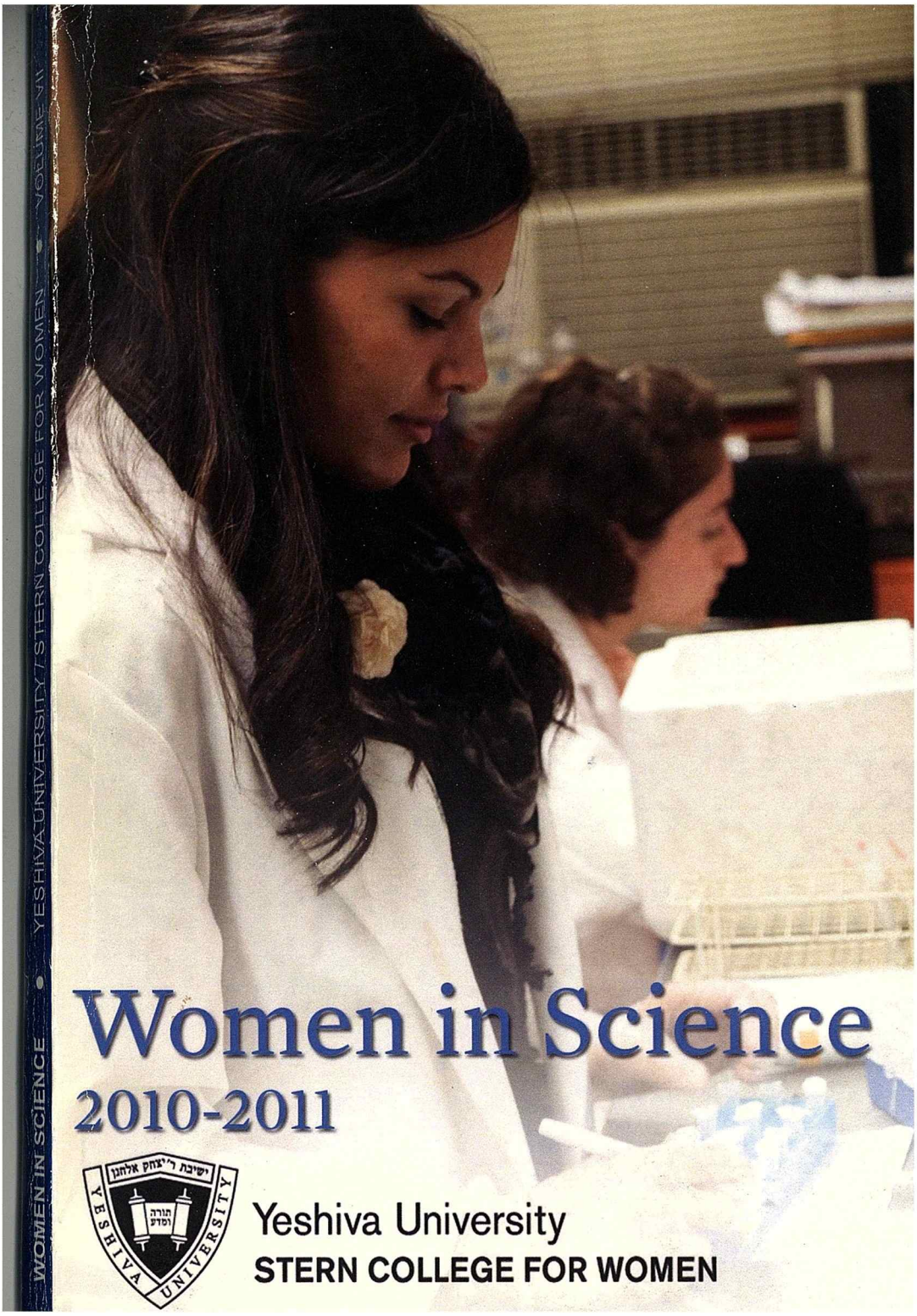

WOMEN IN SCIENCE • YESHIVA UNIVERSITY/STERN COLLEGE FOR WOMEN • VOLUME VII

Women in Science

2010-2011

Yeshiva University

STERN COLLEGE FOR WOMEN

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

The science departments direct students to stretch beyond the classroom experience by involvement in scientific research. Both in the academic year and the summer, students may work one-on-one with on-campus faculty. During the summer, laboratories at Albert Einstein College of Medicine (AECOM) provide additional undergraduate research opportunities through the Roth Institute Program. In the Summer, 2011, a collaborative interaction between Bar Ilan University and Yeshiva University enabled SCW undergraduates to intern in a research laboratory and, thereby, to spend a summer in Israel. Summer internship opportunities for students of all the science majors are available at the world-renowned facilities of the Brookhaven National Laboratory (BNL) and New Jersey Institute of Technology (NJIT), through collaborative research at YU, BNL, and NJIT. Furthermore, the science faculties actively encourage the science majors to apply for competitive undergraduate research internships locally, nationally, and internationally. In the summer of 2011, more than 80 SCW students were involved in research, either at SCW, AECOM (see Summer Research at the Albert Einstein College of Medicine), or external research facilities, including Alyn Institute (Israel), Beth Israel Medical Center, Brown University's Rhode Island Hospital, Cedars Sinai (LA), Hospital for Sick Children (Toronto), Florida Atlantic University Medical School, Fox Chase Cancer Center Montefiore Hospital, New York Center for Neuropsychology and Forensic Behavioral Science, NYU Infertility Center, NYU Medical Center, Northwestern University, University of Pennsylvania, Rutgers University, Rusk Institute for Rehabilitative Medicine, Shaarei Tzedek Hospital (Israel), Sloan Kettering, Stony Brook University, Toronto's Hospital for Sick Children-Developmental and Stem Cell Biology Program UMDNJ, and University of Toronto's Sunnybrook Research Institute.

The Jewish Foundation for the Education of Women (JFEW) Science Fellowship Program was inaugurated in the 2009-2010 academic year, with ten participating students. In the 2010-2011 academic year, another nine students with interests in the sciences joined the program. Highlights of the JFEW Science Fellowship Program include a partial scholarship, a stipend for a summer research internship, stipends to two scientific conferences, one-on-one mentoring with a faculty member, and an enrichment program, providing workshops to aid students in attaining their career goals. This year, all nine JFEW fellows obtained summer internships, either in clinical or biomedical wet-lab research. The fields of research in which JFEW fellows participated include oral biology, genetics, neurobiology, immunology, developmental biology, food chemistry, physics, and cancer biology, and have taken place in prestigious institutions, including the Albert Einstein College of Medicine (AECOM), Johns Hopkins University, Harvard Medical School, and Rutgers University and in industry, Citromax. Several of the JFEW students have taken leadership roles in forming the Neurobiology Club, the Genetics Club, and the Optometry Club.

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 NYU Medical Center and Mt. Sinai School of Medicine, and are supervised by an on-site investigator for 8 hours/week for 12 weeks. The primary requirement for the course is a comprehensive literature review and/or scientific report of the students' research projects, as well as a class presentation. The combination of internship and seminar allows the students to gain practical experience in literature review, data collection and management, and scientific writing and oral presentations. Students attending graduate programs in Clinical Psychology have identified the research seminar as being particularly helpful in preparing them for graduate school.

To meet growing student interest in the neurosciences, programs in neurobiology were instituted by a collaborative interaction between the Department of Psychology and the Department of Biology. In these programs, students complete a prescribed combination of courses in biology and in psychology (with each department emphasizing its own requirements) and upon successful completion of the program, the designation "concentration in the neurosciences" is included on the college transcript. As part of this joint interactive program, in the Spring semester, 2011, a laboratory course in Neurobiology, taught by Dr. Richard Hunter, The Rockefeller University, was developed and included laboratory experiences both at SCW and at The Rockefeller University.

A specific objective of the science departments at SCW, in addition to nurturing the highest level of academic achievement, is to provide students with opportunities for leadership roles. Upper level students may be appointed to positions as Teaching Assistants (TAs) for laboratory sections and as Recitation

Instructors to review materials for the lecture sections of the science courses. Student-led clubs, such as the Biology Club, the Chemistry Club, the Physics Club, the Psychology Club, the PreMedicine Club, the PreDentistry Club, the Occupational Therapy Club, the Pharmacology Club, the Nutrition Club, the Bikur Cholim Club, etc., provide opportunities for students to gain skills in organizing events and in coordinating social functions. The 2010-2011 academic year saw the birth of four new Clubs, the PreNursing Club (president: Shulamit Brunswick), the Genetics Club (president: Pamela Apfel), the Optometry Club (president: Batsheva Kuhr), and the Neuroscience Club (president: Geulah Ben David). The Clubs actively recruit speakers. For example, the Genetics Club hosted Dr. Nicole Schreiber-Agus to speak on the topic, "Carrier testing for Tay-Sachs disease: novel mutations to consider, resulting from genetic diversity within the Jewish population." Dr. Scheiber-Agus is the scientific director to the Human Genetics Laboratory at Jacobi Medical Center, as well as the scientific director of the new Genetics Health Program at AECOM. These student-run Clubs give the students opportunities to develop leadership and organizational skills.

SURGE, the Student Undergraduate Research Group Exchange, is a faculty-sponsored, student-led club that gives students the forum to present their research as a seminar before their colleagues and the science faculty. The goals of this faculty-initiated club are to encourage and foster research and the exchange of research information. Meetings are held once a month, usually with two or three students presenting PowerPoint professional seminars. Faculty members also use these meetings to inform students of upcoming internships and fellowship opportunities. In the 2010-2011 academic year, the following students presented seminars at SURGE meeting:

Student Presenter	Topic	Affiliation/Institution
Emily Liebling	Interactions between microtubules and kinesin-13	AECOM
Tamara Freiden	The molecular characterization of the calcium efflux transport in *Streptococcus pneumonia*	St. Jude Children's Research Hospital
Tsipora Huisman	Modifying the RhoA GTPase biosensor	AECOM
Jenny Deluty	Elucidating the signaling pathways of the immune response in monocytes	Mount Sinai School of Medicine
Rivkah Rogawski	Comanagement of cancer symptom clusters in geriatric cancer patients	UCLA Johnson Clinical Cancer
Shani Zitter	The validation of an automated molecular platform to diagnose novel swine influenza and its clinical translation	Montefiore Medical Center
Rebecca Weiss	Identification of markers for autophagy in serum	AECOM
Barrie Cohen	Neuronal differentiation of H9 human embryonic stem cells	Keck Center for Collaborative Neuroscience, Rutgers Univ.
Chana Dinerman	Untitled	AECOM
Dani Lent	Gap junction remodeling and post-translational phosphorylation of connexin43	NYU School of Medicine
Tirtza Spiegel	Development of an *in vivo* screen to identify novel regulators of tumor growth and metastasis	AECOM
Avital Bauman	Endocannabinoid protein expression in human immunodeficiency virus encephalitis	AECOM
Sarah Lazaros	Pericardial inotropic drug delivery more potent and efficacious than traditional intravenous infusion	MIT
Esther Leah Schoenbrun	Developing a computational protocol to evaluate binding affinity of ligands to molecules	SCW
Aviva Tobin-Hess	Increasing risk of the sprint fidelis implantable cardioverter-defibrillator leads	North Shore LIJ Medical Center
Hadassah Klerman	Centriole elongation in *Drosophila* stage arrest mutants	Harvard Medical School
Kayla Rosenblatt	The role of thiazolidinediones (TZDs) on bone metabolism	Beth Israel Medical Center

Each Fall semester, the science departments jointly sponsor a poster presentation contest. Students present their work and discuss the research with attending faculty. The posters, and more importantly the student's understanding of the project and the extent of her hands-on participation, are evaluated by the science faculty. Winners are selected to present at a national meeting of the American Chemical Society (ACS). The costs of attending the meeting, including transportation and hotel, are underwritten by the Dean's Office, SCW, and by faculty research grants. In the Spring semester of 2011, Tsipora Huisman (poster title: AID and Gadd45a: Are they involved in active DNA demethylation of the 3'RR and class switch recombination?); Rivkah Rogawski (poster title: Elucidating the interaction of LPA with model membranes); and Kate Rosenblatt (poster: Detection of TRP-2 antibodies in the serum of TRP-2 immunized mice) presented at the 241st American Chemical Society National Meeting in Anaheim, CA (March).

SCW graduates attending AECOM for their medical education are eligible to apply for Anne Scheiber Fellowships. This unique award provides up to full tuition scholarships based on need for four years of medical training (see "Anne Scheiber Fellowship"). Students considering careers in various Allied Health fields (for example, occupational and physical therapy) or in engineering may

wish to consider one of our several combined degree programs with other universities. In the spring term of 2009, Yeshiva University entered into a cooperative agreement with the NYU Steinhardt School of Culture, Education, and Human Development, designed to expand opportunities for students to prepare for a career in teaching math and science at the elementary and high school levels. During the past academic year, Stern College signed an articulation agreement to implement a joint program with the NYU College of Nursing. Students interested in this program will pursue a shaped major that will lead to the completion of the necessary prerequisites within five semesters for those who studied for a year abroad in Israel (or seven semesters for those who came directly to Stern College after high school). If they are accepted to the program, they will receive a B.A. from Stern College upon completion of their first semester at the NYU College of Nursing. Once they have successfully completed the 15-month accelerated program at NYU, they will then be awarded a BSN from their nursing school. Much interest has already been expressed in this exciting new program, which should be the start of a productive and long-term partnership between Stern College and the NYU College of Nursing" (see "Combined Programs").

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 Yeshiva University 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 15 and a sample article). The 2005-2006 academic year saw the publication of the new journal, *Science and Ethics: a Joint Perspective*. This journal discusses bioethical and biomedical issues of current interest, again relying on the unique strengths of our students—their combination of Torah and secular studies. Volume 6 was published in the summer of 2011 (see "*Science and Ethics*" for a listing of articles that appeared in volumes 1 through 6, and a sample article).

Specific faculty have designated roles to provide an intensive involvement in guiding students with their career choices and specifically in assisting with the application process. Dr. Brenda Loewy, heading the office of PreHealth Advisement, has recently been joined by Dr. Chaya Rapp, to assist those students interested in careers in medicine, dentistry, and osteopathy. Mr. Jeff Mollin's focus is those students interested in careers in physical therapy, physician assistant, and nursing, while Dr. Gail Gumora concentrates on careers in occupational therapy.

In the 2010-2011 academic year, Dr. Loewy organized several seminars in which the guest speakers provided valuable insights into the various professions, as well as information on the admissions process to their graduate and professional programs. Examples of such seminars included: (a) a panel on osteopathic medicine by Dr. S. Weiss, Director of The Medicine Lodge Clinic, and Dr. S. Milani, Touro College of Osteopathic Medicine; (b) an information session on the Ben Gurion University Medical School for International Health in collaboration with Columbia University Medical Center, led by Ms. S. Sternglass, Public Relations Coordinator, and Dr. Ilana Pister, a graduate of SCW and of Ben Gurion Medical School; (c) a talk by Dr. P. Alexander, Assistant Director for Admissions, on the Technion American medical student program; and (d) a panel of dentists representing the NYS Dental Foundation spoke on their specialties. The panel included Dr. M.S. Ginzburg, general, aesthetic and implant dentistry, Dr. R. Ambewadikar, pediatric dentistry, Dr. J.M. Friedman, oral surgery, Dr. G. Gaynor, orthodontics, Dr. S. Klein, periodontics, and Dr. S.A Reddy, endodontics.

Faculty: Harvey Babich, Ph.D.; Bill Bassman, M.S.; Joseph DeSantis, Ph.D.; Marina Holz, Ph.D.; Richard Hunter, Ph.D.; Brenda Loewy, Ph.D.; Jeffrey Mollin, M.Phil.; Kaliris Salas-Ramirez, Ph.D.; Alyssa Schuck, Ph.D.; Margarita Vigodner, Ph.D.; Jeffrey Weisburg, Ph.D.; Richard Weiss, M.D.; Harriet Zuckerbraun, Ph.D.

The Department of Biology offers a wide range of courses providing students 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 Anatomy, Animal Diversity, Cell Biology, Developmental Biology, Ecology, Genetics, Histology, Immunology, Invertebrate Zoology, Medical Biochemistry, Microbiology, Molecular Biology, Neurobiology, Pharmacology, Physiology, Reproduction Biology, Virology, and Women's Health.

Innovative courses for the 2010-2011 academic year included Animal Diversity offered in the Fall semester and Neurobiology Laboratory offered in the Spring semester. Animal Diversity, taught by Dr. Joseph DeSantis, deals with the life sustaining interrelationships that human beings share with the myriad of other species on Earth. A laboratory course in Neurobiology, taught by Dr. Richard Hunter, The Rockefeller University, included laboratory experiences both at SCW and at The Rockefeller University. This latter course is but one component of a joint interactive program between the Department of Biology and the Department of Psychology to meet growing student interest in the neurosciences. The Biology Department offers a B.A. in biology accompanied by the designation "concentration in the neurosciences" on the college transcript. This is the second such "concentration" designation, as for the past three years the Biology Department offered a B.A. in biology with the accompanying designation "concentration in cell and molecular biology." An exciting new 1-credit Journal Club course, Genetics and Epigenetics, was offered in the Spring semester, 2011, and was taught by SCW graduates who are now medical students at AECOM. To accommodate the science requirements for non-science majors, the course Human Biology was introduced in the Fall semester, 2010. This course consists both of lecture (taught by Dr. R. Weiss) and of laboratory (taught by Dr. H. Zuckerbraun) components. Dr. B. Loewy, a faculty member of the Biology Department, was the recipient of the 2008 Dean Karen Bacon Award for a Senior Faculty Member. A prime responsibility of Dr. Loewy is to serve as the college's Pre-Health Advisor, and to guide students interested in medicine, dentistry, and optometry through the application process. Dr. Loewy organizes a series of wide-ranging seminars. A pleasant addition to the prehealth advisement staff was the appointment of Mr. J. Mollin to guide those students with careers goals in nursing, physical therapy, and physician assistant.

Drs. Margarita Vigodner and Dr. Marina Holz, the so-called "junior" faculty members, have skyrocketed the Department of Biology to research excellence through their impressive publications and grants. Dr. Vigodner was awarded a $300,000 grant, "Second Hand Smoke as a Potential Cause of Spermatogenic Failures and Male Infertility," (7/1/2008 - 6/30/2011), from the Flight Attendant Medical Research Institute (FAMRI). FAMRI continued support of Dr. Vigodner's research through providing her with the Young Clinical Scientist Award, allotting a 2-year extension with funding in the amount of $108,500 per year. Her National Institutes of Health R15 grant, "Regulation of spermatogenesis by sumoylation," is under consideration. Dr. Marina Holz was the recipient of a $30,000 grant, "S6K1 in breast cancer," 7/1/2009-6/31/2010, from the Wendy Will Case Cancer Fund and a 150,000 grant, "The role of S6K1 in breast cancer," 6/01/08-5/31/2014 (renewed for 3 years in 2010) from the ATOL Charitable Trust. This trust also provided a laboratory renovation grant of $100,000. Most exciting was Dr. Holz's award of the grant, "Identification and characterization of S6K1 targets in mammary cell proliferation," NIH/ NCI 2010-2013, $408,400.

