proteins within the cell, leading to an accumulation of protein aggregates. Protein aggregates can accumulate as a result of a change in the pH of the lysosome, adversely affecting the optimal function of acid hydrolases which serve to cleave and degrade proteins.

The Jenny lab focuses on the role of lysosome associated membrane protein *Lamp1* in the regulation of pH within the endolysosomal compartment. *Lamp1* deficient *Drosophila* larvae showed an increase in the number of acidic vesicles found in the cells of fat bodies, as indicated by lysotracker staining. The Jenny Lab has hypothesized that Lamp1 plays a role in the regulation of pH within the endolysosomal system. Additionally, preliminary mosaic analysis suggests a non-cell autonomous function of Lamp1. The mechanism of this non-cell autonomy is currently unknown. We hypothesize that Lamp1 mediates a non-cell autonomous communication regulating endolysosomal acidification between *Drosophila* fat bodies and other tissues such as the brain.

To analyze changes in the number of acidic vesicles based on genotype, we dissected 3rd instar larval fat body cells, stained them with lysotracker, and imaged them using the Apotome microscope. These images were then quantified using the SParQ plug-in in Fiji. Additionally, immunocytochemistry staining technique was performed to measure *Lamp1* expression in the brain and fat body cells of different genotypes.

Our results showed that there is a decrease in the number of acidic vesicles in fat body cells upon specifically rescuing *Lamp1* in the brain. Additionally, we did not detect *Lamp1* protein in the fat body cells of *Lamp1* brain rescue. Together, these data support that having *Lamp1* expression in the brain alone is sufficient to prevent the increase of acidic vesicles in the fat bodies. This suggests that there is non-cell autonomous communication between the fat bodies and brain mediated by *Lamp1*. Additionally, while analyzing lysotracker images and quantifications, we have seen that there is variation in the number of acidic vesicles found in the fat body cells of the *Lamp1* brain rescue. This suggests that there is a partial rescue of *Lamp1* in the fat bodies of the *Lamp1* brain rescue genotype. Further research is required to confirm non-cell autonomous communication between other tissues in the larva and fat bodies. This research will contribute to the overall understanding of the endolysosomal pathway and the biology of neurodegenerative diseases.

Stromal Microenvironment Modulation in Prostate Cancer Progression

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Prostate cancer stands as one of the most prevalent malignancies, primarily affecting the prostate gland with variable clinical outcomes (Pakula et al. 2023). Diverse manifestations of this disease range from slow-growing tumors necessitating minimal intervention to aggressive variants with rapid metastatic dissemination. Castration-resistant prostate cancer (CRPC), often emerging in advanced disease stages, poses a challenge due to its unfavorable prognosis and neuroendocrine differentiation of prostate cancer is a common resistance mechanism to therapy with anti-androgen drugs. The metastatic potential of prostate cancer is intricately linked to alterations within the tumor stroma, a complex of distinct cell populations whose precise contributions to disease progression remain enigmatic. Moreover, the impact of stromal microenvironment modifications in response to varying epithelial molecular subtypes of prostate cancer remains unresolved. This study delves into the stromal remodeling within prostate cancer by employing genetically modified mouse models (GEMMs), mimicking diverse stages of carcinogenesis.

In our lab, we had previously analyzed stromal cells from four distinct GEMMs of prostate cancer (T-ERG (Baena et al. 2013), NP (Floc'h et al. 2012; Ellwood-Yen et al. 2003), Hi-MYC (Ellwood-Yen et al. 2003) and PRN (Berger et al. 2019)) and wild-type counterparts, using a single cell RNA sequencing approach (Pakula et al. 2023). Thanks to this comprehensive study we identified 8 distinct stromal clusters with different transcriptional

and functional profiles, some in common with GEMMs and WT models, (c0-c2) and some clusters GEMM-specific (c3-c7). In particular, the clusters c3 and c4 were mostly represented in T-ERG, Hi-MYC and NP models and they expressed genes related to the WNT gene family. On the other hand, clusters c5-c7 were mostly associated with the NEPC mouse model PRN and characterized by high proliferation genes, collagen proteins and other signaling pathways. As my contribution for this project, I have performed the immunohistochemical characterization of 3 selected markers, WIF1 (for clusters c3-c4), AR and POSTN (for clusters c5-c7).

The multiplex IHC panel for androgen receptor (AR), periostin (POSTN), chromogranin A (CHGA), synaptophysin (SYP), and pancytokeratin (panCK) was chosen to highlight the c5-c7 cluster markers (AR and POSTN) on both adenocarcinoma and neuroendocrine components of the PRN GEMMs of prostate cancer and on a human cohort of prostate tumors. The mouse model and the human samples highlighted the inverse correlation of POSTN and AR in mouse and human stroma. AR was expressed in the stromal component of adenocarcinoma in mouse models and human tissues, while POSTN was downregulated in such areas. On the contrary, the expression of POSTN was present in the stroma of neuroendocrine tumors, both mouse models and humans.

In conclusion, our study highlights the important role of the stromal microenvironment in prostate cancer and emphasizes the valuable insights gained from immunohistochemistry. By combining genetically modified mouse models, advanced techniques, and IHC, we have gained a clearer picture of how different cells work together in cancer. This knowledge not only deepens our understanding of prostate cancer but also points us towards potential new ways to treat it by targeting specific interactions within the stromal microenvironment.

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Pathways to Disordered Protein Dynamics: Biomolecular-NMR Analysis of WIP

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Wiskott Aldrich syndrome protein (WASp) is a 502-residue polypeptide that is expressed in hematopoietic cells and is responsible for cytoskeleton rearrangement when activated. WASp has an activity regulator, the WASp interacting protein (WIP), which is a 503-residue polypeptide and a member of the verprolin family of actin binding proteins[1]. While WIP is most known for the phosphorylation-dependent process that prevents WASp's degradation, there are multiple proteins within the cell that WIP is likely to interact with (Figure 1). However, because WIP is an intrinsically disordered protein (IDP), the reaction processes that WIP carries out with each protein are difficult to track and characterize. The Chill laboratory aims to follow WIP behavior within its natural cellular habitat using nuclear magnetic resonance spectroscopy (NMR). This can be done by replacing an amino acid in WIP with a mutated version containing a fluorine nucleus and acquiring ^{19}F-NMR spectra. This ensures the NMR is detecting WIP only and nothing else within the cell. The laboratory aims at understanding the multiple reactions of the protein itself and establishing methods for in-vivo protein analysis to better understand the complex interactions of IDPs in general. For this to succeed, a protocol to prepare ^{19}F-containing mutant WIP must be generated.

DNA that corresponds to the active site of WIP that typically interacts with WASp (residues 440-503) was isolated. The DNA was mutated using standard oligonucleotide-directed mutagenesis to create a plasmid that would code for a fluorinated

phenylalanine instead of tyrosine at residue 455, valine at residue 469, or isoleucine at residue 501, respectively. The plasmid was transformed into DH5α E-Coli bacterial cells. A transformation was carried out in tandem with DNA that codes for modified tRNA that can interact with the fluorine-substituted phenylalanine (tfmF). The newly formed plasmids were isolated using a standard Miniprep kit and then co-transformed in BL21 *E. coli* cells. The cells were incubated and isopropyl β-D-1-thiogalactopyranoside (IPTG) was added to induce over-expression. The cells were then lysed by sonication and the mutant protein was isolated using a selectively binding nickel column. To analyze purity and concentration of the isolated protein, SDS-PAGE gels were run of the supernatant before (Figure 2) and after (Figure 3) nickel column filtration. Four samples of lysed cells were used, as well as a cell containing a WIP wild type (WT) and control samples, one without IPTG and one without tfmF. The gels clearly show that (i) expression of our desired protein is induced by IPTG, (ii) full-length expression is tfmF-dependent, since the mutated site is interpreted as a stop-codon without the fluorinated amino acid. Overall, these results prove that our efforts were successful and that ^{19}F-labeled WIP can be produced.