Dr. Marina Holz (left) working with student research assistant Naamah Plotzker.

Dr. Margarita Vigodner (far left) with summer research interns Hannah Marmor and Leah Gutstein and postdoctoral research associate Dr. Vibha Shrivastava (far right).

The publication record of the faculty of the Department of Biology is equally impressive. For the academic years 2010-2011 the following manuscripts either were published or were accepted for publication. The names of SCW undergraduates who participated in these research projects are underlined.

Babich, H., Zuckerbraun, H.L., Schuck, A.G., and Weisburg, J.H. 2011, *In vitro* studies on the responses of healthy and cancerous cells derived from tissues of the human oral cavity to tea theaflavins and catechins, In Tea in Health and Disease Prevention, Preedy, V.R. (editor), Elsevier/Academic Press, London, England (invited; in press).

Babich, H., Schuck, A.G., Weisburg, J.H., and Zuckerbraun, H.L., 2011, Research strategies in the study of the prooxidant nature of polyphenol nutraceuticals, J. Toxicol (invited; special issue on oxidative stress; in press).

Vigodner, M., 2011, Roles of small ubiquitin-related modifiers in male reproductive function, Int. Rev. Cell Mol. Biol., 288:227-259.

Weisburg, J.H., Schuck, A.G., Silverman, M.S., Ovits-Levy, C.G., Solodokin, L.J., Zuckerbraun, H.L., and Babich, H., 2010, Pomegranate extract, a prooxidant with antiproliferative and proapoptotic activities preferentially towards carcinoma cells, Anticancer Agts Med. Chem., 10:634-644.

Shrivastava, V., Pekar, M., Grosser, E., Im, J. and Vigodner, M. 2010, SUMO proteins are involved in the stress response during spermatogenesis and are localized to DNA double-strand breaks in germ cells, Reproduction, 139:999-1010.

Yamnik, R.L. and Holz, M.K., 2010, mTOR/S6K1 and MAPK/RSK signaling pathways coordinately regulate estrogen receptor alpha serine 167 phosphorylation. FEBS Lett., 584:124-128.

The faculty of the Department of Biology provides on-campus research opportunities for students and encourages students to present their data at scientific meetings or, at the minimum, includes their names on abstracts and posters displayed at such meetings. Below is a listing of such presentations/abstracts recorded for the 2010-2011 academic year; the names of students are underlined.

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.

Cohen, S.S., Lerman, L.T., Haken, O., Weisburg, J.H., and Schuck, A.G., 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.

Weisburg, J.H. and Vigodner, M., 2011, Mechanisms of resistance to oxidative stress in leukemia cells, Society for In Vitro Biology Annual Meeting, Raleigh, NC, June.

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.

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

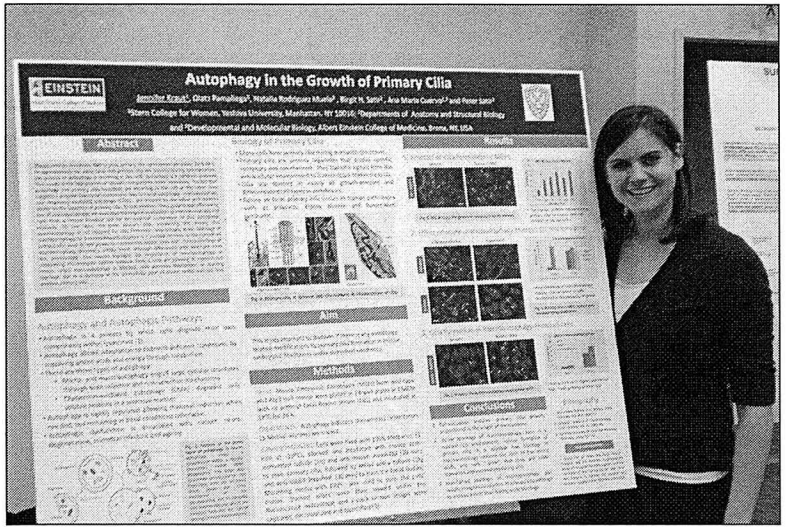
human sperm, Columbia University Undergraduate Research Symposium, Spring, April.

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

Maruani, M. and Holz, M.K. 2011, Positive co-regulatory loops between mTOR/S6K1 and estrogen receptor α pathways, AACR Special Conference on Targeting PI3K/mTOR Signaling in Cancer, San Francisco, CA, Feb.

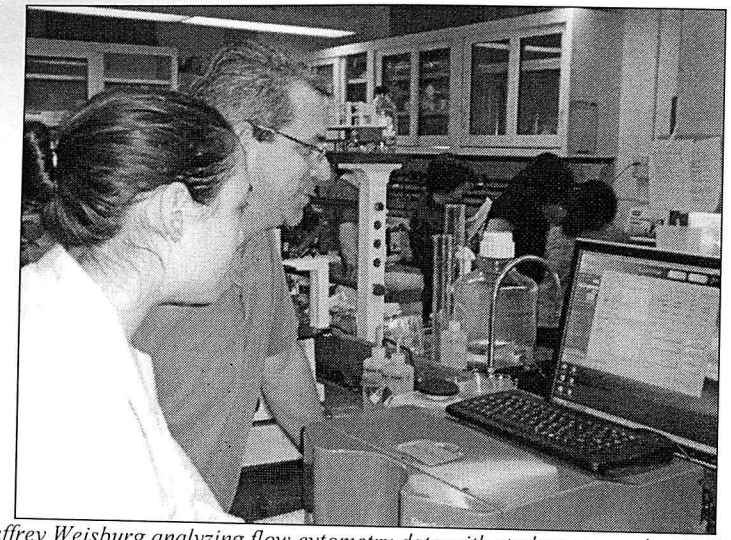
Seligman, F., Spiegel, T., and Holz, M.K., 2010, Estrogenic regulation of S6 kinase expression creates a positive feed-forward loop in control of breast cancer cell proliferation, American Association for Cancer Research 101st Annual meeting, Washington, DC, April.

Off-campus research placements abound, including the Roth Scholars Program at AECOM and other research internships sponsored by Yeshiva University (see "Student Research at the Albert Einstein College of Medicine"). For additional information, see "Student Accomplishments," "Student Publications and Presentations," and the Abstract Booklet. As of the Spring term, 2009, the Department of Biology entered into an agreement with Dr. Martin Grumet, Director of the Rutgers University Cell Research Center and of the W.M. Keck Center for Collaborative Neuroscience, Rutgers University, to establish the Rutgers-Yeshiva Summer Undergraduate Research 10-week laboratory research program on the Rutgers campus. This award is highly competitive and the student selected to intern is engaged in hands-on experimentation in the neurosciences.



Roth Scholar Jennifer Kraut presenting her research at the annual student poster session.

Aware of the need to maintain state-of-the-art technology, the Department of Biology constantly upgrades equipment for use in courses and for on-campus research. In the 2010-2011 academic year, through monies obtained from her grant, Dr. Holz purchased a LiCor Odyssey near-infrared imaging system, a Promega 96-well plate dual-injector spectrophotometer and luminometer, and a Millipore Q3 water purification system. Pooling funding from their grants, Drs. Vigodner and Holz purchased a BioRad real-time PCR optical system. The following equipment was purchased within the prior five years: six VIS/UV spectrophotometers, five inverted microscopes, a Nikon TE2000S epifluorescent inverted microscope system with NIS-Elements research imaging software, a Guava EasyCyte benchtop microcytometry system, Protean II vertical gel electrophoresis system and Transblot cell with power supply for use with gels and western blots, a Glomax 20/20 luminometer, a photodocumentation center, and two laminar flow hoods were obtained. To enhance the laboratory experiences in the introductory Biology courses, both for Biology majors (Principles of Biology) and for non-majors (Human Biology), in the Summer, 2008 forty brightfield microscopes were purchased. In the Summer, 2009, Moticam microscope cameras, projectors, and screens were installed in the two laboratories in which the major and non-major introductory biology courses meet. The camera was interfaced with a computer, allowing the microscope image to be projected on the large screen in front of the room. Furthermore, the computer with projector and screen was a valuable addition for instructors who use PowerPoint presentations as part of their lectures. Three thermocyclers, for use in polymerase chain reactions and purchased in the Summer, 2010, are housed in the Sussman laboratory, a state-of-the-art laboratory utilized for the advanced biology courses.



Dr. Jeffrey Weisburg analyzing flow cytometry data with student researcher Bella Wolf.

Dr. Alyssa Schuck (far left) conducting an experiment with summer research interns Simone Fertel and Sarah Reiss.

The Biology Club organized a series of career workshops for SCW students majoring in Biology. One particularly nice and informative workshop included a panel of SCW graduates from a variety of professions who spoke about their particular fields of interest. This panel included Eliana Grosser (biotechnology, Columbia University), Leah Fried (genetic counseling, Sarah Lawrence),

Miriam Merzel Schachter (Ph.D. candidate, Mt. Sinai School of Medicine), Shifra Liba Klein (Ph.D. candidate, Cornell University), Yael Saden Barach, and Jenny Nachbar (Ph.D. candidates, Sue Golding, AECOM). Another workshop focused on the protocol for formulating a resume and writing a cover letter for summer internship applications. A rather "fun" seminar was "Meet and munch with SCW Biology faculty," in which the biology faculty discussed their research and courses. The Biology Club held its annual fundraiser to raise awareness about breast cancer and to benefit Sharsheret.

The 2010-2011 academic year saw the birth of four new Clubs, the PreNursing Club (president: Shulamit Brunswick), the Genetics Club (president: Pamela Apfel), the Optometry Club (president: Batsheva Kuhr), and the Neurobiology Club (president: Geulah Ben David). The Clubs actively recruit speakers. For example, the Genetics Club hosted Dr. Nicole Schreiber-Agus to speak on the topic, "Carrier testing for Tay-Sachs disease: novel mutations to consider, resulting from genetic diversity within the Jewish population." Dr. Scheiber-Agus is the scientific director to the Human Genetics Laboratory at Jacobi Medical Center, as well as the scientific director of the new Genetics Health Program at AECOM. Meetings of the Optometry Club included several interesting seminars: (a) an information session on applying to optometry school, lead by Dr. G. Albieri, Director of Admissions of SUNY College of Optometry; (b) the lecture titled, "Tuning color visual pigments," by Dr. T. Sakmar, The Rockefeller University; and (c) the lecture titled, "Eye care and vision health," by Dr. D. Rutner, SUNY College of Optometry. The FIMRC Club has been renamed the Global Health Club (president: Shara Feltheimer). These student-run clubs give the students opportunities to develop leadership and organizational skills.

Other programs in the 2010-2011 academic year, organized by Dr. Loewy, included seminars in which the guest speakers provided valuable insight into the various professions, as well as information on the admissions process to their graduate and professional programs. Examples of such seminars included: (a) a panel on osteopathic medicine by Dr. S. Weiss, Director of The Medicine Lodge Clinic, and Dr. S. Milani, Touro College of Osteopathic Medicine; (b) an information session on the Ben Gurion University Medical School for International Health in collaboration with Columbia University Medical Center, led by Ms. S. Sternglass, Public Relations Coordinator, and Dr. Ilana Pister, a graduate of SCW and Ben Gurion Medical School; (c) a talk by Dr. P. Alexander, Assistant Director for Admissions, on the Technion American medical student program; and (d) a panel of dentists representing the NYS Dental Foundation spoke on their specialties. The panel included Dr. M.S. Ginzburg, general, aesthetic and implant dentistry, Dr. R. Ambewadikar, pediatric dentistry, Dr. J.M. Friedman, oral surgery, Dr. G. Gaynor, orthodontics, Dr. S. Klein, periodontics, and Dr. S.A Reddy, endodontics.

Faculty: Lea Blau, Ph.D.; Lora Danley, M.S.; Cecily Dobin, M.S.; Donald Estes, Ph.D.; Alon Gorodetsky, Ph.D.; Chandrika Illandari, M.S; Evan Mintzer, Ph.D.; Chaya Rapp, Ph.D.; Lance Silverman, Ph.D.; Firuzeh Victory, B.S.

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.

Research in computational chemistry, in the area of protein tertiary structure, is ongoing under the mentorship of Dr. Chaya Rapp. Dr. Rapp has recently been awarded a three year R15 AREA grant from the National Institutes of Health (NIH) for her proposal on "Computational Modeling of Post-translational Modification in Proteins. Students are involved in various aspects of this project. Hadassa Klerman, (SCW '11) has been studying hydrogen bonding in tyrosine residues that have been modified by the addition of a phosphate or sulfate group. Emily Levine (SCW '12) is conducting statistical studies of the Protein Databank (www.pdb.org) to discover the frequency and nature of hydrogen bonding patterns among modified residues. Zeeva Levine (SCW '13) has begun working on developing parameters for the study of methylated lysine residues with a focus on the distinct effects resulting from mono, di or tri-methylation. As part of a recently competed project, Aviva Schiffmiller and Esther Leah Schonbrun (SCW '10) are co-authors of "A Molecular Mechanics Approach to Modeling Protein-Ligand Interactions: Relative Binding Affinities in Congeneric Series and Covalent Docking," which is currently under review by the Journal of Chemical Information and Modeling. Finally, Dr. Rapp and student Elisa Karp (SCW '12) are studying enzyme specificity in the isoprenoid synthase enzymes as participants in the Collaborative Center for an Enzyme Function Initiative, a multi disciplinary effort among several research groups.

Stern's resident biophysical chemist, Dr. Evan Mintzer, has been working with several students on a variety of projects. Rivkah Rogawsky, whose presentation of her research into the effect of the bioactive lipid lysophosphatidic acid (LPA) on model membranes won the science poster competition at Stern College and the ICE annual poster competition at Yeshiva College, also presented her results at the national American Chemical Society's annual meeting in California. Rebecca Weiss, who, like Ms. Rogawski, graduated from SCW with honors this year, contributed to the manuscript reporting on the membrane-perturbing effects of LPA. Stern sophomore Nasim Tishbi, a Kressel scholar, generated surface activity and self-aggregation data on LPA and is also a contributing author of that paper, now under revision.

The Mintzer lab also collaborated with Dr. Kathryn Uhrich's group at Rutgers University, in which the thermostability of polymer-lipid complexes was studied. Another graduating senior, Danielle Lent, together with Ms. Tishbi, produced data for this research, which was accepted for publication in the journal Langmuir (in print).

During the summer of 2011, two additional research projects were initiated in Dr. Mintzer's lab. In the first, Ms. Tishbi, along with Stern junior Avigayil Ginsburg, will study the effects of very low (i.e. physiological) concentrations of oxidized cholesterol derivatives on membrane behavior using a variety of model systems. This work constitutes an expansion of research done earlier in Dr. Mintzer's lab (the results of which were reported in the journal Chemistry and Physics of Lipids, 2010, **163**, pp. 586-893) by Ms. Grace Charles, Stern's valedictorian in 2008 and presently completing her third year of study at Mt. Sinai School of Medicine for the MD degree. The second project will investigate the kinetics and thermodynamics of the activity and inhibition of autotaxin, an enzyme that catalyzes the conversion of lysophosphatidyl cholines to LPA, using isothermal titration calorimetry.

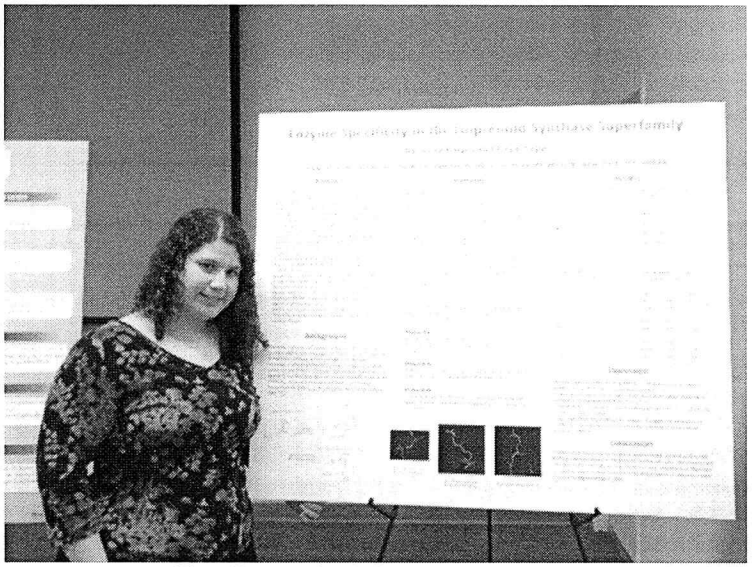
Finally, additional data collected in a study with Dr. P.V. Subbaiah (University of Illinois at Chicago) on conjugated phosphatidylcholines (2010) Biochim. Biophys. Acta **1798:** 506-514**)** are being published in an additional article in which the results were analyzed for additional membrane properties (Biochim. Biophys. Acta, revised edition under final review).

In the laboratory of Professor Colin Nuckolls at the Department of Chemistry of Columbia University, under the mentorship of Dr. Alon Gorodetsky, student Avigail Soloveichik studied the electrochemistry of materials that enable the conversion of sunlight into electricity. Her work could lead to a better understanding of the performance of these materials in organic solar cells. Also in Professor Colin Nuckolls laboratory and in collaboration with Dr. Mark Hybertsen of Brookhaven National Laboratory, mentored by Dr. Alon Gorodetsky and assisted by Hanfei Wang, student Avigail Soloveichik is researching the self-assembly of pyrene-DNA conjugates at graphitic surfaces. This project seeks to understand the self-assemby of DNA at carbon nanotube-based field effect transistors (CNT-FETs) for the development of sensitive, nanoscale biosensors.

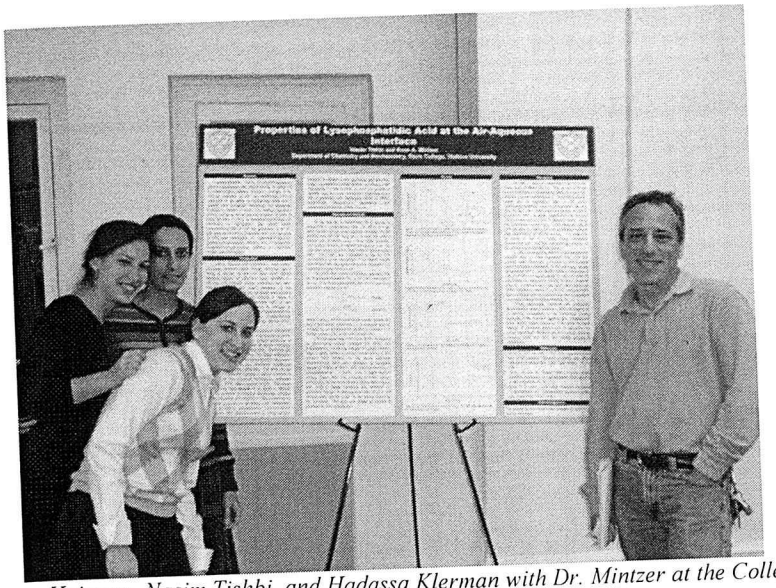
Under the mentorship of Dr. Don Estes and Dr. Lea Blau, Sarah Guigui and Nili Seleski participated in research on the effect of base stacking on the stability of deoxyoligonucleotides and in the development of a biophysical chemistry experiment on DNA stability for the *Physical Chemistry On-Line Consortium.* A manuscript to be submitted to the Journal of Chemical Education is in progress.

The Stern College Chemistry club, advised by Drs. Estes and Rapp, is an award winning affiliate of the American Chemical Society (ACS), and has earned four

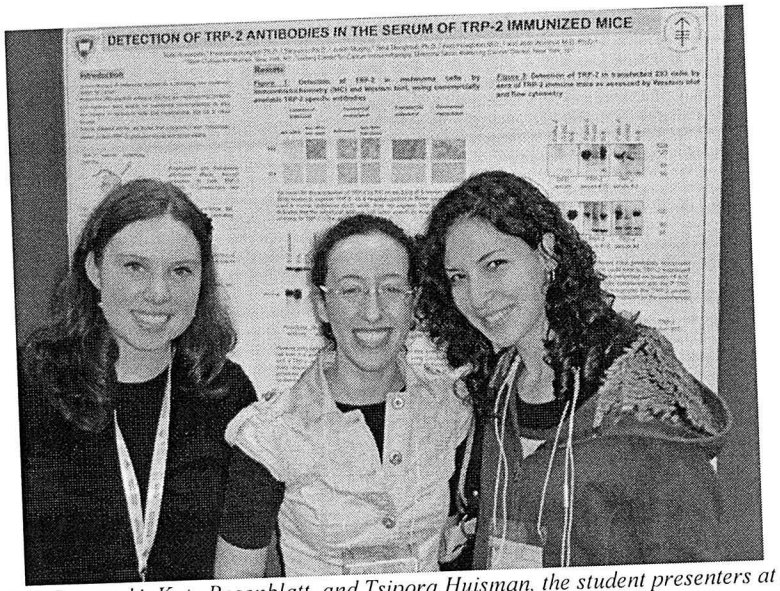
Innovative Activities Grants and two Community Interaction Grants over the past five years. In addition, travel grants were obtained to support students' attendance at ACS meetings. Each year the club runs activities related to a particular theme; recent themes have included "Coloring the World in Chemistry" and "Chemistry and Outer Space." Activities include guest lectures, field trips to pharmaceutical companies, the Food and Drug Administration, museums, and other cultural events. To interest the entire student body tie-dyeing and a magic show are also included in the Club's activities. The colorful magic show, directed by Mrs. Cecily Dobin and performed by members of the Club, is the highlight of the year. The show is attended by Stern College students as well as local high school students. Over the past decade, in recognition of its various accomplishments, the Club has been presented with Outstanding, Commendable, Honorable Mention, and Green Chemistry awards at ACS national meetings.



Elisa Karp at the College's poster contest.



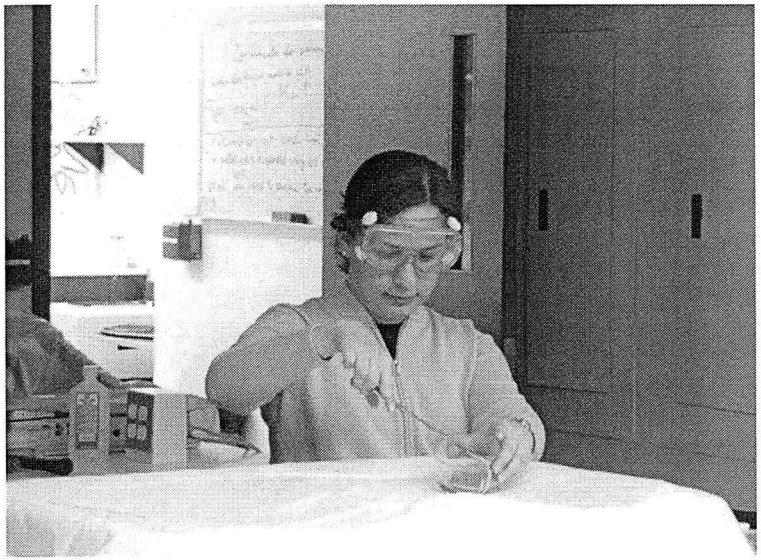
Tsipora Huisman, Nasim Tishbi, and Hadassa Klerman with Dr. Mintzer at the College's poster contest.



Rivkah Rogawski, Kate Rosenblatt, and Tsipora Huisman, the student presenters at the undergraduate poster session of the 2011 ACS meeting in Anaheim.

Dr. Estes, Kate Rosenblatt, Tsipora Huisman, and Rivkah Rogawski at the undergraduate awards ceremony of the 2011 ACS meeting in Anaheim.

Rachel Kirschenbaum and Aviva Gittleman , students in organic chemistry, make nylon in the magic show.



Hadassa Klerman, a graduating senior, participates in the magic show.

In recent years, the number of students enrolled in chemistry courses has increased significantly. In order to maintain small classes, two sections of Organic Chemistry lectures are offered and the number of laboratory sections in both General and Organic Chemistry were increased. A new laboratory specialist was hired for General Chemistry. The laboratory course in organic chemistry has been upgraded as a result of the purchase of new instrumentation. The Analytical Chemistry lecture and laboratory are upgraded to emphasize modern instrumental methods and to include a series of laboratory experiments to characterize the molecular composition of bone, a research focus of the instructor's. In the Biochemistry Laboratory course, new experiments on lipid monolayers, lipid rafts, and model membranes were introduced. Incorporation of laboratory experiments in Analytical Chemistry and Biochemistry that are related to the instructors' research interests allows new course content to be taught in the context of current, cutting edge and biologically relevant research. In addition, a journal club/seminar course on a novel area of chemistry is given, usually by a visiting professor.

Recently, a chemistry course for non-science majors, examining chemistry as it relates to the world around us with emphasis on contemporary environmental issues, was introduced. Furthermore, a course in medicinal chemistry dealing with the discovery and design of new therapeutic agents and their development into useful medicines was offered for the first time in the spring term of 2010. These courses were offered in 2011 as well.

In May 2009 four students received a bachelor degree in Biochemistry; and in

May 2010, six students received a bachelor's degree in Biochemistry and three students were awarded a bachelor degree in Chemistry. In May 2011, nine students received a bachelor degree in Biochemistry and three students were awarded a bachelor's degree in Chemistry.

Chemistry and Biochemistry graduates have gone on to medical, dental, optometry, and law schools; graduate programs in the sciences; and careers in science education.

DEPARTMENT OF PHYSICS

Faculty: Anatoly Frenkel, Ph.D., Professor; Emil Prodan, Ph.D., Assistant Professor; Lea Ferreira dos Santos, Ph.D., Assistant Professor; Mark Edelman, Ph.D., Clinical Assistant Professor; Relja Vasic, Ph.D., Research Associate

The Physics Department at Stern College for Women (SCW) has been steadily gaining interest among incoming freshmen due to its "research and discovery approach" to education. Many talented students aspire to a degree in physics due to the opportunities that have been created in the department over the last few years. Students have access to the state of the art computational labs established at our Stern College and to experimental facilities in the National Laboratories and major research centers through collaborative research and education programs that the Physics Department has created. All faculties pursue an extremely active research agenda and their articles have been published in prestigious professional journals and their work has been highlighted on several occasions and awarded with research grants. The exposure to such first class science and the atmosphere of discoveries plays a major role for undergraduate students shaping their career plans.

The Physics Department offers a B.A. degrees in Physics and Physical Sciences. Recent graduates attended Columbia University's graduate program in physics, Hunter College's graduate program in physics, as well as several graduate programs in engineering across the country and in Israel.

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

The Physics Department faculty members have active research programs in experimental and theoretical physics. Drs. Lea Ferreira dos Santos and Emil Prodan specialize in theoretical condensed matter physics. Dr. Santos' research interests include quantum entanglement, quantum chaos and control, random matrix theory, and quantum computing, among many others. Her research is supported by a grant from the Research Corporation. Dr. Prodan's interests are in topological insulators, strongly correlated systems, bio-materials, charge and spin transport. His research is supported by research grants from the Research Corporation and National Science Foundation. Dr. Edelman is a theoretical physicist who specializes in chaos theory, dynamical systems and astrophysics. Dr. Frenkel is an experimental physicist who runs federally funded research programs in nanoscience and nano-catalysis at Brookhaven National Laboratory

on Long Island. He is a founding director of a recently established Synchrotron Catalysis Consortium at Brookhaven National Laboratory (2005-2006). Many research activities involving SCW students take place at the Consortium facilities. Dr. Relja Vasic, a postdoctoral research associate, started in February 2010. He is supported by a catalysis grant awarded to Dr. Frenkel by the Department of Energy and is stationed at Brookhaven National Laboratory.

Physics students benefit from an intense and challenging curriculum. In the spring of 2010, the physics courses offered included General Physics (calculus based), Introductory Physics (algebra based), Quantum Mechanics, and Mathematical Physics (all honors courses). The Department also runs a weekly seminar where scientists from other universities are invited to present their latest research findings in front of the students and the faculty members.

DEPARTMENT OF PSYCHOLOGY

Faculty: Joshua Bacon, Ph.D.; Terry DiLorenzo, Ph.D.; Robin Freyberg, Ph.D.; Aharon Hersh Fried, Ph.D.; Lauren Harburger, Ph.D.; Marcel Perlman, Ph.D.;

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

This past year the Psychology Department was pleased to introduce a new Neuroscience Track option for Psychology majors. This track offers a focused education to students who are interested in the biology behind human and animal behavior. Students who choose this track receive a basic grounding in psychology through the core courses that are required of all majors, including Experimental Psychology, Social Psychology, Life Span Development and Personality. Further requirements and electives come from critical courses in Neuroscience, such as Cognitive Neuroscience, Behavioral Neuroendocrinology, and a Neurobiology lecture and lab.

Students who are planning to apply to Ph.D. or Psy.D. programs in Psychology or to pursue careers in the other health-related fields such as Physical, Occupational, or Speech Therapy are encouraged to become actively engaged in research. Students have gained invaluable experience outside the classroom by learning about the fundamental role of research in theory and practice of psychology by working with faculty members in projects off-campus such as with Dr Joshua Bacon in the Multiple Sclerosis Care Center at NYU or with Dr. Aharon Fried on his research in Special Education in the Hebrew Schools. On campus, students have worked on research projects with Dr. Freyberg exploring the role of olfaction in social and emotional behavior, with Dr. Lauren Harburger in the neurobiology and psychology of sex differences, or with Dr. Terry DiLorenzo focusing on health-related attitudes and cognitions and their

relations to health behaviors. Many of these students have coauthored presentations at both national and international conferences.

For students whose interests lie in areas outside of those of the department, opportunities are available in a number of academic, hospital, and clinical settings. In this case, a faculty member may serve as a supervisor to maintain continuity of the student's experience as an integrated part of her program in psychology.

Students engaged in research are encouraged to present their work at the Annual Behavioral Sciences Student Research Conference held at the Ferkauf Graduate School of Psychology of Yeshiva University. The conference serves as a valuable opportunity for undergraduates to discuss their research in an academic setting and meet other undergraduate and graduate students involved in research.

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 PhD 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 where he has been ever since. He teaches basic courses in Experimental Psychology, Cognition, Learning, Psychobiology, as well as advanced courses such as Mind, Language, and Consciousness. Dr. Bacon's area of research is perception and cognition and, in particular, cognitive impairment and rehabilitation in patients with Multiple Sclerosis. He holds an Adjunct Assistant Professor position in the Department of Neurology of 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. 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 where she investigated anticipatory distress in women receiving chemotherapy for breast cancer. She 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. Dr. DiLorenzo's research focuses on health-related attitudes and cognitions and their relations to health behaviors, as well as quality of life in women receiving radiation treatment for breast cancer. Dr. DiLorenzo has involved a number of Stern College students in her research projects and has supervised several others completing independent projects. Dr. DiLorenzo teaches the Honor's Psychology Research Seminar in which upper-level psychology majors complete psychology research internships and has recently developed and co-taught Fundamentals of Public Health, a graduate-level course open to both Stern College for Women and Yeshiva College students.

Dr. Robin Freyberg received a B.A. in Psychology from Columbia University and a Ph.D. in Social Developmental Psychology from Rutgers University – New Brunswick. She joined the Psychology Department of Stern College for Women in 2005. She also is an Adjunct Assistant Professor of Psychology in Psychiatry at Weill Cornell Medical College. Since opening her Social Development Laboratory at Stern, she has supervised over 30 students in a variety of lab projects and independent research. Dr. Freyberg's research explores how the olfactory environment influences social and emotional behavior as well as the role of narrative in psychiatric diagnosis and treatment. Aside from research, Dr. Freyberg teaches a wide variety of courses at Stern including Introductory Psychology, Developmental Psychology, Social Psychology, Cross-Cultural Social Development, Personality, Psychology of Women, and the Emotion Seminar. She also serves as the pre-psychology advisor where she advises students at all stages of the psychology major to help them prepare for careers in psychology.

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

Dr. Lauren Harburger earned a B.S. from Cornell University in Human Biology,

Health, and Society. She then attended graduate school in the Department of Psychology at Yale University where she earned her M.S., M.Phil., and Ph.D. During graduate training, Dr. Harburger investigated the effects of age, sex, and ovarian hormones on learning and memory. Her research has been published in *Behavioral Neuroscience, Neurobiology of Learning and Memory, Neurobiology of Aging, Behavioural Brain Research,* and *Journal of Neuroscience*. Dr. Harburger joined the SCW faculty in fall 2008 where she continues to examine the effects of age and sex on learning and memory. Several undergraduate research assistants have been involved in her research investigating the effects of aging on object memory and spatial abilities in men and women. She is also involved in a project examining the cognitive effects of exogenous and endogenous female sex hormones. Dr. Harburger enjoys teaching at Stern and offers a number of courses including Introductory Psychology, Developmental Psychology: Life Span, Psychobiology, and Behavioral Neuroendocrinology.

Dr. Marcel Perlman earned his B.A., M.A., and Ph.D. from Yeshiva University. He received his Doctorate in 1959. In 1958 he was appointed as an Instructor in Psychology at SCW, and in 1959 he was promoted to the rank of Assistant Professor. He became an Associate Professor in 1966 and attained his Professorship in 1979. Dr. Perlman became Chairman of the Division of Social and Behavioral Sciences in 2003. He has been a Clinical Supervisor at Ferkauf School of Psychology since 1982. As part of his Forensic Experience he has lectured for the Practicing Law Institute in the Area of Clinical Psychology and the Law. He is currently in limited Private Practice in Clinical and Forensic Psychology. Additionally, he has given numerous lectures and presentations, the latest of which was at the Oxford University (St. Anne's College) Annual Round Table on the topic of the Changing Paradigms of Contemporary Parenting.

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. These programs are competitive and final admissions decisions are made by the cooperating institutions.

Engineering - B.A./B.S. or B.A./M.S.
Stern College offers several combined plans in Engineering with Columbia University (CU) and Stony Brook University (SBU). Students in the combined YU-CU B.A./B.S. plan usually attend SCW for a minimum of three years, fulfilling all the general requirements for SCW graduation, as well as CU's specific subject matter requirements, and, with the recommendation of the Pre-Engineering advisor, may be admitted to CU's School of Engineering and Applied Science (SEAS). After successful completion of two additional years at CU, SCW awards the B.A. in the major of the candidate's choice, and CU concurrently awards the B.S. in Engineering. Under the B.A./M.S. plan, the student completes a B.A. degree at SCW while fulfilling prerequisites for SEAS. If admitted by the Graduate Department, after two additional years of study at CU, the student receives the M.S., bypassing the bachelor's degree in Engineering.

Students in the combined YU-SBU 3+2 program start their education at SCW and finish at SBU's College of Engineering and Applied Sciences (CEAS). After spending 3 years at SCW, students will have an option either to graduate with B.S. degree in Engineering from SBU or to take graduate level courses during their second year at CEAS and graduate with an M.S. degree, also in two years.

Nursing - B.A./B.S.N./M.S.N.
Stern College offers combined programs in nursing with Johns Hopkins University (JHU) and with New York University (NYU). For JHU, students spend three years at Stern College completing college requirements and pre-requisite courses for a total of 111 credits, followed by a 13½ month accelerated program at JHU. Upon successful completion of these studies, students earn a B.A. from Stern College and a B.S.N. from JHU. In the NYU program, students complete seven semesters of required course work with a minimum of 119 credits at Stern College followed by a 15-month accelerated program at NYU College of Nursing (NYUCN). Students receive the BA degree after successfully completing one semester at NYUCN.

Occupational Therapy - B.A./M.S.
Stern College offers a combined program in Occupational Therapy with Columbia University (CU). During the first three years at SCW, students

complete college requirements and prerequisites for CU's OT program. They apply to the two-year CU program during the fall semester of their junior year. Students are awarded the B.A. from Stern College after the 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 programs in Physical Therapy with New York Medical College Graduate School of Health Sciences and the University of Medicine and Dentistry of N. J. During the first three years at Stern College, students complete college requirements and prerequisites for the Doctorate of Physical Therapy Program. Students are awarded the B.A. after completing the first year at the professional school, and the D.P.T. at the completion of the three-year program.

Physician Assistant - B.A./M.P.S.
Stern College offers a combined program in Physician Assistant Studies with Mercy College. During the first three years, students complete college requirements and prerequisites for Mercy College's M.P.S. program. After completing 111 credits with a minimum GPA of 3.0, and with at least a "B" in prerequisite courses, qualified students continue at Mercy College. After the first year at Mercy College, students receive the B.A. degree from Stern College. The M.P.S. degree is awarded after completing two years and three months at Mercy.

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

Teaching, Math and Science - M.S.
Through an innovative agreement with the NYU Steinhardt School of Culture, Education, and Human Development, juniors and seniors at YU may enroll in selected math or science education courses at NYU. These courses will count both toward the undergraduate degree at SCW and will reduce the number of credits needed for a M.S. degree in math education or in science education from NYU Steinhardt.

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

SUMMER RESEARCH AT THE ALBERT EINSTEIN COLLEGE OF MEDICINE

Every year, several of Stern College for Women's most talented sophomores and juniors apply for research internships in the Roth Scholars Program, sponsored by the Ernst and Hedwig Roth Institute of Biomedical Science Education. This prestigious internship, hosted by YU's Albert Einstein College of Medicine (AECOM), provides students with exposure to nine weeks each summer of intensive biomedical research. Under the guidance of AECOM's top scientists, these women participate in research projects, many of which are at the cutting edge of medicine. For the summer of 2009, four Stern College women were selected for this undergraduate research experience, having successfully passed the rigorous application and interview process. In addition, through the Office of the Vice Present for Academic Affairs, Dr. M. Lowengrub initiated a research internship, the University Undergraduate Research Scholar. For the summer of 2009, two Stern College women were awarded this internship. SCW graduates, currently medical students at AECOM, have established the undergraduate research internship, the Stern-Einstein Research Connection (SERC) Scholar. The University Undergraduate Research Scholar and the SERC Scholar also performed summer research at AECOM.