In preparation for mutant protein analysis, we also ordered a synthetic ^{19}F-labeled polypeptide (residues 440-503 of WIP, with residues 455 and 501 replaced by tfmF) and acquired its spectrum on the Bar Ilan 400 MHz NMR spectrometer (Figure 4). As can be seen on the spectra, sufficient signal from the two ^{19}F nuclei was obtained within a few minutes of measurement. Notably, the signal from both ^{19}Fcontaining amino acids is overlapping. This is likely due to both ^{19}F nuclei being in a similar chemical environment since the polypeptide is disordered and not folded. Upon interaction with cellular binding partners, we predict that the environments surrounding the ^{19}F nuclei would be different enough to exhibit different chemical shifts, allowing them to report on their interactions with other proteins.

With the successful growth and isolation of the fluorinated WIP mutant and the F19-NMR analysis of the synthetic version, the Chill Lab will attempt F19-NMR analysis on isolated WIP mutant, and then within a cell, to truly understand the dynamics and interactions of WIP and IDPs in general.

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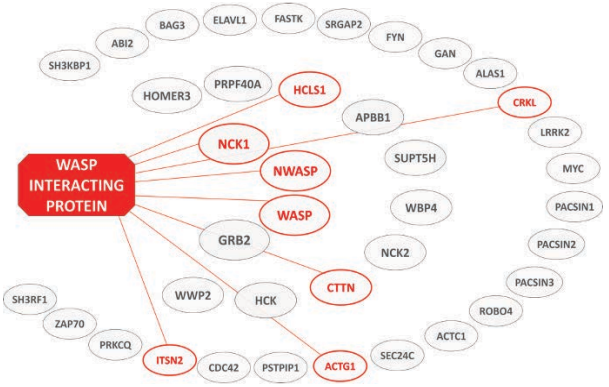
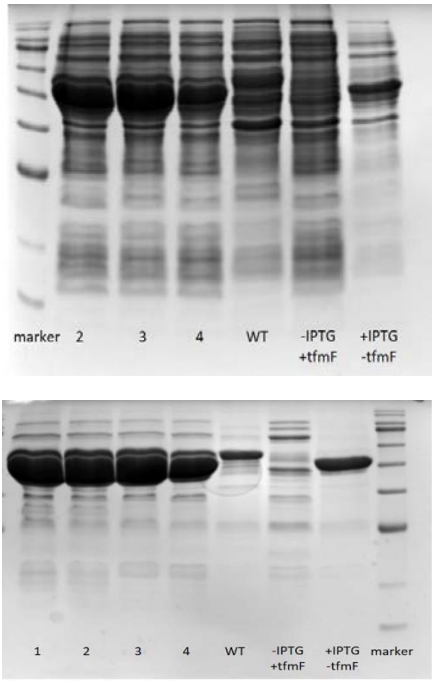


Figure 1. Interaction partners of WIP. The Human Integrated Protein-Protein Interaction rEference (HIPPIE) database indicates proteins with a good probability ($p \geq 0.5$) of interacting with WIP. Inner circle—$0.94 \leq p \leq 0.99$, middle circle—$0.68 \leq p \leq 0.86$, outer circle—$0.52 \leq p \leq 0.63$.[2]



Figures 2 and 3. Supernatant (top) and elution (bottom) SDS-Page gel

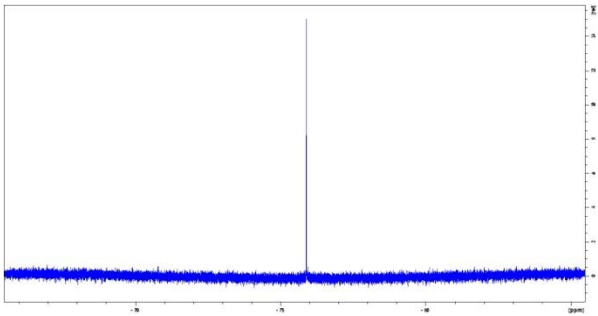


Figure 4. NMR Spectra of synthetic WIP

Response to poly polymerase inhibitors and platinum chemotherapy in BRCA positive lung cancer patients

By: Leeby Levine[1] Johnathan Arnon[2] and Aviad Zick[2]

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When treating breast and ovarian cancers, testing for the presence of a BRCA 1 or 2 gene mutation is routine, as a patient who tests positive for these mutations is more responsive to poly polymerase inhibitor treatment (PARPi) and platinum-based chemotherapy (platinum). For patients with non-small cell lung cancer (NSCLC), platinum is generally the first line of treatment, and PARPi has recently been considered as a possible alternative. However, no known markers predict responsiveness to either chemotherapeutic, and neither platinum nor PARPi demonstrates considerable efficacy in NSCLC patients. We observed that patients with the BRCA 1 or 2 mutation who develop NSCLC exhibit a positive response to these treatments. To test this observation, we analyzed our extensive patient database and matched individual NSCLC patients who tested positive for BRCA 1 or 2 with NSCLC patients who tested negative for these mutations. We paired the patients based on key characteristics. Our data demonstrate the success of PARPi and platinum treatments for NSCLC patients with BRCA 1 or 2 mutations, in contrast to such treatments for NSCLC patients with wildtype BRCA 1 and 2. We conclude that NSCLC patients should be screened for the BRCA 1 and 2 mutations to focus their treatment and increase their survival rates.

Multiplex Viral Detection via RT-LAMP in Small Volume Saliva Samples

By: Hannah L. Mamet[1], Jay Smallwood, PhD[2], Racheli Levy, RN[2], Roey Novick[2], and Steven B. Stein, PhD[2,3]

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Having recently emerged from the first major pandemic in over 100 years, one of the most serious difficulties society faced early-on was the inaccessibility to reliable and fast identification of infected and infectious individuals. Severe consequences included human cost, overwhelmed hospitals, economic loss, and closed schools. What did not emerge, however, was an affordable, highly specific, highly sensitive, reliable, and non-invasive test that rapidly identifies SARS-CoV2 from other pathogens. It is important to determine if an individual is infected with SARS-CoV2 or anything else. Rapid identification of the infectious agent can forestall outbreaks, hospitalization, and even death.

The Stein lab developed an approach and device that tests for the presence of nucleic acids from Covid-19, Respiratory Syncytial Virus (RSV), multiple influenza strain, Strep-A, and Coxsackie infections, all using a single saliva sample using loop-mediated isothermal amplification (LAMP). The device developed in the lab is affordable, intended to be used by ordinary individuals.

Current methods of Covid-19 testing include the Polymerase Chain Reaction (PCR) test and the rapid Antigen test (lateral flow assay). An Antigen test is a quick, easy, and affordable method with a high specificity; it is reliable in identifying SARS-CoV2 from any other pathogen. However, it lacks the high sensitivity of PCR; one must have significant (near infectious levels) of the infectious pathogen in order for the Antigen test to turn positive. This is especially problematic because a positive test indicates that a person is already or about to become infectious. A PCR test, on the other hand, detects as little as 1-10 copies per microliter of viral RNA. However, in addition to being less affordable, it can take up to 2-3 days until one receives PCR results. One might be positive by the time one receives his/her results or opt not to take a PCR test altogether. Thus, the advantage of a PCR test - its extremely high sensitivity - is lost when it takes so long to receive results.

PCR is an intense process that requires thermocycling in order to perform back-and-forth amplification of molecules to create linear copies of the virus nucleic acid template (Figure 1). The samples are placed in a thermocycler and the molecules are heated to denature them and then cooled to renature them. This process is expensive and time intensive. It requires a highly trained technical staff and expensive equipment; a thermocycler alone can cost up to $100,000.

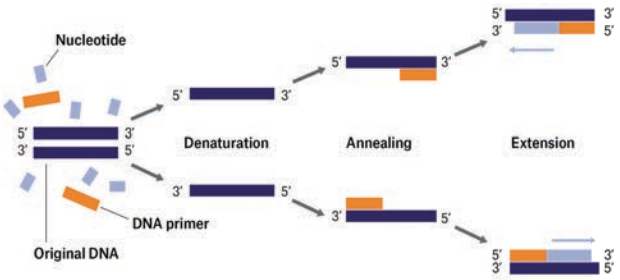

Figure 1. PCR: Polymerase Chain Reaction

Our lab's approach utilizes a highly sensitive and highly specific test that is still rapid and affordable. By using LAMP, a type of amplification that isothermally creates stem and loop structures which continuously replicate, concatemers are formed and the process continues to amplify without need for heat-based denaturation or renaturation (Figure 2). We are able to detect approximately 10-50 copies of viral RNA per microliter using this approach. This allows the identification of infected individuals 2-3 days in advance of their becoming infectious. Essentially, our approach, using LAMP, has the specificity, ease, affordability, and rapidness of an Antigen test, but the sensitivity of a PCR test. Further, our approach uses a non-invasive sample by using 2-10 microliters of a single saliva sample instead of a nasal or oral swab to identify viral nucleic acids in real time.

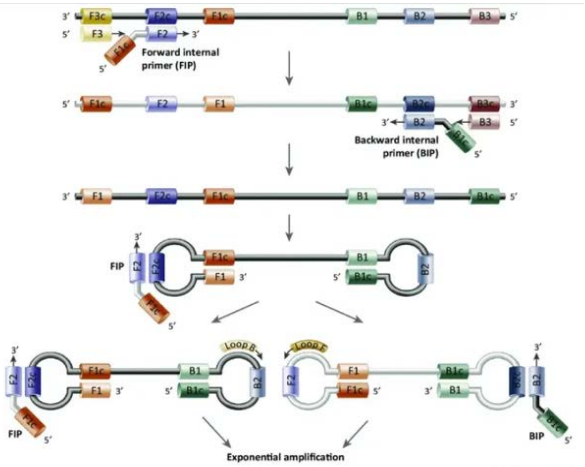

Figure 2. LAMP:Loop-mediated isothermal amplification

To demonstrate our specificity, a positive result is confirmed using orthogonal testing. Two different techniques were performed to yield the same results. The first technique used to observe a positive test result was a colorimetric reaction (Figure 3). All samples began as pink but through the use of a pH indicator in the sample, if it was positive, it would turn yellow. The yellow is a result of increased acidity during a dehydration synthesis when a H^+ ion detaches from the nucleotide during amplification with a pH based color indicator.

Figure 3. Colorimetric Reaction

To confirm a positive result, samples were often run on gel electrophoresis (Figure 4). A smear and banding pattern indicates amplification, which indicates the presence of viral nucleic acid template.

Figure 4. Gel electrophoresis

This approach does not require a highly trained technical staff or expensive equipment, like PCR, yet still is highly sensitive, highly specific, rapid, affordable, and reliable. Our non-invasive approach, using saliva, is highly accessible and leads to wide adoption. During the height of the pandemic, our lab screened more than 120,000 saliva samples using this approach. A device that can simultaneously test for a variety of respiratory pathogens affordably and reliably, can help prevent the spread of infection and ultimately, outbreaks.

Investigating RUNX2 and TIE2 Expression in Chemotherapy Resistance

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Lung cancer is the leading cause of cancer death worldwide, with lung adenocarcinoma (LUAD) comprising 40% of all lung cancers. The majority of lung cancer patients are treated with chemotherapy, the most common treatment of LUAD being cisplatin, a platinum-based chemotherapy drug. Due to epigenomic plasticity and heterogeneity within tumor cells, some cells may be predisposed to chemotherapy resistance. The dysregulation of transcription factors (TFs) plays an essential role in cancer initiation, progression, and metastasis. One such transcription factor, RUNX2, has been shown to be upregulated in post-chemotherapy gastric tumors and has been linked to cisplatin resistance in non-small cell lung cancer. RUNX2 has been implicated in late-stage lung cancer progression and metastasis. Another protein, membrane receptor TIE2 has been shown to be upregulated in gliomas upon treatment with ionizing radiation and to be associated with resistance to radiation therapy. TIE2 is generally localized to the cell membrane but in radioresistant cells, it migrated to the nucleus where phosphorylated histones to promote DNA repair after damage. Therefore, we hypothesize that both RUNX2 and TIE2 play important roles in inducing chemotherapy resistance by promoting cell survival during such treatment. To study the activity of RUNX2 and TIE2 in therapy

resistance, lung cancer cell lines exposed to long term cisplatin treatment (3-5 months) were used to check the expression of both genes at the mRNA and protein level using qPCR and Western Blot, respectively.

First, chemotherapy sensitivity in LUAD cell lines was determined using two cell lines, A549 and H1944, which were found to have relatively high sensitivity against cisplatin as compared to the other two cell lines, H23 and SW1573, which were found to be much less sensitive. After prolonged treatment with cisplatin, the chemotherapy sensitivity was found to decrease, and cells were considered to be therapy resistant. Next, qPCR was performed using LUAD cell lines to determine differential expression of RUNX2 and TIE2 in cisplatin treated cells. A549 and H1944 do not have endogenous expression of RUNX2 and experienced an increase of mRNA in resistant cell lines, whereas H23 and SW1573, which are positive for RUNX2, did not show much change in its expression. Western blot was performed to examine the expression of RUNX2 protein in cisplatin resistant cell lines. Unexpectedly, we did not observe any RUNX2 expression after cisplatin resistance in both A549 and H1944 cells, however H23 and SW1573 cells RUNX2 exhibited no change or decreased expression respectively. Regarding TIE2, the cell lines showed similar trends, with A549 and H1944 having increased in TIE2 mRNA level while no significant change was observed in H23 and SW1573.

To capture the upregulation of RUNX2 protein as indicated by the increase of mRNA in the qPCR results in A549 and H1944, subcellular protein fractionation was then performed on these cell lines. Western blots were then performed on the extracts and the protein localization was also determined. As a transcription factor, RUNX2 was primarily found in the nuclear soluble and chromatin bound portions of the cell. As expected, TIE2 was detected mainly in the cell membrane and smaller amounts of protein were observed in the nuclear compartments of the cell, indicating nuclear localization. Surprisingly, no significant difference was observed

between resistant and control cell lines, perhaps due to differences in their respective fractionations or due to errors in protein estimation leading to higher levels of protein in control than cisplatin-treated protein solutions.

Overall, we concluded that different LUAD cell lines have varied sensitivities to cisplatin treatment and that RUNX2 and TIE2 are upregulated in drug-resistant cell lines at the mRNA level. RUNX2 did not increase at the protein level in cisplatin treated cells, which should be verified due to its discrepancy with the qPCR results. Despite being an endothelial specific protein, TIE2 was expressed in LUAD cell lines and was seen in the nuclei of the cells. Future directions include validating the nuclear localization of TIE2 using immunofluorescence staining and creating a degron system to engineer the progressive loss of RUNX2 within a cell, in order to study its role in cancer progression. Over the course of the RUNX2 degradation, samples will be collected allowing for further research into the transcriptomic and proteomic changes effected by RUNX2.

I would like to thank Dr. Lindsay LaFave for leading and supporting me in this research. Thank you to all the members of the LaFave Lab for their help this summer, especially to Sakshi Goel and Fia Stratton for teaching and guiding me throughout this project.