Summer, 2011

Roth Scholars
Elisa Karp Miriam Steinberger

University Undergraduate Research Scholar
Faygel Beren Jordana Schneider

SERC Scholar
Nancy Shilian

Summer, 2010

Roth Scholars
Orli Haken Tsipora Huisman Hadassa Klerman
Jennifer Kraut Danielle Lent

University Undergraduate Research Scholar
Rebecca Weiss

SERC Scholar
Dina Golfeiz

Summer, 2009

Roth Scholars
Fay Burekhovich Tirtza Spiegel
Chava Ruderman Shoshana Zitter

University Undergraduate Research Scholar
Avital Bauman Emily Liebling

SERC Scholar
Rebecca Weiss

Summer, 2008

Roth Scholars
Judith Fischer Reena Gottesman Wendy Hosinking
Batya Herzberg Sarah Ariella Hollander Tehilla Raviv

University Undergraduate Research Scholar
Ellen Dinerman

SERC Scholar
Avital Bauman

Summer, 2007

Roth Scholars
Abigail Atlas Sarah Guigui
Zahava Brodt Cheryl Schonbrun
Rachel Yamnik

University Undergraduate Summer Research Scholar
Shifra Klein

SERC Scholar
Wendy Hosinking

Summer, 2006

Roth Scholars
Michelle Cohen Jessica Feig
Elizabeth Ravkin Louisette Soussan

University Undergraduate Summer Research Scholar
Michelle Goldberg Yelena Kozirovsky

Summer, 2005

Roth Scholars
Yael Barak Frida Fridman Tamar Gold
Helen Nissim Ilana Pister Tehilla Stepansky
Sarah Weinerman

University Undergraduate Summer Research Scholar
Suzanne Snyder

Summer, 2004

Roth Scholars
Esther Flaschner Eydie (Pesi) Porat Malkie Krupka
Debbie Rybak Reina Roth

Summer, 2003

Roth Scholars

Nomi Ben-Zvi — Elisheva Douglas — Chaya Gopin
Dina Ohevshalom

University Undergraduate Summer Research Scholar

Tova Fischer

Summer, 2002

Roth Scholars

Caryn Gamss — Julia (Tobi) Josovitz
Meryl Sava — Anna Sedletcaia

Summer, 2001

Roth Scholars

Shayna Aster — Elena Sedletcaia — Yehudit Weinberger

University Undergraduate Summer Research Scholar

Bracha Kenigsberg — Hadassa Rutman — Meredith Weiss

Summer, 2000

Roth Scholars

Shira Rivkin — Shiry Wagner

Summer, 1999

Roth Scholars

Olga Dynina — Rochelle Goldfisher

Summer, 1998

Roth Scholars

Jeniffer Feig — Sivah Shifteh — Malka Skiba

Summer, 1997

Roth Scholar

Sarah Friedman

Summer, 1996

None

Summer, 1995

Roth Scholars

Caren Gottlieb — Lauren Insel — Azita Simoni

Summer, 1994

Roth Scholars

Judy Ehrenberg — Stacey Renee Rubel — Brenda Wurzburger

Summer, 1993

Roth Scholars

Yaffa Cheslow — Rashel Monhian — Stacey Tuckman

Summer, 1992

Roth Scholars

Nava Goldman — Marcia R. Palace — Randi Kay Sasnowitz

Summer, 1991

Roth Scholars

Monica Kriger — Aviva Rosenstein

Summer, 1989

Roth Scholar

Heather Rush

Summer, 1988

Roth Scholars

Bat Sheva Levine — Tamar Silverstein

Summer, 1987

Roth Scholars

Miriam Berger — Aviva Kahane

Summer, 1986

Roth Scholar

Deborah Bernstein

Summer, 1985

Roth Scholars

Shoshana Kahn — Francine Anne Ziv — Elana Unger

Summer, 1984

Roth Scholars

Michelle Small — Susan Mandelbaum

THE ANNE SCHEIBER FELLOWSHIP PROGRAM

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

Chaya Abelow
Agnes Nathalie Abitol
Nechama Ackerman
Abigail Atlas
Miriam Ausubel
Rachel Aviv
Tamar Belsh
Nomi Ben-Zvi
Deena Blanchard
Yael Boyarsky
Zahava (Nilly) Brodt
Faigy Burekhovich
Aliza Charlop
Tzipa Chaim
Esti Charlop
Elana Clark
Barrie Cohen
Davida Cohen
Michelle Cohen
Jennifer Deluty
Ellen Dinerman
Abigail Feldman
Tova Fischer
Aliza Forman
Rena Frankel
Tamara Freiden
Ahuva Freilich
Caryn Gamss
Julie Gilbert
Aviva Ginsburg
Ariella Glueck
Sharon Gordon
Reena Gottesman
Jessica Gross
Batya Hertzberg
Ariella Hollander
Wendy Hosinking
Julia Josowitz
Chava Kahn
Hadassah Klerman
Lea Kozirovsky
Aimee Krausz
Malka Krupka
Yosefa Lerner
Elisheva Levine
Emily Liebling
Esther Mizrachi
Ariella Nadler
Helen Nissim
Chana Gila Ovitz
Yardanna Platt
Tehilla Raviv
Yael Raymon
Tamar Riegel Weinberger
Shuli Roditi-Kulak
Shira Roszler
Rachel Rubinstein
Chava Ruderman
Debbie Rybak
Esther Leah Schoenbrun
Chana Schonbrun
Naomi Schneider
Nechama Mina Shoshani
Michelle Simpser
Shani Snyder
Tirtza Spiegel
Tehilla Stepansky
Temima Strauss
Jessica Tugetman
Yehudit Weinberger
Amanda Weiss
Meredith Weiss
Rebecca Weiss
Sahar Zaghi

STUDENT ACCOMPLISHMENTS ACADEMIC YEAR 2010-2011 AND SUMMER 2011
DEPARTMENT OF BIOLOGY, DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY, DEPARTMENT OF PHYSICS, AND DEPARTMENT OF PSYCHOLOGY

Ph.D - Biomedical sciences	Sue Golding, AECOM (1)
Ph.D.- Chemistry	Princeton (1); Columbia Univ. (1)
Ph.D/Psy.D. – Psychology	Ferkauf (1); LaSalle Univ. (1); St. John's Univ. (1)
Allopathic medical school	AECOM (16); Downstate (1); Hofstra Univ. (2); UMDNJ (2); Florida Atlantic Univ. (1); Technion (1)
Osteopathic medicine	Touro (1); NYCOM (2)
Dental school	Univ. Pennsylvania (1); Boston Univ. (1); Columbia Univ. (3); Univ. Maryland (1); Tufts (1); UMDNJ (1); NYU (4)
Optometry school	SUNY (1)
Physical therapy	Hunter (1); LIU (1); Columbia Univ. (1); UMDNJ (1); SUNY Downstate (1)
Physician assistant	Touro (3); LIU (1); Mercy College (1)
Occupational therapy	NYU (5); SUNY Downstate (2); Seton Hall Univ. (1); Touro (1); Kean Univ. (1)
Nursing	NYU (13); UMDNJ (2); Drexel Univ. (1); SUNY Downstate (1); Columbia Univ. (1); Pace Univ. (1); University of Miami (1); University of Maryland (1); University of Toronto (1)
M.S. - Biomedical Engineering	Université Paris Descartes, Institute Paris Tech (1)
M.S. - Nutrition	Hunter (1)
M.S. - Public health	Columbia Univ. (1); NY Medical College (1)
M.S. - Social work	Hunter (1); Fordham Univ. (1)

Law school	Harvard (1, a biology major)
MS. - Education	Teacher's College (1); CUNY (1)

Winners of the in-house scientific poster competition, October 12, 2010

Tsipora Huisman (poster title: AID and Gadd45a: Are they involved in active DNA demethylation of the 3'RR and class switch recombination?)

Rivkah Rogawski (poster title: Elucidating the interaction of LPA with model membranes)

Kate Rosenblatt (poster: Detection of TRP-2 antibodies in the serum of TRP-2 immunized mice)

Awards:

Rebecca Miller: M.S. program in Pharmacology, University of Toronto (entered September 2010) is a recipient of a $15,000 research scholarship.

Summer 2011 - Internships

Shaine Abbani: AECOM & Jacobi Medical Center (Drs. Lipton & Provataris)

Pamela Apfel: Program for Jewish Genetic Health of Yeshiva University (Dr. N. Agus)

Aviva Azar: UMDNJ (Dr. Gill Diamond)

Sarrit Bassal: Summer Science Research Internships for Yeshiva University Students at Bar-Ilan University

Geulah Ben David: Summer Science Research Internships for Yeshiva University Students at Bar-Ilan University

Rebecca Benhaghnazar: Cedars Sinai (Los Angeles)

Faygel Beren: University Undergraduate Summer Research Scholar, AECOM

Rachel Blinick: Summer Science Research Internships for Yeshiva University Students at Bar-Ilan University

Lisa Cohen: Hadassah Hospital (Yavneh Olami)

Koral Dadon: AECOM

Bluma Dukesz: SCW, Department of Physics (Dr. A. Frenkel)

Batya Edelman: Department of Biology, YC and Dept. Medicine, AECOM (Dr. Y. Peter)

Amanda Elmakiyes: Beth Israel Medical Center (Dr. D. Seto-Young)

Nora Ellison: SCW, Department of Psychology (Dr. Harburger)

Channah Esan: AECOM (Dr. Michelle Ng Gong)

Simone Fertel: SCW, Department of Biology (Dr. H. Babich)

Maya Fishbein: Montefiore Hospital/AECOM

Naomi Friedman: Einstein/Montefiore Medical Center (Dr. Ruth Freeman)

Avigayil Ginsburg: SCW, Department of Chemistry/Biochemistry (Dr. E. Mintzer)

Miriam Gofine: Hospital for Sick Children, Toronto (Dr. Joanne Rovet)

Naomi Gofine: University of Toronto's Sunnybrook Research Institute (Dr. Bradley Strauss, Cardiology)

Elizabeth Goldberger: Florida Atlantic University Medical School

Aviva Gubin: SCW, Department of Physics (Dr. L. Santos)

Leah Elisheva Gutstein: SCW, Department of Biology (Dr. M. Vigodner)

Orli Haken: Summer Science Research Internships for Yeshiva University Students at Bar-Ilan University

Erica Hasten: Summer Science Research Internships for Yeshiva University Students at Bar-Ilan University

Kira Joel: Summer Science Research Internships for Yeshiva University Students at Bar-Ilan University

Margo Kahn: Northwestern University

Elisa Karp: Roth Scholar, AECOM

Davida Kollmar: Summer Science Research Internships for Yeshiva University Students at Bar-Ilan University

Miriam Koolyk: Summer Science Research Internships for Yeshiva University Students at Bar-Ilan University

Jennifer Lazaros: Beth Israel Medical Center (Dr. D. Seto-Young)

Naomi Levin: SCW, Department of Physics (Dr. A. Frenkel)

Zeeva Levine: SCW, Department of Chemistry/Biochemistry (Dr. C. Rapp)

Katie Liebling: RYSURP intern (Dr. M. Grumet)

Mollie Lindell: University of Pennsylvania (Drs. Bea Hollander & Nancy Isserman)

Elizabeth Lobell: AECOM (Dr. Golda Hudes)

Aliza Lochinsky: Health Careers Opportunity Program, Rusk Institute (Pharmacy)

Miri Mandelbaum: NYU Infertility Center (Dr. Ferda Arca-Sedda)

Sarah Tovah Mansher: Dental surgery (private dental practice)

Hannah Marmor: SCW, Department of Biology (Dr. M. Vigodner)

Avital Meiri: AECOM

Alex Michalowski: SCW, Department of Psychology (Dr. Freyberg)

Tova Miller: Summer Science Research Internships for Yeshiva University Students at Bar-Ilan University

Shoshana Mogilner: Physical Therapy Department, NYU Medical Center

Sarah Noble: AECOM (Dr. S. Smoller)

Naamah Plotzker: SCW, Department of Biology (Dr. M. Holz)

Sarah Reiss: SCW, Department of Biology (Dr. A.G. Schuck)

Rivkah Rogawski: Summer Science Research Internships for Yeshiva University Students at Bar-Ilan University

Kate Rosenblatt: Sloan Kettering

Tova Schiff: Shaarei Tzedek Hospital, Israel (pathology lab)

Jordana Schneider: University Undergraduate Summer Research Scholar, AECOM

Rachel Schwartz: New York Center for Neuropsychology and Forensic Behavioral Science

Sonia Shafner: Rhode Island Hospital, Brown University (Pathology; Dr. W. Cao)

Nancy Shilian; SERC Scholar

Malki Silverman: Montefiore Medical Center (Drs. E. Alderman & K. Lobach)

Miriam Sragow: Health Careers Opportunity Program, Rusk Institute (Physical therapy)

Paige Snyder: Montefiore Medical Center (Oncology unit)

Rose Snyder: Fox Chase Cancer Center (Philadelphia)

Miriam Steinberger: Roth Scholar, AECOM

Chana Stern: Stony Brook University (Dr. M. Rafailovich)

Rebecca Tabaroui: Department of Biology, YC and Dept. Medicine, AECOM (Dr. Y. Peter)

Rebecca Tessler: Knippenberg, Patterson, & Associates, Group Therapy (Mr. Craig Knippenberg)

Nasim Tishbi: SCW, Department of Chemistry/Biochemistry (Dr. E. Mintzer)

Helen Unger: Summer Science Research Internships for Yeshiva University Students at Bar- Ilan University

Davita Wachsstock: SCW, Department of Biology (Dr. M. Holz)

Tova Wargon: Montefiore's Child Psychiatry Annex (Dr. Eric Hollander)

Danielle Weis: Physical Therapy Department, NYU Medical Center

Laura Weiss: Toronto's Hospital for Sick Children- Developmental and Stem Cell Biology Program (Dr. S. Egan)

Bella Wolf: SCW, Department of Biology (Dr. J. Weisburg)

Sara Yitzhaky: PT/OT program, Alyn Institute, Jerusalem

Malka Zughaft: SCW, Department of Psychology (Dr. Harburger)

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

Gross, S., and Freyberg, R. (in press), Margaret Washburn. In R.W. Rieber (Ed.). *The Encyclopedia of the History of Psychological Theories.* Heidelberg, Germany: Springer.

Shorr, R., and Freyberg, R. (in press), Raymond B. Cattell. In R.W. Rieber (Ed.). *The Encyclopedia of the History of Psychological Theories.* Heidelberg, Germany: Springer.

Freyberg, R. and **Ahren, M.** (2011), Understanding fragrance preferences in adolescent girls,. J. Sensory Sci. (in press).

Goparaju, C.M.V., Pass, H.I., Blasberg, J., **Hirsch, N.**, and Donington, .J.S., 2010, Functional heterogeneity of osteopontin isoforms in non-small cell lung cancer. J. Thorac. Oncol,. 5:1516-1523.

Weisburg, J.H., Schuck, A.G., **Silverman, M.S., Ovits-Levy, C.G., Solodokin, L.J.**, Zuckerbraun, H.L., and Babich, H., 2010, Pomegranate extract, a prooxidant with antiproliferative and proapoptotic activities preferentially towards carcinoma cells, Anticancer Agts. Med. Chem., 10:634-644.

Shrivastava, V., **Pekar, M.**, **Grosser, E.**, Im, J. and Vigodner, M. 2010, SUMO proteins are involved in the stress response during spermatogenesis and are localized to DNA double-strand breaks in germ cells, Reproduction, 139:999-1010.

Dinerman, J. and Santos, L.F, 2010, Manipulation of the dynamics of many-body systems via quantum control methods, New Journal of Physics (in press)

Shrivastava, V., **Pekar, M.**, **Grosser, E.**, Im, J. and Vigodner, M. 2010, SUMO proteins are involved in the stress response during spermatogenesis and are localized to DNA double-strand breaks in germ cells, Reproduction (in press).

Yamnik, R.L. and Holz, M.K., 2010, mTOR/S6K1 and MAPK/RSK signaling pathways coordinately regulate estrogen receptor alpha serine 167 phosphorylation. FEBS Lett. 584:124-128.

Prodan, E. and **LeVee, A.**, 2010, Tunneling transport in devices with semiconducting leads, Phys. Rev., Series B, 81:085307.

Spiegel, T.N., Hill, K.A., and E. Warner, 2009, The attitudes of women with BRCA1 and BRCA2 mutations toward clinical breast examinations and breast self-examinations, J. Women Hlth. 18: 1019-1024.

Babich, H., **Akerman, N.J., Burekhovich, F.,** Zuckerbraun, H.L., and A.G. Schuck, 2009, *Gingko biloba* leaf extract induces oxidative stress in carcinoma HSC-2 cells, Toxicol. In Vitro 23:992-999.

Sanchez, S.I., Menard, L.D., **Bram, A.**, Kang, J.H., Small, M.W., Nuzzo, R.J., and Frenkel, A.I., 2009. The emergence of non-bulk properties in supported metal clusters: negative thermal expansion and atomic disorder in Pt nanoclusters supported on g-Al_2O_3 , J. Am. Chem. Soc. 131 , 7040-7054.

Rapp, C., **Schonbrun, C.**, Jacobson, M.P., Kalyanaraman, C., and Huang, N, 2009, Automated site preparation in physics-based rescoring of receptor ligand complexes, Proteins 77:52-61.

Hathaway, F., **Burns, E.**, and Ostrer, H., 2009, Consumers' desire towards current and prospective reproductive genetic testing, J. Genet. Couns. 18:137-146.

Vigodner, M., Weisburg, J.H., Shrivastava, V., **Marmor, R., Fathy, J.,** and Skop, N., 2009, Differential expression patterns of SUMO proteins in HL-60 cancer cell lines support a role for sumoylation in the development of drug.resistance, Cell Tiss. Res. (in press).

Rivera, T., Birnbaum, B., Izmirly, P., Byrne, P., Brauth, J., Katholi, M., Kim, M., **Fischer, J.**, Clancy, R., and Buyon, J., 2009, Disease progression in mothers of children enrolled in the research registry for neonatal lupus, Ann. Rheumat. Dis. 68a;828-835.

Dukesz, F., **Zilbergerts, M.,** and L. F. Santos, 2009, Interplay between interaction and (un)correlated disorder in one-dimensional many-particle systems: delocalization and global entanglement, New J. Phys.11, 043026.

Yamnik, R.L., **Digilova, A., Davis, D.C.**, **Brodt, Z.N.**, Murphy, C.J., and M.K., Holz, 2009, S6 kinase I regulates estrogen receptor α in control of breast cancer cell proliferation, J. Biol. Chem. 284:6361-6369 .

Babich, H., **Liebling, E.J.**, **Burger, R.F.**, Zuckerbraun, H.L., and A.G. Schuck, 2009, Choice of DMEM, formulated with or without pyruvate, plays an important role in assessing the in vitro cytotoxicity of oxidants and prooxidant nutraceuticals, In Vitro Cell. Dev. Biol. - Animal 45:226-233.

Durand, J.L., **Hosinking, W.**, and L.A. Jelicks, 2009, Time course of effects of inhalation anesthesia on blood glucose level in male and female C57BL/6 mice,

Horm. Metab. Res. 41:1-3 (published on-line; DOI 10.1055/s-0028-1112114)

Guffanti, E., Kittur, N., **Brodt, Z.N.**, Polotsky, A.J., Kuokkanen, S.M., Heller, D.S., Young, S.L., Santoro, N., and U.T. Meier, 2008, Nuclear pore complex proteins mark the implantation window in human endometrium, J. Cell Sci. 121:2037-2045.