Truncated SIRT6 and the Effects of Mutated CBS in Mice

By: Sivan Mussafi[1], Michelle Steiner[1], Noga Touitou[2], Prof. Haim Cohen[2]

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The science of aging and longevity has recently become a growing area of study. As old age becomes an increasingly prevalent cause of mortality, it has become more obvious that the metabolic processes and genomics that relate to aging are largely unknown. A genetically conserved family of proteins known as Sirtuins have been found to have a profound effect on metabolic regulation. SIRT6 is one of the seven proteins (SIRT1-SIRT7) in this family having recently been found to prevent metabolic effects of aging. An NAD+ dependent deacetylase specific for H3K9 (Histone 3, Lysine 9) and H3K56 (Histone 3, Lysine 56) and an ADP ribosyl transferase, SIRT6 regulates genome stability, DNA double strand break repair, telomere integrity as well as gene transcription through the use of the transcription factor Sp1. The overexpression of SIRT6 in B6 male and female mice both preserved glucose homeostasis and hepatic glucose output in their old age, repressed glycolysis, and activated pathways such as AMP kinase [1]. All of these effects helped maintain homeostasis in the mice as they aged by promoting normoglycemia. In the liver specifically, SIRT6 was found to repress glycolysis, triglyceride synthesis, and increase beta oxidation. Structurally, SIRT6 is composed of a core domain of 276 amino acids. The C terminal is mainly responsible for nuclear localizations where the N terminal is the primary site of the catalytic activity. While the overall location of catalytic activity in SIRT6 is known, little research has gone into pinpointing the Sp1 binding site of SIRT6 [2].

Gaseous H_2S has also been found to have a positive effect on health and aging by preventing hypertension and protecting against neurodegeneration associated with Huntington's disease, atherosclerosis, and type 1 diabetes [3]. A major product of the

transsulfuration (TSS) pathway, H_2S is generated by CBS and CGL, enzymes in the TSS pathway. This pathway is present in both humans and mice. It has been found in our lab that the mouse CBS protein is acetylated on lysine 386 (K386). Further research discovered that this acetylation regulates CBS's H_2S production activity. However, in the human CBS, this lysine residue is substituted with an arginine (R), which is traditionally used in molecular biology for the mimicking constant deacetylation. Thus, this region in CBS in humans resembles a constant state of deacetylation, where in mice this region is variable. Little is known about the effects of the differing residues in human and mice CBS, and consequently how the acetylation/deacetylation of CBS affects metabolic activity.

Our goal was twofold. Firstly, to determine the effects of acetylation on CBS activity, H3K9 acetylation, and CGL concentration; secondly, to successfully truncate SIRT6 in order to determine the location of the Sp1 binding site in the future.

In order to test the effects of acetylated CBS, mutant BQ (mice with a glutamine residue in place of lysine in CBS) mice were used in which the lysine residue at the 386 region, normally the variable region of acetylation, was modified. Instead of lysine, the mutant mice contained glutamine to mimic constant acetylation. The liver samples of 5 male and 5 female transgenic mice were extracted along with a corresponding number of wild type mice of each gender. The livers were homogenized and lysed. The samples were then standardized using Ponceau and a western blot was repeatedly used to visualize the protein levels of CBS, CGL, and acetylated H3K9 in each mouse. ImageJ was used to assess the relative concentrations of each sample, and T-tests were performed to determine the significance of the results.

In order to create the truncated SIRT6 along with the proper vectors, primers specific for the N-Terminal, C-Terminal, and core region of SIRT6 were used to create the proper inserts. A PCR was performed in order to truncate and amplify the regions of SIRT6. DNA cloning was performed in order to fuse a pcDNA vector with the SIRT6 segments, using restriction enzymes BamHI and EcoRI, creating a plasmid which can be used in the future to determine the

Sp1 binding site. The truncations were sequenced and analyzed using BLAST Sequencing in order to obtain the most viable sequences.

In order to determine the concentrations of the proteins analyzed in each western blot, the protein levels of each sample, obtained through assessing the image of each nitrocellulose membrane using ImageJ, was divided by the general protein levels indicated by the ponceau solution and obtained through imageJ. The results of the western blots for the various proteins are indicated in Figure 1 for males and Figure 2 for females. It is noteworthy that the western blot used to determine H3K9 acetylation in the male mice (Figure 1) did not yield results. The western blot was performed twice, in both instances the nitrocellulose membrane appeared randomly stained and splotchy. It is possible there may have been an issue with the antibodies themselves. The averages and standard deviations of each of these values were also calculated. T-tests were used to assess the significance of the results by comparing between each of the groups. However, no statistically significant results were obtained. These results indicate that the acetylation of CBS does not change its expression and stability, meaning that future phenotypes seen in those mice are a result of the mutation alone. These results indicated the effect of the Q mutant of CBS in mice. The next step of this research would be to engineer mice which possess an arginine (R) residue (similar to humans) in place of lysine, mimicking constant deacetylation, and to then compare the physiological and molecular differences between the two mutants (Q and R).

In our second project, the cloning of the truncated forms of the human SIRT6 to a pcDNA3.1+ expression vector, three separate PCRs were performed at slightly different annealing temperatures (55, 57, 59 degrees celsius). The results of the initial truncation are depicted in Figure 3. All the reactions showed an amplification of the aforementioned desired regions. Once the cloning was performed the samples were again assessed to determine the success of the vector insertion. All results (Figure 4) indicated success. Separate samples of each of the truncated

segments of SIRT6 were isolated and sequenced in order to obtain the sample with the correct sequence for future use. DC4, DN3, and Core1 had the best sequences and were set aside for future use, namely to determine the Sp1 binding site.

The relative concentrations were obtained for each of the tested values for the transgenic female mice, but results were inconclusive for H3K9 in male transgenic mice. Ultimately, acetylated CBS does not have a significant effect on CGL production of H3K9 acetylation. However, these results will be used in future procedures comparing mutant BQ mice (acetylated) to transgenic R mice (deacetylated). The cloning for truncated SIRT6 was successful and the plasmids will later be used in order to further the objective of determining the Sp1 binding site.

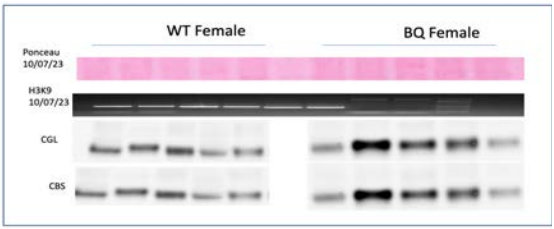

Figure 1. Western Blot Results for WT and BQ Female Mice

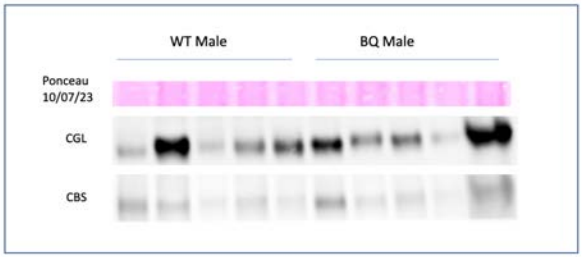

Figure 2. Western Blot Results for WT and BQ Male Mice

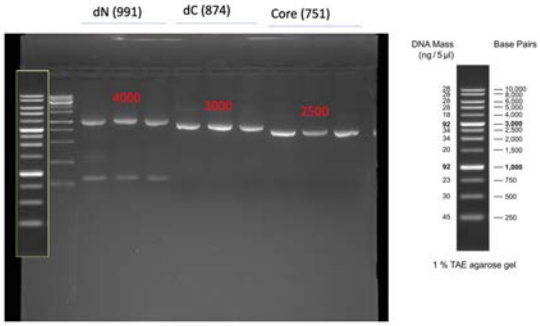

Figure 3. PCR Results for Truncated SIRT6

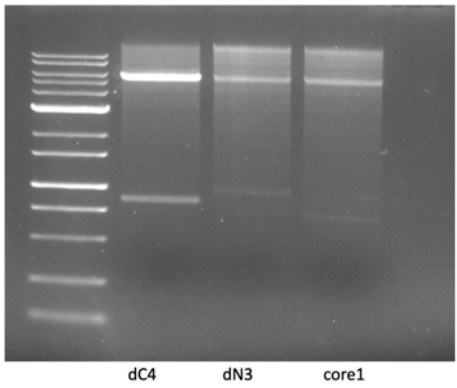

Figure 4. PCR Results for Truncated SIRT6 with Vector

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Quality Metrics for Palliative and Supportive Care in Oncology

By: Avivit Nsiri[1], Jose Morillo,[2] Cardinale Smith MD, PhD[3]

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Background: Palliative care is specialized medical care for people living with a serious illness. This type of care is focused on providing relief from the symptoms and stress of the illness [1]. The goal is to improve the quality of life for both the patient and the family. Palliative care is appropriate at any stage of illness. Within cancer, guidelines recommend palliative care, also referred to as supportive oncology, for all patients with advanced incurable cancer. Research has shown that adding this type of care to a patient's treatment can improve quality of life and increase survival rates among patients with advanced cancer [2]. A recent survey of cancer centers in the United States found that most don't have outpatient palliative care services. This is concerning since research demonstrates that improvement in patients' outcomes, including reducing physical and emotional distress [3]. As such, several agencies including the American Society of Clinical Oncology (ASCO) has published consensus-based quality metrics to measure quality of care and meaningful patient outcomes. In this project we sought to measure the totality of quality measures that encompass supportive oncology measurement to then assess those that are routinely captured within the oncology program [4].

Methods: We performed an online search of all the quality metrics related to palliative care and supportive oncology. Additionally,

we had a quality expert review the list for any potential missing regulatory agencies. A general search to find metrics in supportive care in oncology was done in the following organization: ASCO, American Society for Therapeutic Radiology and Oncology (ASTRO), National Quality Forum (NQF), The Commission on Cancer (CoC),

National Comprehensive Cancer Network (NCCN), and Battelle. Measures were collected in Excel and organized by regulatory organization and category. After a concise list was created, it was presented to a group of clinical and administrative leaders within the oncology department to review and build consensus. We then compared the number of quality measures utilized in the supportive oncology practice.

Results: We identified 29 supportive oncology quality measures (Tables 1-3). Some examples included, "Proportion receiving chemotherapy in the last 14 days of life", "Oncology: Pain Intensity Quantified- Medical Oncology and Radiation Oncology", "Percentage of patients who died from cancer admitted to the Intensive Care Unit (ICU) in the last 30 days of life (ASCO): Endorsed", and more. Of the 29 measures, 18 (62%) were marked "relevant", indicating the importance to the Supportive Care team. Of the 29, only 8 (28%) were being tracked, and 5 (17%) are measured or are of interest to the team. Additionally, 5 (17%) metrics were marked "aren't being tracked but can be."

Conclusions: Overall, it was found that the Supportive Oncology team is tracking a small proportion of the existing quality measures. Future steps include presenting these findings at upcoming group meetings to identify additional measures to track. Measuring Supportive and Palliative Quality Metrics in Oncology helps assess practice performance and provides data on where improvements are needed in cancer care delivery.

Table 1: Quality metrics currently being tracked by the Oncology Department

Organization	Quality Measure
ASCO, NQF	Proportion receiving chemotherapy in the last 14 days of life
ASCO, NQF	Proportion with more than one emergency room visit in the last 30 days of life
ASCO	Oncology: Pain Intensity Quantified – Medical Oncology and Radiation Oncology
NQF	Proportion not admitted to hospice
NQF	Hospice Referral or Enrollment/Palliative Care Referral or Services for Patients with Metastatic Cancer Not Receiving Telehealth Care
ASCO	Hospice Referral or Enrollment/Palliative Care Referral or Services for Patients with Metastatic Cancer Receiving Telehealth Care
NQF	Preventative Care and Screening: Screening for Depression on Telehealth Encounter
ASCO	CAHPS® Hospice Survey (experience with care)

Table 2: Quality metrics that are not being tracked but can be in the future

Organization	Quality Measure
ASCO	Effective Communication and Care Coordination- Percentage of visits for patients, regardless of age, with a diagnosis of cancer currently receiving chemotherapy or radiation therapy who report having pain with a documented plan of care to address pain.
ASCO	Percentage of patients with chart documentation of preferences for life sustaining treatments;

ASCO	Percentage of Patients Who Died from Cancer Admitted to the Intensive Care Unit (ICU) in the Last 30 Days of Life (ASCO): Endorsed
ASCO	Telehealth Advance Directive Documentation for Patients with Metastatic Cancer
ASCO	Oncology: Medical and Radiation-Pain Intensity Quantified on Telehealth Encounter

Table 3: Quality metrics not being tracked

Organization	**Quality Measure**
ASCO	Proportion admitted to hospice for less than 3 days
ASCO	Appropriate Antiemetic Therapy for High- and Moderate-Emetic-Risk Antineoplastic Agents
ASCO	Antiemetic Therapy for Low- and Minimal-Emetic-Risk Antineoplastic Agents – Avoidance of Overuse (Lower Score – Better)
ASCO	Dyspnea, Nausea/Vomiting and Performance Status Assessed at Every Telehealth Encounter for Patients with Metastatic Cancer
RAND	Dyspnea, Nausea/Vomiting and Performance Status Assessed at Every Face-to-Face (In-Person) Encounter for Patients with Metastatic Cancer
NQF	Bowel Regimen Offered/Prescribed on a Telehealth Encounter
CMS	Patients with Advanced Cancer Screened for Pain at Outpatient Visits- with a standardized quantitative tool at each outpatient visit
CMS	Hospice and Palliative Care Composite Process Measure — Comprehensive Assessment at Admission
CMS, NQF	The proportion of hospice patients who have received visits from a Registered Nurse or Medical Social Worker (non-telephonically) on at

	least two out of the final three days of the patient's life.
National Hospice and Palliative Care Organization	Comfortable Dying: Pain Brought to a Comfortable Level Within 48 Hours of Initial Assessment
NQF	Evaluation of Functional Status (Basic and Instrumental Activities of Daily Living [ADL]) for HomeBased Primary Care and Palliative Care Patients
PQM	30-day unplanned readmissions for cancer patients
PQM	OP-35: Admissions and Emergency Department (ED) Visits for Patients Receiving Outpatient Chemotherapy
PQM	Proportion dying of cancer in an acute care setting
*Boxes in blue are deemed not relevant to the supportive oncology practice.	

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Influence of Metals on Calcium-Regulated Photoproteins

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Bioluminescence, which is the production of light by living organisms, is facilitated by proteins known as luciferases that catalyze the oxidation of substrates, generically named luciferins. This reaction produces an unstable complex (usually a cyclic peroxide) that breaks down and gives off a large amount of energy as light. Bioluminescent systems sometimes employ a stable complex between luciferase and luciferin, a structure known as a photoprotein, to produce light. Typically, a specific ion, like calcium, initiates this reaction. For example, calcium-regulated photoproteins (CaPhs) can emit light in the presence of Ca^{2+}. These proteins have been widely utilized to measure intracellular Ca^{2+} levels and to examine how Ca^{2+} oscillations in biological processes.

Although certain CaPhs can undergo luminescence when exposed to cations like La^{3+}, Pb^{2+}, and Cd^{2+}, other metals—such as Mg^{2+}—do not elicit light emission. In fact, Mg^{2+} seems to decrease the sensitivity of CaPhs to Ca^{2+}. In this way, understanding the effect of metals on photoproteins is crucial for their effective utilization as a biological tool in numerous biochemical fields. This study aims to investigate the influence of a series of cations, such as La^{3+}, Mg^{2+}, Zn^{2+}, Sr^{2+}, Pb^{2+}, and Cd^{2+}, on the light emission efficiency of CaPhs recently isolated by our research group from marine invertebrates.