Babich, H., **Gottesman, R.T., Liebling, E.J.**, and A.G. Schuck, 2008, Theaflavin-3-gallate and theaflavin-3'-gallate, polyphenols in black tea with prooxidant properties, Basic Clin. Pharmacol. Toxicol. 103:66-74.

Flores, R.M., Routledge, T., Seshan, V.E., Dycoco, J., Zakowski, M., **Hirth, Y.**, Rusch, V.W., 2008, The impact of lymph node station on survival in 348 patients with surgically resected malignant pleural mesothelioma: implications for revision of the American Joint Committee on Cancer staging system. J.Thorac. Cardiovasc. Surg. 136:605-610.

Iacobas, D., Suadicani, S., Iacobas, S., Chrisman, C., **Cohen, M.,** Spray, D., and E. Scemes, 2007, Gap junction and purinergic P2 receptor proteins as a functional unit: insights from transcriptomics. J. Membr. Biol. 217:83-91.

Frenkel, A.I., Ehre, D., Lyahovitskaya, V., **Kanner, L.**, Wachtel, E., and I. Lubomirsky, 2007, Origin of polarity in amorphous SrTiO3, Physical Rev. Lett. 99:215502 (also in: Virtual J. Nanoscale Sci. Technol., vol. 16, 2007)

Schuck, A.G., **Ausubel, M.B.,** Zuckerbraun, H.L., and Babich, H., 2007, Theaflavin- 3,3'- digallate, a component of black tea: an inducer of oxidative stress and apoptosis, Toxicol. In Vitro 22:598-609.

Orthmann-Murphy, J.L., Freidin, M., **Fischer, E.,** Scherer, S.S., and Abrams, C.K..2007, Two distinct heterotypic channels mediate gap junction coupling between astrocyte and oligodendrocyte connexins, J. Neurosci., 27:13949-13957.

Rapp, C.S., **Strauss, T.**, Nederveen, A.J. and G. Fuentes, 2007, Prediction of protein loop geometries in solution, Proteins 69:69-74.

Babich, H., **Selevan, A.R.**, and **E.R. Ravkin**, 2007, Glutathione as a mediator of the *in vitro* cytotoxicity of a green tea polyphenol extract, Toxicol. Mech. Meth. 17:357-369.

Babich, H., Zuckerbraun, H.L., and **S.M. Weinerman**, 2007, In vitro cytotoxicity of (-)-catechin gallate, a minor polyphenol in green tea, Toxicol. Lett., 171:171-180.

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, 2007, Geometry and charge state of mixed-ligand Au13 nanoclusters, Proc. Am. Inst. Physics, 882:749-751.

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Harris, T., **Soussan, L.**, Isseroff, R., Sun,Y., Rafailovich, M.H., and A.I. Frenkel, 2007, studies of palladium nanoparticles: Size control and hydrogenation, Proc. Am. Inst. Physics, 882:752-754.

Pease, D.M. Frenkel, A.I., Shanthakumar, P., Huang, T., Balasubramanian, M., Budnick, J.I., Brewe, D., **Abitbol, N.**, and O. Odom, 2007, Performance and improved design of the log spiral of revolution monochromator, Proc. Am. Inst. Physics, 882:902-904.

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Ehrlich, I., Strauss, B.H., and J. Butany, 2006, Stent thrombosis following the STAR technique in a complex RCA chronic total occlusion, Catheter Cardiovasc. Interv., 68:708-712.

Babich, H., **Pinsky, S.M., Muskin, E.T.**, and H.L. Zuckerbraun, 2006, *In vitro* cytotoxicity of a theaflavin mixture from black tea to malignant, immortalized, and normal cells from the human oral cavity, Toxicol. In Vitro 20: 677-688.

Sun, Y., Frenkel, A.I., Isseroff, R., **Shonbrun, C.,** Forman, M., Shin, K., Koga, T., White, H., Zhang, L., Zhu, Y., Rafailovich, M.H., and J. C. Sokolov, 2006, Characterization of palladium nanoparticles using X-ray reflectivity, EXAFS and electron microscopy Langmuir, Neuroradiology 22: 807-816.

Dow, G.S., Caridha, D., **Goldberg, M.**, Wolf, L., Koenig, M.L., Yourik, D.L., and Z. Wang, 2005, Transcriptional profiling of mefloquine-induced disruption of calcium homeostasis in neurons *in vitro*, Genomics 86:539-550.

Frenkel, A.I., **Nemzer, S., Pister, I., Soussan, L., Harris, T.,** Sun, Y., and M.H. Rafailovich, 2005, Size-controlled synthesis and characterization of thiol-stabilized gold nanoparticles, J. Chem. Phys. 123:184701.

Liu, W.C., Feldman, S.C., Schulder, M., Kalnin, A.J., Zimmerman, A., **Sinensky, R.**, 2005, The effect of tumour type and distance on activation in the motor cortex, Neuroradiology, 47:813-819.

Ponnusamy R., **Nissim, H.A.**, and M. Barad, 2005, Systemic blockade of D2-like dopamine receptors facilitates extinction of conditioned fear in mice, .Learn Mem. 12:399-406.

Jiang, T., Wang, Z., Proctor, G., **Moskowitz, S.**, Liebman, S.E., Rogers, T., Lucia, M.S., Li, J., and M. Levi, 2005, Diet induced obesity in C57BL/6J mice causes increased renal lipid accumulation and glomerulosclerosis via a sterol regulatory element binding protein-1C dependent pathway, J. Biol. Chem., 280:32317-32325.

Yu, Z., Jacobson, M.P., **Josovitz, J.**, Rapp, C.S., and R.A. Friesner, 2005, First shell solvation of ion pairs: Correction of systematic errors in implicit solvent models, J. Phys. Chem., part B, 108: 6643-6654.

Frenkel, A.I., **Frankel, S.C.,** and T. Liu, 2005, Structural stability of giant polyoxomolybdate molecules as probed by EXAFS, Physica Scripta, T115: 721-725.

Rapp, C.S. and **R.M. Pollack** (R. Frankel), 2005, Crystal packing effects on protein loops, Proteins: Structure, Function, & Bioinformatics 60:103-109.

Babich, H., **Gold, T.**, and **R. Gold**, 2005, Mediation of the *in vitro* cytotoxicity of green and black tea polyphenols by cobalt chloride, Toxicol. Lett., 155:195-205.

Jiang, F., Zhang, Z.G., Katakowski, M., Robin, A.M., **Faber, M.**, Zhang, F., and M. Chopp, 2004, Angiogenesis induced by photodynamic therapy in normal rat brain, Photochem. Photobiol. 79:494-498.

Weisburg, J.H., **Weissman, D.B.**, **Sedaghat, T.** and H. Babich, 2004, *In vitro* cytotoxicity of epigallocatechin gallate (EGCG) and tea extracts to cancerous and normal cells from the human oral cavity, Basic Clin. Pharmacol. Toxicol. 95:191-200.

Babich, H., **Krupka, M.E., Nissim, H.A.**, and H.L. Zuckerbraun, 2004, Differential *in vitro* cytotoxicity of (-)-epicatechin gallate (ECG) to cancer and normal cells from the human oral cavity, Toxicol. In Vitro 19:231-242.

Nehler, M.R., Coll, J.R., Hiatt, W.R., Regensteiner, J.G., Schnickel, G.T., Klenke, W.A., Strecker, P.K., Anderson, M.W., Jones, D.N., Whitehill, T.A., **Moskowitz, S.**, and W.C. Krupski, 2003, Functional outcome in a contemporary series of major lower extremity amputations, J Vasc Surg. 38:7-14.

Babich, H., **Sedletcaia, A.**, and **B. Kenigsberg,** 2002, *In vitro* cytotoxicity of protocatechuic acid to cultured human cells from oral tissue: involvement in oxidative stress, Pharmacol. Toxicol., 91:145-253.

Babich, H., **Reisbaum, A.G.** and H.L. Zuckerbraun, 2000, *In vitro* response of human gingival epithelial S-G cells to resveratrol, Toxicol. Lett., 114:143-153.

Babich, H., Zuckerbraun, H.L., **Hirsch, S.T.** and L. Blau, 1999, *In vitro* cytotoxicity of the nitric oxide donor, *S*-nitroso-*N*-acetyl-penicillamine, towards cells from human oral tissue, Pharmacol. Toxicol., 84:218-225.

Zuckerbraun, H.L., Babich, H., **May, R.J.** and M.C. Sinensky, 1998, Triclosan: cytotoxicity, mode of action, and induction of apoptosis in human gingival cells *in vitro*, Eur. J. Oral Sci., 106:628-636.

Babich, H., Zuckerbraun, H.L., **Ricklis, A.S.** and L. Blau, 1998, *In vitro* toxicity of sodium nitroprusside to human endothelial ECV304 cells, Environ. Toxicol. Pharmacol., 5:135-144.

Davis, D.L., Gottlieb, M.B. and **J.R. Stampnitzky**, 1998, Reduced ratio of male to female births in several industrial countries: a sentinel health indicator? JAMA 279:1018-1023.

Babich, H., **Segall, M.A.** and K.D. Fox, 1997, The *Allium* test - a simple eucaryote genotoxicity assay, Amer. Biol. Teach., 59:580-583.

Babich, H., Zuckerbraun, H.L., **Wurzburger, B.J., Rubin, Y.L.**, Borenfreund, E. and L. Blau, 1996, Benzoyl peroxide cytotoxicity evaluated *in vitro* with the human keratinocyte cell line, RHEK-1, Toxicology, 106:187-196.

Babich, H., Zuckerbraun, H.L., **Barber, I.B.,** Babich, S.B. and E. Borenfreund, 1996, Cytotoxicity of sanguinarine chloride to cultured human cells from oral tissue, Pharmacol. Toxicol., 78:397-403.

Sinensky, M.C., **Leiser, A.L.** and H. Babich, 1995, Oxidative stress aspects of the cytotoxicity of carbamide peroxide: *in vitro* studies, Toxicol. Lett., 75:101-109.

Babich, H., **Wurzburger, B.J., Rubin, Y.L.,** Sinensky, M.C., Borenfreund, E. and L. Blau, 1995, An *in vitro* study on the cytotoxicity of chlorhexidine digluconate to human gingival cells, Cell Biol. Toxicol., 11:79-88.

Babich, H., **Palace, M.R.,** Borenfreund, E. and A. Stern, 1994, Naphthoquinone cytotoxicity to bluegill sunfish BF-2 cells, Arch. Environ. Contam. Toxicol., 27:8-13.

Babich, H., **Markenson, D.F.,** Blau, L. and A. Stern, 1994, *In vitro* cytotoxicity of the chlorinated naphthoquinone, dichlone, to human endothelial ECV304 cells, Toxicol. In Vitro, 8:1075-1081.

Babich, H., **Palace, M.R.** and A. Stern, 1993, Oxidative stress in fish cells: *in vitro* studies, Arch. Environ. Contam. Toxicol., 24:173-178.

Babich, H., Martin-Alguacil, N., **Raul, C.**, Rosenberg, D.W. and E. Borenfreund, 1991, Response of human cell cultures to cytotoxicants requiring metabolic activation, *In* Alternative Methods in Toxicology, vol. 8, Goldberg, A.M.(ed.), Mary Ann Liebert, Inc., NY, NY, pp. 263-276.

Babich, H., **Goldstein, S.H.** and E. Borenfreund, 1990, *In vitro* cyto- and genotoxicity of organomercurials to cells in culture, Toxicol. Lett., 50:143-149.

Goldstein, S.H. and H. Babich, 1989, Differential effects of arsenite and arsenate to *Drosophila melanogaster* in a combined adult/developmental toxicity assay, Bull. Environ. Contam. Toxicol., 44:456-460.

Blau, L., **Stern, R.B.,** and R. Bittman, 1984, The stoichiometry of A23187- and X537A- mediated calcium ion transport across lipid bilayers, Biochim. Biophys. Acta 778:219- 223.

Presentations at Scientific Conferences

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.

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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Herzberg, B.M., Ting, L.-M., Mwakingwe, A., Croken, M.M., Madrid, D., Hochman, S., and K. Kim, 2009, Genetic studies of adenosine deaminase in the rodent malaria parasites, *Plasmodium yoelii* and *Plasmodium berghei*, The 237th American Chemical Society Meeting, Salt Lake City, Utah, March (abstract).

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

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

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

March (abstract).

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

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

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

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

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

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

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

Dukesz, F., Frenkel, A.I., Bromberg, M.R.,Wang, O., Asherie, N., Blass, S., Rafailovich, M.H., Sun, Y., and J. Kang, 2008, Comparing various methods of synthesis and analysis of gold nanoparticles, National Meeting of the American Chemical Society, New Orleans, LA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Sun, Y., Frenkel, A.I., Isseroff, R., **Shonbrun, C.,** Forman, M., Shin, K., Koga, T., White, H., Rafailovich, M., and J. Sokolov, 2006, Characterization of

Palladium and Gold nanoparticles using x-ray reflectivity, EXAFS and electron microscopy, March Meeting of the American Physical Society, Baltimore, MD.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Glasner, D., Zypman, F., and A.I. Frenkel, 2004, 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.

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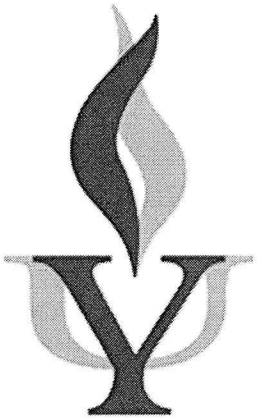
1998: **Malka Skiba** and **Cheryl Younger**

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

ABSTRACT BOOKLET OF STUDENT RESEARCH 2010

STERN COLLEGE FOR WOMEN
YESHIVA UNIVERSITY



DEPARTMENT OF BIOLOGY
DEPARTMENT OF CHEMISTRY/BIOCHEMISTRY
DEPARTMENT OF PHYSICS
DEPARTMENT OF PSYCHOLOGY

SCW students are accepted as summer undergraduate research interns in a variety of institutions, ranging from in-house research laboratories at SCW to research facilities at Albert Einstein College of Medicine and at other prestigious institutions (see Student Accomplishments). Many of these summer undergraduate research internships are highly competitive. As we are proud of our students' accomplishments, the Departments of Biology, Chemistry & Biochemistry, Physics, and Psychology present abstracts of the summer research projects in which our students have participated.

Student Editors:

Faygel Beren – Department of Biology
Elisa Karp – Department of Chemistry & Biochemistry
Alex Michalowski – Department of Psychology
Dassi Shulman – Department of Physics

Student Authors:

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"New Types of Solutions of Non-Linear Fractional Differential Equations"
Nasim Tishbi
"Interaction of the Antioxidant Resveratrol with Model Membranes"
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Assessment of the FACIT-Sp Scale and QOL among the Spanish-Speaking Population: A Review of the Literature

By: Raquel Amram

Stern College for Women, Yeshiva University, New York, NY;
Summer Practicum, University of Miami, Department of Behavioral Medicine, FL

The FACIT-Sp (Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being) is often used as a measure of spirituality/religiosity for those with chronic illnesses (Dapueto, Servente, Francolino, & Hahn, 2005). Research has found a positive correlation between the FACIT-Sp and QOL (Quality of Life) where people who endorse high spirituality/religiosity also report physical, emotional, and functional wellbeing (Zavala, Maliski, Kwan, Fink, & Litwin, 2009). Not only is it correlated, but it has also been found to be a significant predictor of QOL. Additionally, McClain, Rosenfeld, and Breitbart (2003) found that high spiritual wellbeing is negatively correlated with a desire for hastened death, hopelessness, and suicidal ideation. This supports previous findings indicating that QOL of patients with chronic illnesses can be enhanced with spiritual wellbeing. It should be noted that though these findings should apply to all chronic illnesses, most studies have looked at the QOL of cancer and HIV patients. Considering that QOL could be greatly affected by socio-cultural factors, research has looked at whether these findings are consistent among the Spanish-speaking population. These findings have been consistent, although there are differences across cultures. The FACIT-Sp is also consistently correlated with religiosity, spirituality and QOL in Spanish-speaking participants (Brady, Peterman, Fitchett, Mo, & Cella, 1999; Dapueto et al., 2005). Further research on this scale can clarify the role of spirituality and religion in health and coping. Additional research can elucidate the psychological pathways (i.e. optimism, hope) that are linked to chronic illnesses and QOL.

The Effects of Perfume Replacement on Mood

By: Melissa Bart & Robin Freyberg

Department of Psychology, Stern College for Women, Yeshiva University, New York, NY

Researchers have suggested that some women wear perfume in an attempt to project a specific image (Fiore, 1992). Although perfume improved performance in formal social interactions (Higuchi et al, 2005), little is known about the effects of changing an individual's regular fragrance routine. In this study, 100 pairs of undergraduate close female friends filled out mood questionnaires before and after two 15-minute interactions. For half of these pairs, one member of the dyad was given an alternative perfume to wear during the second session. For the other pairs as a control condition, one participant was given a different watch to wear. Introducing perfume had the most positive effect for women who do not usually wear it. Specifically, non-regular perfume wearers in the alternative fragrance condition reported improved mood after the interaction. Mood effects were not observed for fragrance wearers. Implications will be discussed.

Research conducted as part of a senior honors thesis at Stern College for Women, advised by Dr. Robin Freyberg.

Differentiating SH-SY5Y Neuroblastoma into Neurons Using Retinoic Acid

By: Geulah S. Ben-David[1], Erica Hasten[1], Ronit Birenboin[2], and Prof. Ron S. Goldstein[2]

[1]Stern College for Women, Yeshiva University, New York, NY; [2]Department of Life Sciences, Bar Ilan University, Ramat Gan, Israel

Development of an accessible source of human neurons is desirable for many types of studies, one of which includes neurodegenerative diseases. SH-SY5Y neuroblastoma cells are a line of transformed neuronal precursor cells that have been used in many studies. In our work, we tested several methods to induce these proliferating cancer cells into neuron-like cells. Molecules we used included retinoic acid (RA), cytosine arabinoside (ara-C), Rho kinase inhibitor (Rock), and nerve growth factor (NGF). Twenty four-well plates were seeded with 5,000-100,000 cells and then treated either with RA alone, RA accompanied by ara-C, or ara-C with NGF and Rock. We found that treatment of 15,000 cells with RA alone for 7 days effectively differentiated the neuroblastoma cells. Many of the resulting differentiated cells displayed neuronal morphology including round cell bodies and axon-like processes (Figure 1). In addition, immunostaining for specific neuronal markers confirmed the neuronal phenotype. Our results show that treatment with RA can be used as an inexpensive and efficient method to differentiate neurons from neuroblastoma cells, a process that can significantly aid further biomedical research.