Briefly, our approach involves conducting comparative sequences and structural analyses of the residues that impact the calcium

binding of well-studied CaPhs such as apomnemiopsin and apoaequorin. By doing so, we aim to gain a deeper understanding of the factors that influence the calcium binding of these proteins and explore potential strategies to improve their sensitivity towards Ca^{2+} for future applications. The analysis of various factors, such as the ideal Ca^{2+} concentration, temperature, and pH range, will allow us to determine the optimal conditions for the in vitro light emission of these CaPhs. Our initial findings suggest that a Ca^{2+} concentration of 1 mM and a pH of 9.5 is ideal for light emission.

While this study is still in progress, the luminescent system described here has great potential to generate fundamental and applied knowledge in medical areas, biotechnology, and environmental applications. The long-term goal is to utilize the results of these project to design novel CaPhs as luminescent probes, enabling the detection and quantification of Ca^{2+} in both in vitro and in vivo settings.

Analyzing COVID-19 Spread and Government Response Strategies in the United States

By: Jenny Rapp[1], Giang Thai[2], and Dr. Ying Wei[3]

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At the onset of the COVID-19 pandemic, governments were forced to make policy decisions with incomplete information. Now that we have the privilege of hindsight, we can study which policies were effective, enabling us to better respond to future infectious diseases. We studied data from the first six weeks of the pandemic, before vaccines were available. Using linear regression, we measured how the stringency of 24 different components of government policy in each state, during the first six weeks of the pandemic, affected community mobility and COVID-19 incidence during the following week. We used the University of Oxford COVID-19 Government Response Tracker for quantitative measures of government policy, the John Hopkins COVID-19 Data Repository for information on COVID-19 incidence in each state, and the Google Community Mobility Reports to measure mobility in parks, transit, and retail locations. We used the 2019 United States Census to remove confounding caused by population density and demographics. Additionally, using k-means clustering and principal component analysis, we compared the way different states were affected by different policies. We found that overall, more stringent government policies were effective at reducing community mobility and COVID-19 incidence. Particularly effective measures included stay-at-home orders, restrictions on gatherings, protection of the elderly, and income support. Some measures such as testing policy and contact tracing were clearly subject to confounding as more testing will inevitably lead to higher incidence. Interestingly, workplace closures were associated with both higher community mobility in all areas and higher incidence rates. This association does not imply causation but does invite further research as to what its cause may be.

The Presence of Touch Neurons for Cross Modal Plasticity

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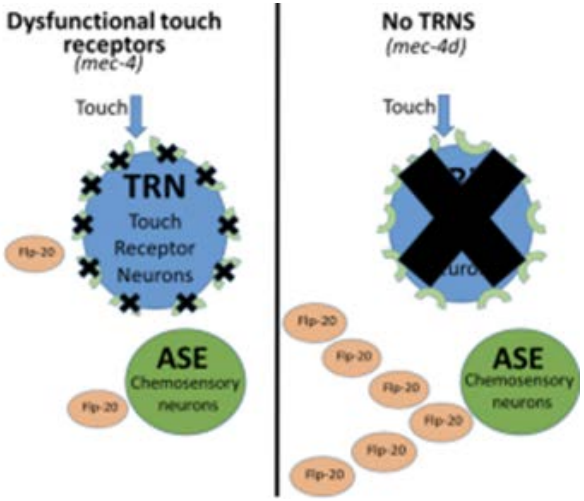
Modal plasticity of the brain is the ability to respond to sensory loss by boosting the remaining functioning senses. Cross-modal plasticity compensates for sensory loss through compensation and recruitment. The study examined the odor-locomotion coupling of four different *C. elegan* strains, MEC-4, Che-1, N2, and IRB-44. *C. elegans* are worms with a rapid life cycle, transparent bodies, cheap maintenance, 302 neurons, and a known connectome. These subjects lack the senses of sound and sight, relying upon their touch and smell circuits. The different mutant strains were compared with the wild type to determine what changes within the specimen increased its sense of smell.

In most cases, if a specimen lacks certain senses its remaining sensory circuits reorganize the sensory modalities to improve sensory performance. Additionally, the deprived sensory circuits provide neural resources by recruiting non-damaged sensory modalities.



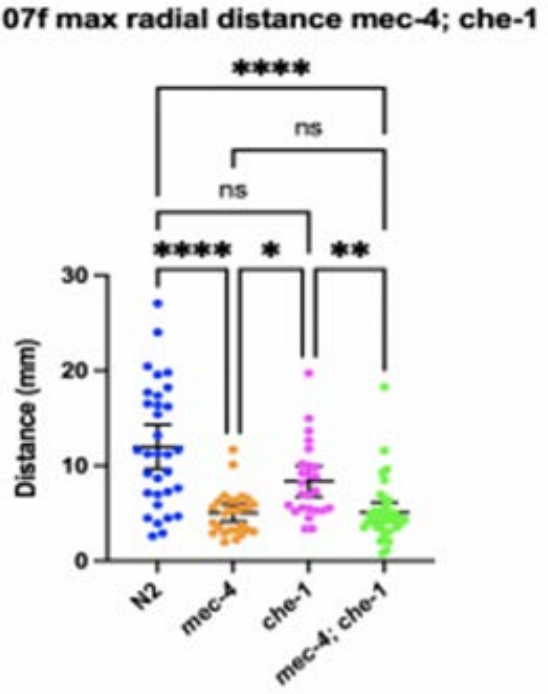
In a wild type of *C. elegan* the odor-locomotion coupling relies on the AWC to receive the odor. This reception triggerseither the AIY, which increases the number of turns and AIB which has the opposite effect. An increase in turns indicates a weaker sense of smell. *C. elegans* with a stronger sense will move with more certainty and direction due to the increased sense.

The four strains used included the wild type, N2, and mutants Mec-4, Che-1, and IRB-44. Mec-4 is a mutant that lacks functional DEG/ENaC channel submission only expressed in the touch receptor neurons and is necessary for sensing gentle touch to the body. Che-1 is a mutant strain that lacks the ASE neurons responsible for secreting additional Flp-20, neuropeptides that regulate starvation responses.IRB-44 is a mutant strain that has both the mutations present in Che-1 and Mec-4.

To determine the strength of the mutant strains' sense of smell in comparison to the wild type the experiment utilized behavioral tests including reversals and dispersals. Both tests required the *C. elegan* to be isolated and rid of any food on their bodies and petri dish. Once isolated an experimenter monitored the *C. elegan* under a microscope for three minutes and recorded the total amount of reversals (turns) completed. This test was administered blindly ensuring the researcher was unaware of the strain they were administering the test on. The dispersals were a similar test that utilized a digital camera rather than an individual. The computer software monitored and tracked the movements of the *C. elegan* for

a total of three minutes and recorded the total amount of reversals as the final data.

After running the behavior tests numerous times on each strain the compiled data revealed extreme significance between strains N2 and Mec-4, and N2 and IRB44. Meanwhile, there was significance found between Mec-4 and Che-1 in addition to Che-1 and IRB-44. Finally, no significance was found between N2 and Che-1 or Mec-4 and IRB-44. The experiment supported the hypothesis that different mutations impact the strength of the functioning senses. Different munitions range in their ability to compensate for what sense the specimen is lacking.



The Depressometer: Transformation of the Psychology World Using AI

By: Ma'ayan Tzur[1], Professor Eva Gilboa Schechtman[2], Barak [2], Raquel Landau [2], and Itamar Zalking

[1] Yeshiva University. New York, [2] Department of Pyshcology, Bar Ilan University, Ramat Gan, Israel

The number of people with depression today unfortunately is growing rapidly, and there are not enough therapists to properly treat and diagnose everyone. Additionally, therapy is expensive and sometimes can be subjective. If it were possible to use Artificial Intelligence to diagnose depression, therapy could become more standardized, accessible, and cost effective.