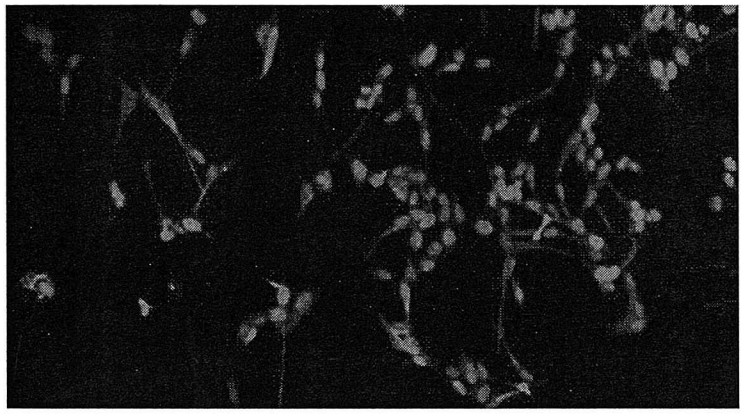

Figure 1. Neuroblastoma cells treated with RA alone for 4 days in 1% FCS media. Stained with Islet antibody in red and Hoechst dye in blue 20x

Porcine Nucleus Pulposus-Derived Stem Cells are Affected by Tissue Degeneration

By: Rebecca Benhaghnazar[1], Dmitriy Sheyn[2], Olga Mizrahi[3], Anthony Oh[2], Wafa Tawackoli[2], Dan Gazit[2,3], and Zulma Gazit[2,3]

[1]Stern College for Women, Yeshiva University, New York, NY; [2] Regenerative Medicine Institute, Cedars-Sinai Medical Center, Los Angeles, CA; [3]Hebrew University of Jerusalem, Jerusalem, Israel

Intervertebral disc (IVD) degeneration is a common disorder. In the U.S. there is an estimated cost of up to $50 billion for chronic lower back pain. As potential therapies for disc degeneration, intradiscal protein injection, gene transfer and cell implantation are being studied *in vivo.* During aging and degeneration, the intervertebral disc exhibits extensive histomorphological changes such as fibrosis of the nucleus pulposus and lamellae, disorganizing of the anuulus fibrosus, thinning and calcification of cartiliganous endplates, and so on.

The goal of the current study was to investigate whether IVD degeneration affects the number and differentiation potential of Stem Cells that reside in the nucleus pulposus (NP). It is widely accepted that adult Stem Cells (SC) maintain the homeostasis of the tissue they reside in and also play a major role in regeneration following injury. There are some indications that in certain pathologies, resident SCs lose some of their abilities to proliferate and differentiate.

Cell proliferation in-vitro was assessed using trypan blue-based cell counts. To start, passage 1 cells were seeded at $4.75x10^3$ cells/cm^2 (n=5). Cells were grown for 4-6 days, trypsinized and counted with the aid of trypan blue and cell-countess (Invitrogen). Following counts, cells were reseeded in the same density and labeled as passage 2. Process was repeated until passage 3. Cell doublings were calculated as cell number counted in each passage/19,0000/2. Cell doublings/day was calculated as cell doublings/days in culture.

The preliminary results show that the DNP stem cells proliferate slightly more than HNP stem cells when studied during the last two cell passaging. Based on these data, it is proposed that DNP cells proliferate at a higher rate because of the degeneration process in the discs.

The Study of Differential Methylation in Autism Spectrum Disorders (ASD) & Hepatocellular Carcinoma (HCC) and of Covert Mosaicism in ASD

By: Faygel Beren[1], Esther Berko[2], Christine Alaimo[3], Marién Pascual[2], N. Ari Wijetunga[2], Brian Aronow[2], Masako Suzuki[2], and John Greally[2]

[1]Stern College for Women, Yeshiva University, New York, NY; [2]Center for Epigenomics, Albert Einstein College of Medicine of Yeshiva University, Bronx, NY; [3]Children's Evaluation and Rehabilitation Center, Albert Einstein College of Medicine of Yeshiva University, Bronx, NY

Our lab is currently researching epigenetic phenomena in two human diseases: hepatocellular carcinoma (HCC) and autism spectrum disorder (ASD). It has already been established that there are epigenetic differences between hepatocellular carcinoma and healthy hepatocytes. Our hypothesis is that the Hepatitis C Virus induces epigenetic changes in hepatocytes that represent an intermediate step in the progression to the cancer epigenome. We are currently employing bisulfite massarray to validate differential methylation sites in HCC samples discovered from HELP-tagging assays.

There is less known about the epigenetic dysregulation in autism since it is difficult to obtain samples from the affected organ, the brain. We have, therefore, decided to use the embryologically related buccal epithelial cells, which like neuronal cells are of ectodermal origin, to evaluate the genetic content and epigenome of children with and without ASD born to mothers over 35. We are particularly interested in the effect of maternal age on the development of ASD. We hypothesize that mechanisms involved in pathology of the aging germline may contribute to the etiology of ASDs. Not only is there evidence that epigenetic regulation can decay with age, but a mother's oocyte may undergo meiotic I non-disjunction before zygote formation because of its arrest in prophase I. Meiotic I non-disjunction can ultimately generate an embryo with mosaic cell lines with covert aneuploidy and uniparental disomy. We are currently processing DNA from subjects to perform quantitative single nucleotide polymorphism (SNP) genotyping to identify covert mosaicism and to perform other studies that would identify differential methylation patterns and epigenomic dysregulation.

Acknowledgements:
Thank you to all those involved in the Summer Undergraduate Research Program at the Albert Einstein College of Medicine and to all the members of the Greally Lab.

Measuring Effects of P53 Mutations on DNA Binding with Microfluidic Affinity Analysis

By: Rachel Blinick[1], Dorit Avrahami[2], and Doron Gerber[2]

[1] Stern College for Women, Yeshiva University, New York, NY; [2] Nanotechnology Center, Bar Ilan University, Ramat Gan, Israel

P53 is a tumor suppressor protein that is encoded by the gene TP53 and is made up of 393 amino acids. It is known to act as a tumor suppressor by activating DNA repair proteins, inducing cell cycle arrest and apoptosis. The wildtype p53 is known to prevent tumor growth whereas mutated proteins are common in many types of cancer. Current theory suggests that mutated p53 interferes with the wildtype through a negative dominant effect, but this theory does not always seem to hold true. The objective of this study is to compare p53 and its mutants DNA binding preferences to investigate whether a change in DNA binding preference can explain some of the discrepancies in the literature.

To this end, the mutations Q165P, R273H, R175H, and R248W were introduced into p53 by point directed mutagenesis and verified by sequencing. Mutant p53 plasmid were transformed into XL 10-Gold ultracompetent bacterial cells. Promoters and terminators were then added to the p53 DNA sequences by assembly PCR, creating a synthetic gene. These genes were expressed with rabbit reticulocyte lysate, producing the mutated p53 proteins.

We use a microfluidics device (figure 1) that enables us to perform up to 10,000 assays at once. The device is made up of two layers: the flow layer and the control layer. The flow layer is made up of the DNA chamber and protein chamber, while the control layer is made up of the neck valve, sandwich valve, and button valve. Once activated, the valves enable us to control the flow layer. The neck valve separates between the DNA and protein chambers, the sandwich valve separates between protein chambers, and the button valve enables us to pull down the protein and trap interactions.

A DNA microarray is aligned with the device so that each DNA spot lies within a DNA chamber. After performing surface chemistry in the protein chamber to enable pull down of the protein, the protein is flowed into the protein chamber with the neck valve closed. Once the protein is pulled down in each chamber, the sandwich valves are closed and the neck valves are opened to allow the DNA to diffuse into the protein chamber and bind the protein, in this case either p53 or one of its mutants.

Combining a DNA microarray with the microfluidics assay, allows us to screen p53 for interactions with a huge spectrum of DNA sequences. Based on this data, we may be able to identify the effects of these mutations on DNA transcription.

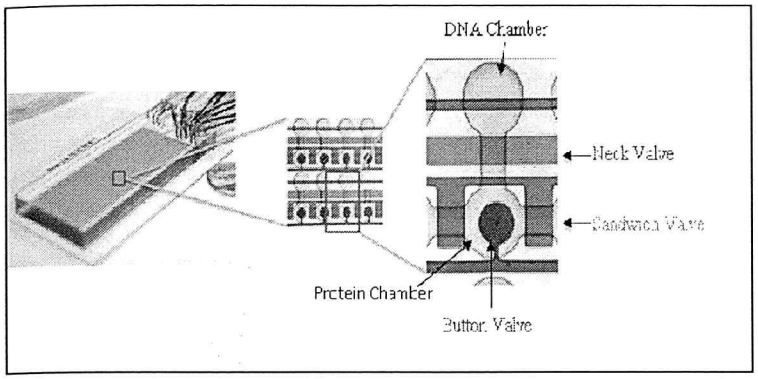

Figure 1. Microfluidic Device for measuring DNA-protein interactions

Modulation of the Plasminogen Activator (PA) System as a Potential Therapeutic Target in MG: Involvement of TGF-β

By: Lisa Cohen[1], Devorah Gur-Wahnon[2], and Talma Brenner[2]

[1]Stern College for Women, Yeshiva University, New York, NY; [2]Laboratory of Neuroimmunology, Department of Neurology, Hadassah University Medical Center, Jerusalem, Israel

Myasthenia gravis (MG) is an autoimmune disease characterized by a fluctuating muscle weakness caused by antibodies to the nicotinic acetylcholine receptor (nAChR) at the post-synaptic site of the neuromuscular junction. The AChR antibodies reduce the number of the available AChRs and cause a defect in neuromuscular transmission. The animal model for MG, experimental autoimmune MG (EAMG), is widely used for studying numerous aspects of the human disease and for evaluating potential treatments. In our lab we used the EAMG model to assess the potential involvement of the plasminogen activator (PA) system in the development of EAMG.

Plasminogen activators are extracellular proteases that modulate cell-cell and cell-matrix interactions. Components of the PA system, namely tissue PA (tPA) and urokinase PA (uPA), are elevated in inflammatory areas and are involved in inflammatory neurological disorders. In an ongoing study in the lab, the involvement of the PA system in EAMG was evaluated by using mice lacking tPA (tPA ko). It has been found that the tPA ko mice developed a more severe clinical disease than the wild type (wt) mice. In addition, the tPA ko mice had a higher titer of anti-AChR antibodies, as well as a higher expression of the B-cell markers: $CD19^+$ and $CD45R^+$. In contrast, specific T- cell reactivity towards the T-AChR, was markedly reduced in the tPA ko animals. In an attempt to solve the paradoxical role of tPA seen in the development of EAMG, the relative number of T-regulatory cells (Tregs) which are important in maintaining self tolerance was determined. A reduction in Tregs in EAMG tPA ko mice as compared to wt mice was found. While the reduction in Tregs may explain the more severe disease seen in the tPA ko animals, the reason for this reduction of Tregs remains unknown.

In the present study we evaluated gene expression of the anti-inflammatory cytokine, TGF-β in tPA ko mice compared to wt mice. tPA is known to participate in the maturation of TGF-β, and TGF-β is important for the generation and development of Tregs. To evaluate gene expression of TGF-β, RNA was extracted from muscle and lymph node from EAMG induced tPA ko and wt mice. RNA was extracted using the 5-Prime Perfectpure RNA kit (GmbH, Hamburg) according to the manufacturer's protocol. cDNA was synthesized by reverse transcription and further PCR amplified on an ABI 7900HT Fast Real-time PCR system using reagents and protocols provided by Applied Biosystems (Foster City, CA). The results of real time PCR for TGF-β reveal a reduction in gene expression in the tPA ko mice in both lymph node and muscle compared to the wt (Figure 1).

The evident correlation between a deficient PA system and the reduction in TGF-β gene expression may explain the reduction in Tregs in tPA ko mice and the more severe disease seen in the ko mice. Further investigation into the molecular mechanisms underlying the severe EAMG seen in PA system deficient mice may facilitate our understanding of EAMG development. This knowledge may help develop potential treatment for MG by modulation of the PA system.

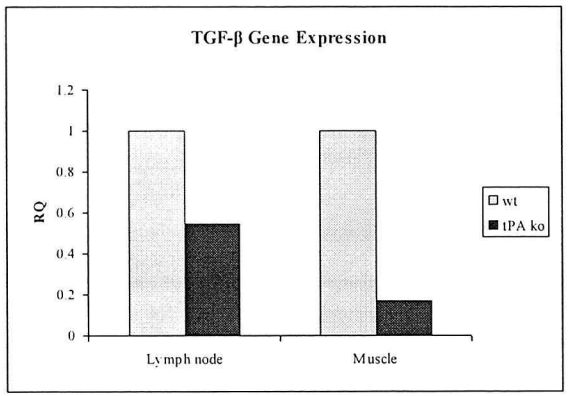

Figure 1. Relative quantification of TGF-β gene expression in EAMG tPA ko mice compared to wt mice in lymph node and muscle shows a reduction in the ko animals.

EXAFS Analysis of Structure and Thermal Properties of Nanoporous Gold

By: Bluma Dukesz,[1] Diya Li[2], Relja Vasic[1] and Anatoly Frenkel[1]

[1]Stern College for Women, Yeshiva University, New York, NY; [2]University of Pennsylvania, Philadelphia, PA

Nanoporous Gold (NPG) is known to exhibit very different catalytic properties from bulk Gold. In contrast to the inert nature of bulk Gold, NPG can reduce oxygen to both hydrogen peroxide and water. In addition, NPG is a 'green catalyst,' exhibiting high catalytic efficiency under relatively low temperatures. The pores of NPG are created through chemically extracting Silver from an alloy composed of Gold and Silver. Our experiment used Extended X-ray Absorption Fine Structure (EXAFS) to determine the local atomic structure of NPG in order to study the influence of NPG's porous surface on its enhanced catalytic reactivity. We studied samples of NPG and the original Au-Ag alloys on Au and Ag x-ray absorption edges, independently. The size of the pores in our NPG samples ranged from 15 to 50 nm.

In EXAFS, interfering photoelectron waves are created through bombarding NPG with x-rays of sufficient energy to excite its core shell electrons. As an ejected photoelectron wave scatters from the atoms around the absorbing atom it creates interferences between the outgoing and scattered parts of the photoelectron wave-function. This behaviour causes an energy-dependent variation in the x-ray absorption probability, which is proportional to the x-ray absorption coefficient. These modulations provide information about the structure, atomic number, structural disorder, and thermal motions of neighbouring atoms.

In our experiment, physical properties such as coordination number (N), structural disorder (σ^2), and nearest-neighbour atomic distance (R) were obtained. NPG's thermal behavior was analyzed through calculating its Thermal Expansion Coefficient and Einstein Temperature. The EXAFS measurements were carried out at various temperatures ranging from 673 K to approx 183 K. After measuring the data at room temperature and at liquid N_2, the samples were reheated to room temperature to check for reversibility.

Our experimental data indicates that NPG has greater structural disorder than bulk Gold, due to the large number of atoms on the pores' surface in the NPG (Figure 1). We found a large value for static disorder in the first NPG sample (0.0017 ± 0.0001 Å^2). We attributed this disorder, in part, to the cold-rolling preparation technique of NPG since the reference Gold sample showed large static disorder as well. The cold-rolling caused stiffening of the force constants, which also increased our measured Einstein temperature of the reference bulk Gold relative to the literature values. Intriguingly, we observed an anomalously large (compared to the bulk) thermal expansion coefficient in NPG (Figure 2), and anomalously small (compared to the bulk) Au-Au nearest neighbor distance. This reduction in bond length, especially at low temperatures is consistent with the nano-size effect caused by the confinement of Gold atoms in small volumes at the surface of NPG.

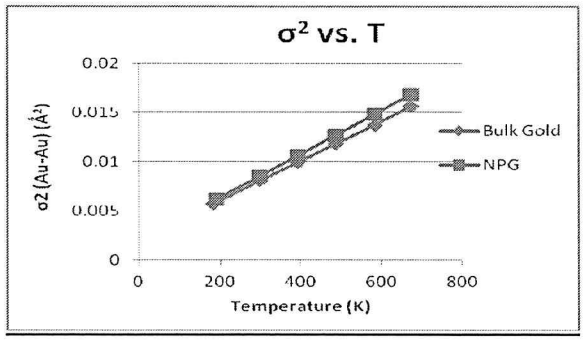

Figure 1. Thermal dependence of structural disorder in bulk Gold vs. NPG.

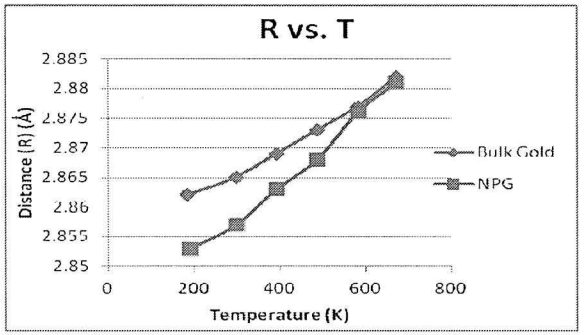

Figure 2. Thermal dependence of nearest-neighbour atomic distance in bulk Gold vs. NPG.

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Determining Markers for Increased Risk of Developing Gestational Diabetes among Chinese-Americans

By: Amanda Elmakiyes[1], Jennifer Lazaros[1], Vanessa Sy-Po[2], and Donna Seto-Young, Ph.D.[2]

[1]Stern College for Women, Yeshiva University, New York, NY; [2]Division of Endocrinology and Metabolism, Beth Israel Medical Center, New York, NY

Gestational diabetes mellitus (GDM) is a pathological condition affecting approximately 4% of all pregnancies, with about 135,000 cases occurring annually in the United States. GDM occurs when women without previously diagnosed diabetes exhibit high glucose levels and poor glucose tolerance during pregnancy, especially during the third trimester. Women who develop GDM are unable to compensate for the increased insulin resistance state characteristic of pregnancy due to their diminished beta cell reserve. Infants born to mothers suffering from gestational diabetes may develop jaundice, exhibit abnormal levels of blood sugar, and become large for their gestational age, which can complicate delivery.

This study aimed to compare biochemical markers that influence insulin resistance in Chinese-American and Caucasian women who develop GDM. Chinese women, when compared to Caucasians of a similar body mass index, have a significantly increased risk of developing GDM. The frequency of gestational diabetes among Chinese women is 5.6%-6.22%, while it afflicts only 2.5%-3.8% of Caucasian women. Additionally, the Chinese population exhibits higher insulin levels than the Caucasian population. The discrepancy may be due to genetic variance and mutations in the Chinese population that can be identified by biochemical markers.

For the study, Chinese patients over the age of 18 both with and without GDM were recruited. All patients were pregnant women between their 24^{th} and 28^{th} week of pregnancy. Demographic information obtained from each patient included the following: family history of diabetes and previous GDM, age, height, weight, blood pressure, glucose level after a one-hour 50g glucose challenge test (GCT), and HgA_{1C} levels. HgA_{1C} is a form of hemoglobin that serves as an identifier of average plasma glucose concentrations since the fraction of glycosylated hemoglobin positively correlates with glucose levels.

Patient blood samples were centrifuged and analyzed via enzyme-linked immunosorbence assay (ELISA) to measure levels of biochemical markers involved in the insulin signaling pathway, insulin resistance, adipocytokines and certain inflammatory mediators. Specific markers of interest included insulin, IGF-1, IGFBP-1, leptin, adiponectin, resistin, RBP_4, and CRP. Most significantly, adiponectin, a protein hormone secreted by adipose tissue, which modulates glucose regulation and fatty acid catabolism, was found to be present in lower levels in patients with gestational diabetes. Patients with GDM were also found to have higher HgA_{1C}, glucose and insulin levels after the one-hour GCT, thus suggesting a negative correlation between adiponectin, HgA_{1C} and insulin. In all patients, glucose levels were positively correlated with increasing insulin and resistin levels. Resistin has been shown to cause an increase in the expression of pro-inflammatory cytokines and is also reputed to contribute to insulin resistance.

The researchers anticipate examining additional markers of insulin resistance including other inflammatory mediators and other components of insulin signaling pathways. In addition, pregnant Caucasian patients, both with and without GDM, will be recruited for comparison with Chinese participants.

The ability to identify markers indicative of the development of gestational diabetes could potentially improve pregnancy and neonatal health by leading to earlier treatment and better modulation of gestational diabetes within the Chinese community.

Normocalcemic Primary Hyperparathyroidism: Variability of PTH in Normocalcemic Patients and Possible Etiologies

By: Naomi Friedman[1] and Dr. Ruth Freeman, M.D.[2]

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The main function of parathyroid hormone (PTH) is to maintain the appropriate calcium and phosphorous levels in the blood. Elevated parathyroid levels are usually associated with high blood calcium levels, called Primary Hyperparathyroidism (PHPT). This is caused by a benign solitary adenoma or, less commonly, by hyperplasia of the parathyroid glands. Low levels of Vitamin D can also cause high PTH levels. Although classical PHPT is manifested by hypercalcemia, an increase in blood calcium levels, recently it has been found that people with normal calcium levels can show elevated PTH levels. This has been classified as normocalcemic hyperparathyroidism (HPT), a condition in which patients maintain normal calcium levels but exhibit elevated PTH levels. The significance of elevated PTH levels in the absence of hypercalcemia is not understood. The present observational study was done in order to characterize the significance of normocalcemic hyperparathyroidism as the condition may have implications for bone disease, kidney function, and cardiovascular disease.

Original data (medical records) of 24 women from 1983 until 2011 were reviewed. Patients were studied for a mean of 9.8 years (range 1-28 years). PTH and calcium levels were tracked together with Vitamin D levels. Ionized calcium levels were measured in some of the subjects. Twenty-four urine calcium and creatinine measurements were also collected from patients. Since PTH is a known cause of low bone density and all subjects displayed low bone density, all subjects had their PTH measured even though they exhibited normal calcium levels.

We discovered that only 2/24 of the patients displayed high ionized calcium levels, which is a defining feature of hypercalcemic hyperparathyroidism. Furthermore, 16/24 of the patients displayed fluctuating levels of PTH (an example of which is shown for one patient in Figure 1). Fluctuating levels are defined as PTH levels which elevate, return to normal, and then elevate again at seemingly random time intervals.

These finding are significant because they allow for a better characterization of normocalcemic hyperparathyroidism and shed light onto whether it is a disease unto itself or a precursor to hypercalcemic hyperparathyroidism. In a majority of patients with normocalcemic hyperparathyroidism, progression to hypercalcemia is not observed. As such, conservative management is recommended and surgical correction may not be needed.

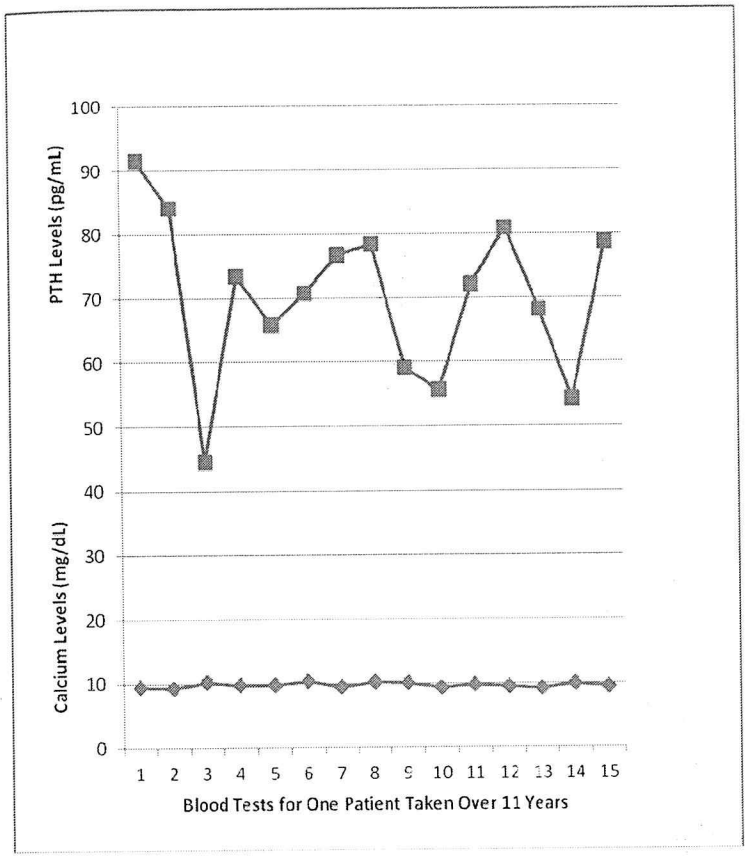

Figure 1. Blood test results for one patient showing fluctuating PTH levels and normal calcium levels taken over 15 different patient visits. Calcium Levels (in blue) remain within normal range of 8.5 – 10.5mg/dL while PTH levels (in red) fluctuate between measurements above and within the normal range of 10-65pg/mL.

Behavior of Oxidized Cholesterol Species in a Model Membrane Composed of a Ternary Mixture

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It has been previously shown that oxidized forms of cholesterol (oxysterols) interact differently with phospholipids than cholesterol, an integral part of eukaryotic cell membranes. The goal of this study was to study the effects of two oxysterols, 7-ketocholesterol and 25-hydroxycholesterol, when added to mixtures of membrane phospholipids and normal cholesterol. Using varying amounts of either 1-palmitoyl-2-oleoyl-sn-glycero-3-phosphocholine (POPC) or Dipalmitoylphosphatidylcholine (DPPC), cholesterol, and oxysterol, we compressed isothermal Langmuir monolayers of each mixture. We then compared graphs of the resulting pressure versus area per molecule. Preliminary data shows that the oxysterol mixtures compress the film less than pure cholesterol does. Based on these findings it appears that oxysterols change the interactions between cholesterol and the membrane phospholipids.

Neuroprotective Actions of Taurine and Granulocyte Colony Stimulating Factor

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Recent studies have indicated protective roles for taurine and granulocyte colony stimulating factor (GCSF) against excitotoxic neuronal death. GCSF has also been shown to activate stem cells and to be therapeutic in a mouse model of Parkinson's disease. Taurine and GCSF are additionally reported to prevent both apoptosis and ER stress-induced cell death in response to glutamate stimulation. Three model systems are currently in use to clarify the neuroprotective roles of GCSF and taurine: primary neuronal cultures, the rat stroke model, and the murine model of Parkinson's disease. Present results suggest inhibition of ER stress pathways by taurine in primary neuronal cultures subjected to hypoxia/re-oxygenation stress. Moreover, taurine seems to decrease H/R-induced cell death as measured by the ATP assay (Promega) as well as by TUNEL staining. Studies are underway to examine the effects of GCSF on inhibition of ER stress markers and on enhancement of neuronal cell survival. In addition, studies employing the MPTP Parkinson's model are in progress in order to determine the levels and localization of stem cell mobilization at 21 days after administration of GCSF. In the rat model of transitory brain ischemia, studies focus on the effect of prior GCSF administration on expression of ER stress markers and on decreasing infarct size at 2, 4, 7, 10, and 21 days following ischemia. Current data indicate a critical protective role for both taurine and GCSF against excitotoxic cell death, effective in both primary neurons as well as in in-vivo models (mouse Parkinson's model and rat transient brain ischemia model).

Effects on Phosphorylation by Receptor Tyrosine Kinase Deactivating Mutant

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Receptor tyrosine kinase (RTK) is a family of receptors expressed on the plasma membrane where it plays an essential role in cellular reproduction, specialization, and cell signaling. RTKs become activated when bound to their cognate extracellular growth-factor ligands, which in most cases facilitate RTK dimerization, auto-phosphorylation, and subsequent initiation of transduction pathways. When an RTK is in its inactive conformation, the tail of the kinase blocks the active site and inhibits the receptor's activation.

The short-term aim of this study was to determine how deactivation affects phosphorylation of the RTK. By transfecting cells with a deactivating RTK mutant, previously designed by our lab, we were able to observe changes in phosphorylation levels.

Spodoptera frugiperda Sf9 cells were harvested 33 hours after infection with the RTK gene construct deactivating mutant. Lysates were prepared and subjected to kinase buffer (containing ATP and $MgCl_2$). Western blotting was employed to assay for phosphorylation using anti-phosphotyrosine antibodies. Transfection of Sf9 cells with this gene construct revealed differential phosphorylation levels when treated with various reagents. These results provide an important foundation with which to conduct future RTK activation studies.

Acknowledgements:
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Quantum Origins of Chaos

By: Aviva E. Gubin and Dr. Lea F. Santos

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Classical systems are things which we see in everyday life: balls, cars, and trees for example. They follow the laws of classical physics, which means that if we know enough parameters of the system initially, we can say definitively how it will evolve in time. Quantum systems, on the other hand, are things which are small enough that Planck's constant ($6.63 \times 10^{-34}\ J\,s$) does not become negligible, such as electrons. The behavior of these particles cannot be definitively determined. The quantum world is intrinsically probabilistic – we can find how *likely* it is for a particle to be in a certain place going a certain speed, but we can never actually know with 100% certainty.[1]

The difference between classical and quantum systems also carries over into the study of chaos. Chaos is the study of unpredictability of systems – systems that we cannot determine how they will evolve in time based on their initial conditions. In classical systems, we observe chaos when systems exhibit hypersensitivity to initial conditions. This means that two systems which start at *very similar*, but slightly different, initial conditions will in time diverge exponentially. Weather is one example; many organism populations also behave in this manner. Mathematically, this behavior is due to the presence of nonlinear terms in the equations describing the systems. For a single system, we define chaos in terms of ergodicity.

A system is said to be ergodic if, in a finite amount of time, it will visit every possible state with equal probability. For instance, a ball has a position and a velocity. If the ball bounces around a pool table in such a way that in time it visits everywhere on the pool table at every possible velocity an equal amount of times, the ball will be said to be ergodic. However, if the ball visits one area more than the others, or does not visit a particular area at all, it is no longer ergodic.

We know that everything we see in classical physics is really just an expression of quantum physics, since all classical systems are made of millions of quantum systems. Thus, anything we see in the classical world should have its basis in the quantum world. So it should be with chaos.

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[1] Classical physics is actually just a limit of quantum physics. The difference in definitiveness simply arises because of the size of the objects under consideration. We say we can completely predict the behavior of classical systems, but this really means that the probability of that outcome is so close to 100% that the difference is negligible.

A problem arises here. As we have discussed, the quantum world is intrinsically probabilistic. We can never know with absolute certainty a particle's position and velocity. Since classical chaos is so dependent on position and velocity, which have little to no real meaning in the quantum world, how can we explain chaos in terms of quantum mechanics? We have to find other expressions of chaos, which can apply in the quantum world.

One of these expressions is level repulsion. In a non-chaotic quantum system, the energy levels of the system are dispersed randomly. In a chaotic system, on the other hand, the energy levels repel. During the summer, however, in addition to studying energy levels, we also looked for alternative ways to determine whether the quantum system is chaotic or not. Mathematically, the energy levels correspond to the eigenvalues of the Hamiltonian, the latter being a matrix which describes the system. Associated with the eigenvalues there are eigenvectors. The eigenvectors may be used to determine the NPC (number of principle components) of a system, which is a measure of how many states are accessible to the system. High NPC means that many states are accessible with similar probabilities. Therefore, a system which yields high and similar NPC values in a window of energy implies ergodicity and can then be said to be chaotic.

We studied a one-dimensional chain of interacting spins $\pm 1/2$ with L sites subjected to a static magnetic field in the z-direction. The field splits the energy of each site. Each site has either a spin-up (with higher energy) or a spin-down (with lower energy). All sites have the same energy splitting except one, which is exposed to a magnetic field slightly larger. This site corresponds to the defect of the chain. By studying the energy levels, we verified that the insertion of a defect into the chain does not guarantee chaotic behavior. Rather, when the defect is inserted at the end of the chain, the system is still nonchaotic. However, when we insert the defect into the middle site of the chain, we obtain level repulsion and therefore chaotic behavior. We then proceeded to study the values of NPC for both scenarios.

Figures 1 and 2 below show the plots of NPC vs. energy for the two systems, each with 15 sites and 5 up-spins and all parameters being equal except the location of the defect. In Figure 1, the defect has been placed on site 1, at the end of the chain. The system is nonchaotic and as such, we see much variation in the NPC values, even for similar energies. Figure 2 shows the results from the chain in which the defect has been placed on the center site. The system is chaotic and we therefore observe that the NPC values for similar energies are much more concentrated.

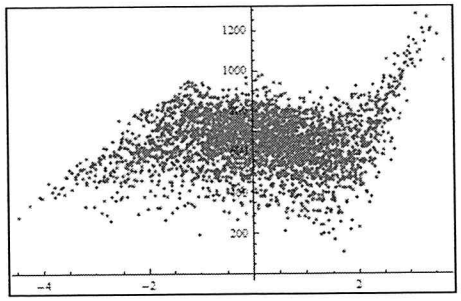

Figure 1. NPC vs. energy with defect placed on site 1.

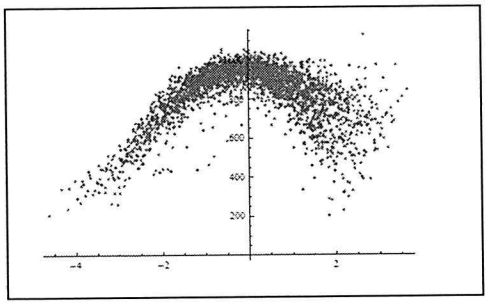

Figure 2. NPC vs. energy with defect placed on the center site.

Stress Modulates Mitochondrial Gene Expression in the Rat Hippocampus

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[1]Stern College for Women, Yeshiva University, New York, NY; [2]Laboratory of Neurobiology and Behavior; Laboratory of Neuroendocrinology, The Rockefeller University, New York, NY

Our recent research has shown that both acute and chronic stress cause changes in the expression of mitochondrial genes in the hippocampus, a brain region vital to memory formation and some types of cognition. Acute stress appears to reduce the expression of several genes on the mitochondrial chromosome, whereas chronic stress produces an increase in one of the same genes.

A large body of research has linked mitochondrial function to human diseases including cancer, Parkinson's disease, and depression. However, only a small number of studies have sought to examine how the genes on the mitochondrial chromosome, which is separate from the chromosomes in the nucleus, are regulated by environmental conditions in living animals. Mitochondria are unique cellular organelles since they are the only organelle which retains its own genome in animals. The genome is composed of 13 protein-coding genes, 22 transfer RNA genes, and two ribosomal RNA genes. Our research looked at the protein-coding genes for the NADH dehydrogenase complex I constituents ND-1, ND-3 and ND-6; as well as the expression of the complex V ATP-synthase subunit ATP-6. Both the NADH dehydrogenase complex I and ATP-synthase are essential for production of ATP.

Mitochondria are also responsible for the production and control of reactive oxygen species and programmed cell death. Their ability to produce cell death can result from damage due to over-activation or toxic insult. They are particularly important in the brain, as the brain requires 10 times more energy than other tissues. As such, disorders which effect mitochondrial function often present with neurologic symptoms.

Stressful circumstances increase energetic demands on the brain. Studies in recent years have shown stress may cause structural and functional changes in highly active brain regions such as the hippocampus. Acute stress is known to produce a number of rapid effects which are often opposed to those observed after chronic stress. Further, we and others have shown that stress hormone receptors enter hippocampal mitochondria and alter their function. To determine if stress was acting directly on mitochondrial genes, we subjected 3 month old rats to either a 30 minute acute stress, or a longer stress which was repeated daily for 3 weeks. We then examined how the stress changed the messenger RNA expressed by the mitochondria resident in the hippocampus.

We found that after an acute stress, expression of four mitochondrial genes, ND-1, ND-3, ND-6 and ATP-6, was decreased more than 50% (Figure 1), suggesting a need to suppress mitochondrial activity after it was stimulated by stressful circumstances. Chronic stress showed an increase in the expression of one of these genes, ND-6, which may represent an adaptation to the higher energetic demands placed on the hippocampus in a chronically stressful environment. Our results provide evidence that mitochondria are capable of local energetic plasticity in response to stressful environmental circumstances and provide a new window into our understanding of stress's impact on brain function.

As mitochondrial function has been implicated in a number of diseases, including certain neurodegenerative diseases like Alzheimer's, which preferentially attack regions like the hippocampus, it would be interesting in future studies to examine the impact of stress in the context of aging on mitochondrial gene expression and function. Much work has established that mitochondrial dysfunction is present in the aging brain, but to date, none have examined how changes in mitochondrial gene expression might contribute, or how stress might worsen that contribution. Therefore our work has important implications for our future understanding of a variety of brain diseases, particularly those associated with aging and stress.

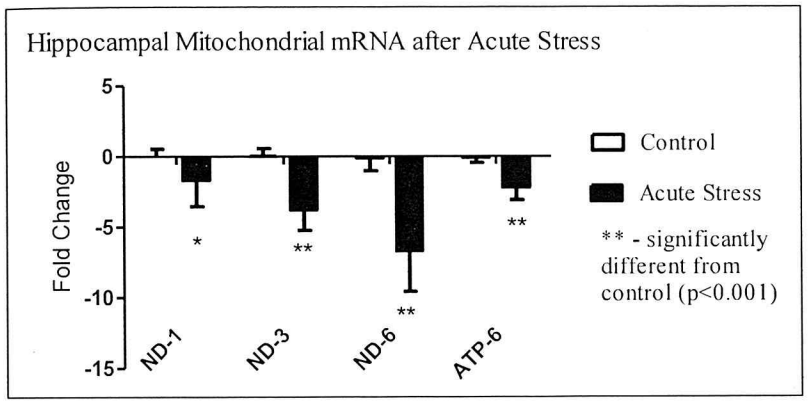

Figure 1. Graph depicts the downregulation of ND-1, ND-3, ND-6, and ATP-6 in rat hippocampal mitochondrial mRNA after acute restraint stress. There was a significant main effect of Stress, ($F=74.12$, $p<0.0001$).

Cytotoxicity of Cranberry Juice Extract to Oral Carcinoma HSC-2 Cells

By: Ilana M. Ickow and H. Babich

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Prior research in this laboratory has shown that polyphenol extracts from natural products, *e.g.,* pomegranate (*Punica granatum*) and *Gingko biloba*, were cytotoxic to carcinoma cells derived from tissues of the human oral cavity. Lesser cytotoxicities were observed towards normal gingival fibroblasts. The mode of cytotoxic activity was via two routes. First, the autooxidation of the polyphenols led to the generation of hydrogen peroxide, at levels high enough to exert cytotoxicity. Second, the polyphenols themselves were cytotoxic. Thus, it was of interest to ascertain whether a polyphenol-rich extract from cranberry (*Vaccinium macrocarpa*) juice followed a similar dual mechanism of toxic action.