It is hypothesized that people with depression display less vocal, facial, and verbal congruence. Therefore, by measuring congruence levels during initial intake videos of people who were subsequently diagnosed and treated for depression and measuring their levels of depression after treatment, this research attempts to see if more severe initial depression is correlated with less congruence during intake, and if congruency can predict treatment outcomes. This is in the hopes that some sort of AI which measures vocal, facial, and verbal congruence may be developed to help diagnose depression.

For this research, assessors first evaluated each participant for depression, rating its severity. Those diagnosed with depression then underwent sixteen sessions of psychodynamic therapy and the severity of their depression was evaluated upon completion. Then, emotional congruence during intake videos was assessed by measuring arousal and valence of voice, face, and content. Arousal describes how strong an emotion is, with a higher rating denoting intensely felt emotions such as anger and excitement

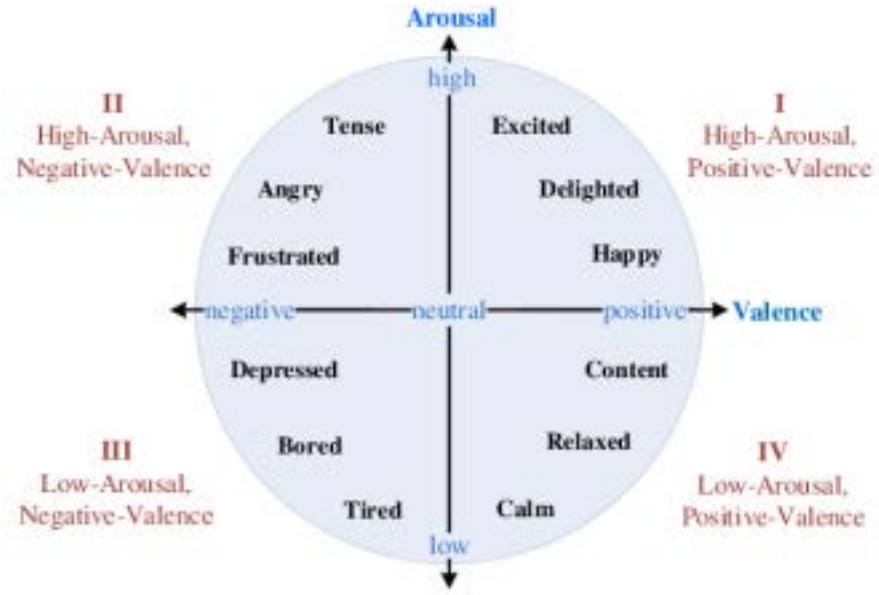
(see Figure 1). Valence describes an emotion on a spectrum from positive to negative, with a higher rating denoting a more positive emotion such as happiness and a lower rating denoting a more negative emotion such as sadness (Figure 1).

In order to assess participants' vocal valence and arousal levels, all the parts where the therapist spoke in the intake videos were muted and they were then run through The Geneva Minimalistic Acoustic Parameter Set (GeMAPS), a software that measures voice arousal and valence levels. Then, the videos were run through Facereader, a program that measures the valence and arousal of facial expressions. The participants' words were also transcribed and rated based on arousal and valence to assess content.

Now, the data will be compared to determine congruence levels between voice and vocal channels, voice and content channels, and vocal and content channels, and the congruence levels will be used to determine if severity of depression is correlated with congruence. The initial and final evaluation of depression levels will also be compared with the level of congruence in order to determine how congruence may be correlated with treatment outcomes. In addition, congruence levels between voice and vocal channels, voice and content channels, and vocal and content channels were also evaluated by three researchers in order to compare the levels of congruence determined by software to those determined by individuals.

Again, if the research shows that AI can diagnose depression based on congruence in a similar manner to humans and that treatment outcomes are affected by degree of emotional congruence, that would be groundbreaking. Not only would it be possible to develop AI to conduct this sort of evaluation and provide a more subjective and cost-effective intake method, but therapists could also then use the AI to recommend the best treatment plans. Additionally, with more research, it might be possible to program AI to diagnose

other psychological disorders as well, or to even be involved in treatment. This would only show the beginning of how helpful and transformative AI might prove to be to the psychology world today.



Response of *Adh*$^{-}$ *Drosophila* Larvae to Varying Concentrations of Alcohol

By: Allison Warren, Gavriella Jutan, and H. Babich
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Drosophila melanogaster, commonly known as the fruit fly, is used frequently in genetic research due to their short generation time, ability to produce many offspring with females laying roughly 100 eggs/day, having only four pairs of chromosomes, being cost-effective, and having easily identifiable mutations. The four developmental stages of the *D. melanogaster* include egg, larva, pupa, and adult. Embryogenesis is completed within 24 hours and the time span from fertilized egg to adult is approximately 10 days. The third mature instar larva leaves the moist culture medium and attaches to yjr dry wall of the vial in search of a place to pupate for 24–48 hours. During pupation the fly undergoes a metamorphosis from worm to adult fly [1].

Alcohol dehydrogenase (ADH), an abundant enzyme in *D. melanogaster*, is encoded by the gene *Adh*$^{+}$. The primary function of ADH is to metabolize ethanol, common in rotting fruits used as environments to lay eggs [2]. Flies with the *Adh*$^{-}$ mutation lack the functional ADH gene and ability to metabolize significant quantities of alcohol. *Adh*$^{-}$ flies can metabolize small amounts of ethanol ranging from 3-5% using alternate pathways, such as catalases [3].

This experiment compared the responses to alcohol at varying concentrations of adult *Adh*$^{-}$ flies to those of their larvae. Attention focused on comparing the number of F_1 offspring produced by adults exposed to nontoxic levels of alcohol. The hypothesis was that larvae, as compared to adults, would constitute a hypersensitive population to alcohol.

Adh^{-} flies were grown in medium (Carolina Biological) in plastic vials and housed in a 28ºC incubator. Ten flies, selected at random, were placed in the vials and exposed to alcohol, at 0, 0.7, 3.5, and 7%. Two trials were performed, and each trial included two replicates of the concentration of alcohol. Observations were noted biweekly. Adult flies were removed from vials at the end of week one and the amount of newly hatched F_1 offspring was calculated at the end of week two (Figures 1-4)

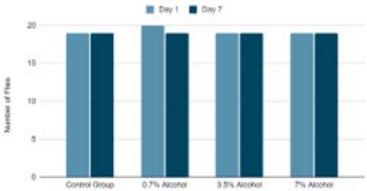

Figure 1. Trial #1: Adult *Adh*$^{-}$ flies exposed to varying concentrations of alcohol.

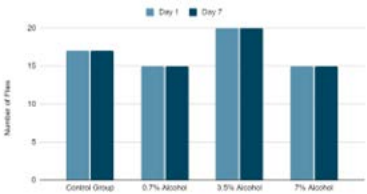

Figure 2. Trial #2: Adult *Adh*$^{-}$ flies exposed to varying concentrations of alcohol.

When preparing trial 2, based on observations, it appeared that some flies died in the transferring process.

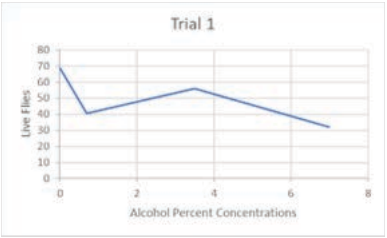

Figure 3. Trial #1. F_1 flies hatched from larvae grown in alcohol-amended medium.

Figure 4. Trail #2. F_1 flies hatched from larvae grown in alcohol-amended medium.

The results indicate that adult *Adh*$^-$ flies were less sensitive to alcohol than were their larvae. Both trials demonstrated that alcohol above 0.7% was deleterious to fly development.

When analyzing the data several errors can account for the discrepancies, such as not differentiating between male and female flies, difficulties with transferring the flies leading to premature death, and poorly prepared media.

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Fingerprint Total Ridge Count Analysis of Jewish Females

By: Allison Warren[1], Abigayle Zupnik [1], Gabrielle Green [1], Shoshana Epstein [1], and H. Babich [1]

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A polygenic trait is a characteristic controlled by more than one gene, producing a broad continuum of phenotypes. Fingerprint total ridge count (TRC) is an example of a multifactorial, polygenic trait. Fingerprint patterns are placed into three categories: arches, loops, and whorls (Figure 1). To determine the number of ridges one counts from the core of the fingerprint until the triradius. An arch, which lacks a triradius, would be scored zero. A loop has one triradius and a whorl has two triradii. For a loop one counts the ridges until the triradius and for a whorl one counts the number of ridges to the farthest triradius.

Figure 1. Fingerprint patterns

TRC is a sum of the ridges of all ten fingers. In 1968 a study conducted by Sarah Holt on the general British population found that the mean TRC for males was 145 and for females was 126 [2]. In our study on 331 Jewish women attending Stern College for Women (SCW), the TRC mean was 106; the population was primarily Ashkenazic women, with lesser amounts of women with a Sephardi or Mizrachi heritage. Katznelson and Ashbel reported that the mean TRC value amongst the Jewish female population is 138 [4].

Mendenhall et al. [2] found that 7 gene loci contribute to TRC; our experiment suggested 4 gene loci contributed to the TRC value (Figure 2).

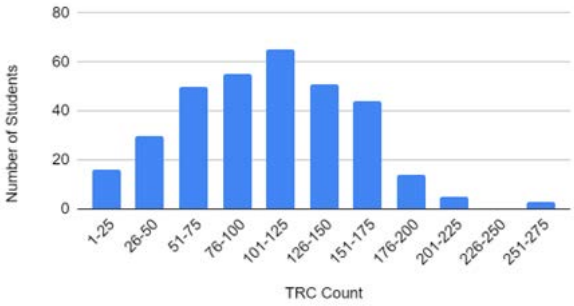

Figure 2. TRC distribution for students at Stern College for Women.

Studies have also shown that there are differences in average pattern frequencies and TRCs among groups from differing ethnic origins. A possible cause is biological segregation of different ethnic groups. Segregation ensures a single ancestral bloodline which may affect the TRC variability across the population [5]. For example, Caucasian populations exhibit lower whorl frequencies and total ridge counts, as well as higher arch frequencies, than those of Asian or Mediterranean descent [1]. Our results showed in this specific population of Jewish females, loops were the most frequent pattern (Figure 3).

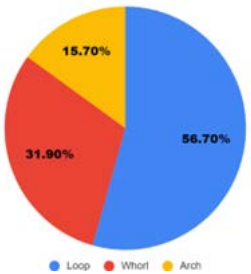

Figure 3. Fingerprint pattern frequencies in students from Stern College for Women.

Fingerprint patterns were determined for Eastern European (Ashkenazi) men and women over the age of eighteen years. Each finger was individually tested, and in both men and women, fingers I and IV had the highest frequency of whorls. Yet when testing fingers III and V, researchers found the highest frequency of loops,

which were higher than those of whorls on the other fingers. Interestingly, in other Jewish populations, specifically with regards to women, loops, rather than whorls, were also more frequent [4].

Immigrants to Israel served as readily available, diverse populations for genetic analyses. TRC data were obtained from those who immigrated from Egypt, Turkey, Germany, and Yemen. TRC data and frequencies of whorls and loops were similar to the data recorded at SCW, with loops found to be in the highest frequency. Researchers noted that their results on whorl and loop frequencies differed from the non-Jewish populations. Compellingly, the frequency of loops in SCW students was approximately 56% and in all four countries the loop frequency ranged between approximately 56-59% [3]. These results demonstrate that although the Jewish people have been dispersed in the diaspora for centuries, genetic similarities remain.

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The influence of *Adh* function on ethanol toxicity to adult *Drosophila melanogaster* and their offspring

By: Abigayle Zupnik[1], Aliza Kass [1], and H. Babich [1]

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Drosophila melanogaster has been used as an experimental organism for various facets of genetics since the 1900s.This is due largely to their small size, short generation time, easily identifiable mutations, and ability to produce many offspring. This study focused on the tolerance of wild-type flies to alcohol. The gene *Adh* encodes for alcohol dehydrogenase (ADH), an enzyme needed for alcohol metabolism. *D. melanogaster* metabolize an average of 90% of ethanol through ADH and the remaindered by catalases. Environments with high levels of ethanol are preferred breeding grounds for adult fruit flies, as these flies prefer environments of fermenting foods which are generally high in ethanol.

This experiment evaluated the acute toxicity of alcohol to adult wild-type *Drosophila*. Once nontoxic concentrations of alcohol were identified, the investigation focused on the number of F_1 offspring produced by *Drosophila* exposed to nontoxic levels of alcohol. This was accomplished by counting the number of newly hatched F_1 flies produced from eggs/larvae in the alcohol-amended medium. The results were compared to a similar study done by others on the response of *Drosophila* lacking a functional *Adh* gene, and therefore having a lesser ability to tolerate and metabolize alcohol. The hypothesis was that wild-type *Adh*+ adults flies would be more resistant to alcohol toxicity than the mutant *Adh*- adult flies. It was further hypothesized that F_1 offspring of both the *Adh*+ and *Adh*- flies would be a hypersensitive population compared to the adults, since they were exposed to alcohol in all stages of development. Finally, it was hypothesized that the F_1 offspring of the mutant flies would be more sensitive to the alcohol than those of the wild-type flies.

The experiment was performed three times, and two replicates of each concentration were used in each experiment to ensure accurate results. Ten male and female wild type flies were transferred to *Drosophila* medium (Carolina Biological) amended 0, 0.7, 3.5, and 7% ethanol. The flies were housed in an incubator at 28ºC for the duration of the experiment. The flies were examined on day 2 to determine flies that died due to the transferring; these flies were eliminated from the results of the experiment. The vials were examined again on day 7 and the viable flies were scored. The three trial results were then averaged (Figure 1).

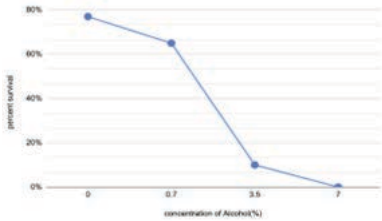

Figure 1. Dose-response data for exposure of *Adh*+ adult flies after a 7-day exposure to alcohol.

After the 7-day exposure, all viable flies were removed and the vials housing the eggs and larva were left to incubate for an additional two weeks. Removal of these adult flies ensured that any flies observed were of the F_1 generation. Viable flies were then scored. The three trial results were again averaged together (Figure 2).

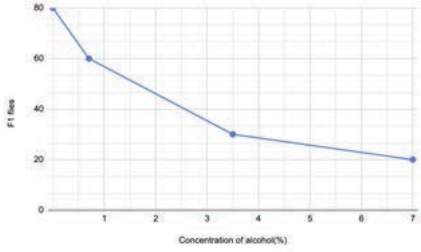

Figure 2. survival rate of F_1 generation flies of *Adh*+ adult flies after exposure to alcohol

The F_1 larval generation survival rates moved in a trend similar to the adult flies. As the concentration of alcohol exposure increased the survival rate of larva- derived F_1 flies decreased. The higher the alcohol exposure on the F_1 generation, the lower the rate of survival was. Additionally, the larva-derived flies were hypersensitive towards alcohol as compared to the adult flies seen in Figure 1. This is expected and supported our hypothesis that larva-derived flies would be hypersensitive to alcohol as compared to the adult flies.

In comparison to the results of a similar experiment which used mutant *Adh*- flies, the adult wild-type flies were more resistant to alcohol toxicity. Additionally, the wild-type flies produced more offspring than the mutant flies. Results from both studies support the initial hypotheses.

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