Using the neutral red cytotoxicity assay after a 24-hr exposure, the cytotoxicity of cranberry juice extract (CJE) to HSC-2 carcinoma cells was noted initially at 150 µg/ml CJE, with almost complete toxicity occurring at 250 µg/ml CJE. In contrast, no toxicity was seen with gingival fibroblasts, even at 250 µg/ml CJE (Fig. 1, 2). This greater sensitivity of the carcinoma than of the normal cells to CJE was similar to that observed for pomegranate and *G. biloba* extracts.

Using the ferrous orange xylenol (FOX) assay to measure hydrogen peroxide and the nitroblue tetrazolium (NBT) assay to measure superoxide, the generation of both reactive oxygen species (ROS) was detected in media amended with the CJE; lesser amounts of hydrogen peroxide were detected in phosphate buffer at acidic, as compared to alkaline, pH (Fig. 3). The generation of hydrogen peroxide in CJE-amended cell culture medium was eliminated upon coincubation with catalase and was greatly diminished in the presence of superoxide dismutase.

The levels of hydrogen peroxide detected by amending cell culture medium with CJE were much lower than similar studies with extracts from pomegranate and *G. biloba*, suggesting that the induction of oxidative stress was not a factor in the cytotoxic effectiveness of CJE. This idea was strengthened as pyruvate (110 mg/L), a scavenger of hydrogen peroxide [pyruvate + hydrogen peroxide → acetate + carbon dioxide + water], and catalase (100 and 200 Units/ml), an enzyme that decomposes hydrogen peroxide [hydrogen peroxide + catalase → water + molecular oxygen], had no effects on the toxicity of CJE (175 µg/ml) to HSC-2 carcinoma cells.

As noted by others, superoxide dismutase stabilizes polyphenols and prevents their autooxidation and subsequent generation of ROS. The enhanced cytotoxicity of CJE to HSC-2 cells cotreated with superoxide dismutase indicated that CJE toxicity occurred via the polyphenols *per se*, rather than via their degradation ROS end products. CJE solubilized in cell culture medium and incubated for 1 day at 37 C (termed, "spent CJE"), when tested towards HSC-2 cells, was not cytotoxic (Fig. 4). Apparently, the CJE extract was unstable and after a 1-day incubation it decomposed to end products of lesser cytotoxicities than of the parent molecules.

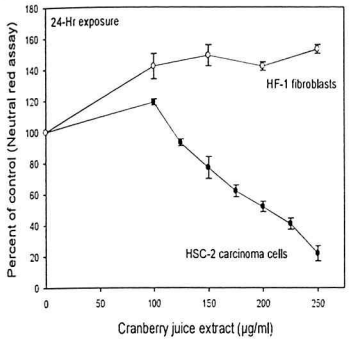

Figure 1. Comparative sensitivities of HSC-2 and HF-1 cells to a 24-hr exposure to CJE. Data are expressed as the mean percent of control ± SEM.

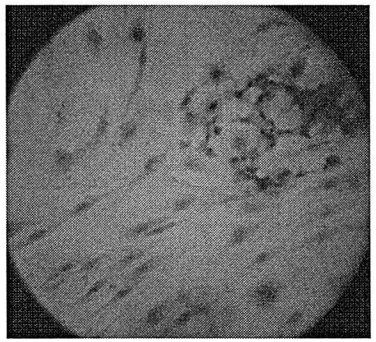

Figure 2. A 24-hour coincubation of HSC-2 and HF-1 cells to 200 µg/ml CJE.

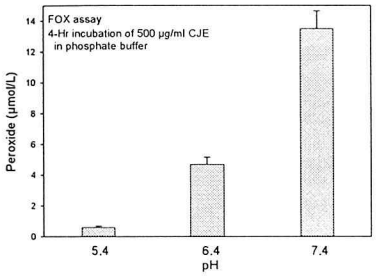

Figure 3. CJE is stable at acidic pH values; as the pH increases, autooxidation increases. Data are expressed as the arithmetic mean ± SEM.

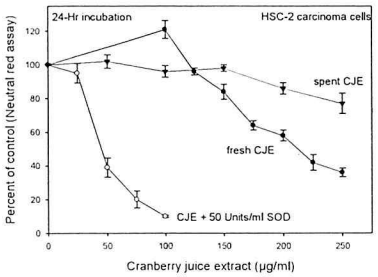

Figure 4. Toxicity of CJE is potentiated in the presence of SOD but is greatly lowered in the presence of spent CJE. Data are expressed as the mean percent of control ± SEM.

Studying the Interaction between DNA Polymers and Proteins Using Tethered Particle Motion

By: Kira R. Joel[1], Yuval Garini[2], Guy Nir[2], Moshe Lindner[2]

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A single molecule method, known as Tethered Particle Motion (TPM), allows for the study of the dynamics of individual molecules, which provides information non-accessible through ensemble studies. There are several other methods used to study single molecules, however some methods, like atomic force microscopy as well as using optical or magnetic tweezers, apply a force on the polymer. TPM allows for the study of the DNA polymer in its natural state.

The objective of this experiment was to analyze a protein believed to be involved in Lupus disease. We wanted to measure how this specific protein binds to the DNA by studying the changes in the dynamics of the DNA polymer while interacting with the protein. In this experiment we used DNA polymers that had digoxigenin attached to one end and biotin attached to the other. We then tethered the DNA polymers to an anti-digoxigenin covered glass slide and attached anti-biotin covered gold nano-beads to the free end of the polymers (Figure 1). Using dark-field microscopy and a CCD camera we were able to study the effects on the dynamics of the DNA polymer as different concentrations of a protein solution were introduced into the system. Variance in persistence length, or the rigidity of the polymer, was used as an indication of changes in the DNA. The persistence length could be calculated to an accuracy of about $\pm$ 3nm.

The highest concentration protein solution that we used seemed to cause a drop in the persistence length by about 15nm, though this change in persistence length was temporary (Figure 2). This could be an indication of a physical response of the DNA to the particular protein. However, additional repetitions of the experiment, as well as running further control experiments, are necessary in order to verify the results.

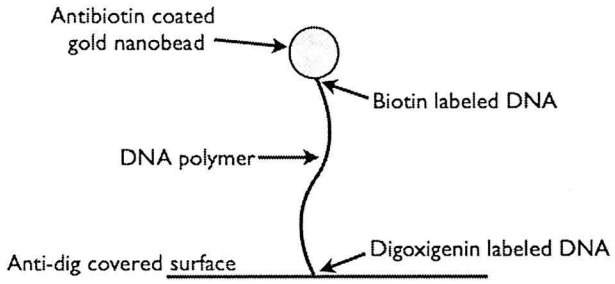

Figure 1. Illustration of tethered polymer

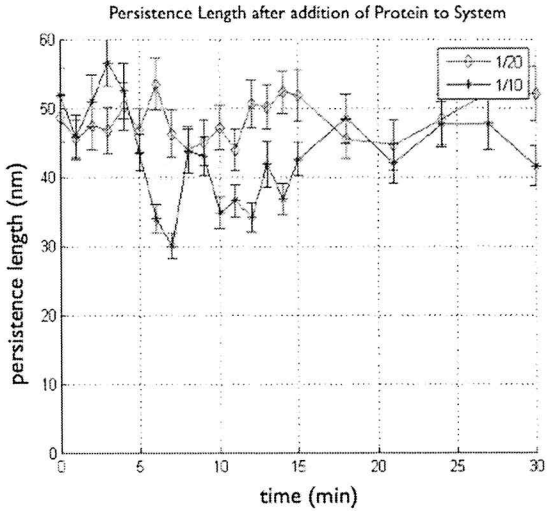

Figure 2. Graph comparing persistence length as function of time after insertion of protein in PB buffer solution for two different concentrations

Understanding the Role of Intronic Cis-acting Elements in the Splicing of MacroH2A1 Variants

By: Elisa Karp[1], Leonid Novikov[2], Hadassa Klerman[1], and Matthew J. Gamble[2]

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The histone variant macroH2A replaces the canonical histone H2A in nucleosomes in specific regions of the genome in order to regulate gene expression. Two splice variants of macroH2A1, macroH2A1.1 and macroH2A1.2, are encoded by mutually exclusive splicing of two alternative exons. Most normal human cells express similar levels of macroH2A1.1 and macroH2A1.2. However, work from our lab has shown that alternative splicing of macroH2A1 pre-mRNA, leading to a decrease in macroH2A1.1 expression, occurs in a variety of cancers. Additionally, ectopic expression of macroH2A1.1 represses cancer cell growth and induces senescence in a splice variant-specific manner. Therefore, it is important to determine the mechanism that regulates macroH2A1 splicing and determine how this mechanism is modified in cancer cells. In order to identify the cis-acting sequences that regulate macroH2A1 splicing, we designed a macroH2A1 minigene which includes three introns of 600 base pairs each flanking the alternative exons. In A549 lung fibroblast cells which only express macroH2A1.2, the macroH2A1 minigene only expresses the macroH2A1.2 spliced transcript. However, in MG-63 osteosarcoma cells which normally express both macroH2A1.1 and macroH2A1.2, the minigene still only expresses macroH2A1.2. This suggests that the macroH2A1 minigene is missing critical cis-acting sequences that are necessary to accurately splice macroH2A1.1. Interestingly, several highly conserved elements exist in the introns flanking the alternative exons of this gene. By applying our mingene splicing assay we are systematically analyzing the contribution of these ultra-conserved regions to the regulation of macroH2A1 splicing.

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Vitamin D Status and Calciuria in Calcium Oxalate Nephrolithiasis

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Idiopathic hypercalciuria is the most common cause of calcium containing kidney stones. The pathophysiology of hypercalciuria appears to be related to dysregulation of calcium transport and may be related to calcitriol and interaction with vitamin D receptor. Vit D deficiency is highly prevalent in the adult population. The recent Institute of Medicine report raises concern about administration of high doses of vit D as a risk for hypercalciuria and kidney stones. The purpose of this study was to assess whether there is an association with vit D status and calciuria in a cohort of calcium oxalate stone formers.

Between 2005 and 2009, 136 subjects (60 males) with history of calcium oxalate nephrolithiasis who met the criteria of having obtained a calcidiol level within 90 days of obtaining a metabolic urine evaluation consisting of 2 sequentially obtained 24 hr urine collections. Subjects undergoing treatment for hypercalciuria or with documented hyperparathyroidism were excluded. Calcidiol concentration was significantly correlated with the magnitude of calciuria ($p=0.05$). Low calcidiol level defined as < 30 ng/ml. Sixty seven (24 male) subjects had low calcidiol levels (21 ± 6;mean$\pm$SD) compared to 69 (36 male) subjects who had adequate calcidiol levels (43 ± 10). Median urine calcium was slightly higher in those with adequate calcidiol (195 v 163; $p=0.06$). The positive association of urine calcium with calcidiol was a function of subjects with low vit D as once calcidiol levels were ≥ 30 ng/ml there was a negative, however nonsignificant association with magnitude of calciuria.

Thus, in calcium oxalate stone formers, there is a direct correlation between calcidiol level and magnitude of calciuria. However, in those who are vit D sufficient, this correlation no longer exists. This preliminary cohort analysis suggests that in calcium stone formers who are vit D replete, there is no association between calcidiol level and magnitude of calciuria.

Colon Cancer Cells Express Immunosuppressive Cytokines TGFβ and IL-10 Which Have Been Shown to Suppress Anti-tumor Immunity

By: Rachel Kirshenbaum[1], Dr. Ajay Maker[2,3], Dr. Jianzhong[2], and Dr. Bellur S. Prabhakar[2]

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Tumor cells may secrete immunosuppressive cytokines to down-regulate host anti-tumor immune response. Recent studies have demonstrated that specific cytokines can suppress anti-tumor immunity by stimulating the development of regulatory $CD4^+CD25^+$ T cells which suppress cytotoxic T cell effector function and weaken the host anti-tumor immune response. Increased immunosuppressive cytokine expression has been documented in a number of malignancies including colon, pancreatic, breast, and lung cancer. In this experiment, we studied the mRNA and protein expression of two immunosuppressive cytokines TGFβ and IL-10 in murine and human colon carcinoma cells to determine if the tumor cells constitutively express TGFβ and IL-10 or if expression is induced by the tumor microenvironment. RT-PCR analysis demonstrated that TGFβ mRNA was expressed in murine CT26 colon carcinoma cells both *in vitro* and *in vivo* while IL-10 transcripts were detected *in vivo* only. Protein expression for IL-10 (not performed for TGFβ) as evaluated by Western blotting did not confirm IL-10 expression *in vitro* or *in vivo*. *In vitro* studies on human HT29 colon carcinoma cells revealed no IL-10 protein transcripts but did reveal TGFβ transcripts while human COLO205 colon carcinoma cells revealed IL-10 protein transcripts but no TGFβ transcripts. Our findings suggest that both murine and human colon cancer cell lines constitutively express protein transcripts for immunosuppressive cytokines. Additional protein expression and *in* vivo studies are necessary to determine the clinical relevance of our results.

The Me-Self, the I-self and Relating to an Other

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Previous research has examined how similarity, proximity, communication and peers affect emotional closeness; however, it is unclear how a pair develops close emotional bonds. This literature review will explore how pairs develop in relation to the different parts of our Selves, the "I" and the "Me." The "Me-self" is each person's self-image and self-perception, while the "I-self" is the part of the self that reacts, internalizes and interprets experiences. It is hypothesized that as relationships deepen from the level of acquaintance to the level of friend, each member of the dyad relates to the other on a deeper level of self. Specifically, when relating to an acquaintance, the individuals' "Me-selves" connect, and as the relationship forms deeper emotional bonds, the pair relate on the level of "I." The more that is understood about the development of relationships can allow greater work to be done to improve the nature of relationships.

Research conducted as part of a senior honors thesis at Stern College for Women, advised by Dr. Robin Freyberg.

Morphometric Study of Neurite Growth

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Neurites are "Dynamic"- during development they switch off between growing and retracting. The neuron must balance the need to have many, long neurites to be able to communicate with more, farther cells, and the need for few, short neurites to conserve energy. Morphometrics is the quantitative study of form such as size and shape. By using morphometric analysis to measure the lengths of neurites, it is possible to learn about how neurites grow.

We grew leech neurons on two types of culture plates - regular plates and plates with lines added onto them lithographically. We measured the lengths of the neurites using Neuron J, an Image J plugin created by Eric Meijering which traces neurites and measures their lengths. Using the measurements, we averaged the lengths of the neurites and the number of neurites for each day and made graphs of the data. We compared the neurite lengths and numbers for cells at different days of their growth after plating, and for each day we compared the lengths of neurons grown on the two types of culture plates. We also made graphs that differentiated between cells that contacted other cells and cells that stood alone.

Our results indicated that, for all types of plates, the sum of the neurite lengths for each cell and the number of neurites would increase for the first few days of development, but would then hit a peak and begin to decrease. However, the cells on plates with patterns had shorter neurites than the cells on the regular plates. Based on this data, we believe that the neurites grow until their neurites reach other cells, at which point they decrease the lengths of unattached neurites to conserve energy. The cells on the plates with patterns had shorter neurites because contact with the patterns was similar to contact with cells, so the cells began to diminish the lengths of their neurites earlier. This hypothesis is supported by our graphs comparing the cells with and without contact, from which it is evident that the cells without contact had longer and a greater number of neurites. This is likely because the neurites were still growing and searching for other cells with which to make contact.

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Hydrogen Bonding in Modified Serine and Tyrosine Protein Residues

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Post-translational modification of proteins, which occurs through the covalent addition of a functional group on a protein side chain, plays a key role in expanding the diversity of protein activities. The introduction of a novel functional group changes the chemical and physical properties of the protein side chain. This results in altered protein structure and dynamics, and ultimately a modulation of enzyme activity, ligand affinity, protein-protein interactions, and protein stability.

Phosphorylation of a serine, threonine, or tyrosine residue, is one of the most commonly occurring post-translational modifications; there are 518 protein kinases in the cell, 90 of which are tyrosine kinases. Recently, there has been increased interest in tyrosine sulfation, a modification that is related to several physiological and pathological processes, such as the entry of the HIV-1 virus into the cell via the sulfated CCR5 receptor. Here we investigate how hydrogen bonding patterns differ between phosphorylated serine and phosphorylated tyrosine residues, and between phosphorylated tyrosine and sulfated tyrosine residues.

Our study involves a survey of the Protein Databank (www.pdb.org), a repository of over 75,000 three dimensional protein structures. First, we identify all protein structures containing a phosphorylated serine (pSer), phosphorylated tyrosine (pTyr), or sulfated tyrosine residue (sTyr). Each structure is then subject to a crude optimization in which atoms missing from the structural file are filled in, and hydrogen atom positions are optimized. Then we use the PLOP protein modeling program to identify all hydrogen bonds to the residues of interest.

Figure 1 shows the percentage of residues showing a particular number of hydrogen bonds for pSer, pTyr and sTyr. Results show similar hydrogen bond propensities for pSer and pTyr and a reduced tendency to form hydrogen bonds for pSer. This is probably due in part to its reduced charge, -1 for the sulfated residue vs. -2 for the phosphorylated residues.

For pTyr, we investigated the nature of hydrogen bonding by breaking down the hydrogen bonds that were identified by residue and geometry. Table 1 shows that over half of all hydrogen bonds were to Arginine residues. Bidentate hydrogen bonds, in which two phosphate oxygen atoms interact with two nitrogen atoms on Arg, were particularly favorable. Interactions with the amide group on the protein backbone and with Serine were also commonly observed.

Ongoing studies involve a breakdown of pSer and sTyr hydrogen bonds by residue and geometry, and computational studies to provide insight into the theoretical basis for the observed hydrogen bonding patterns.

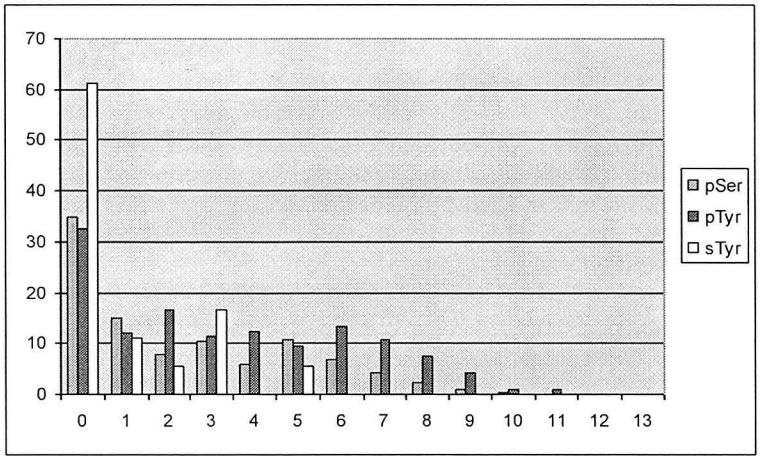

Figure 1. Percentage of pSer, pTyr and sTyr residues in the Protein Databank showing a particular number of Hydrogen Bonds.

Table 1. PDB Statistics for Phosphotyrosine Residues

Residue	% Hydrogen Bonds
ARG (single)	27.8
ARG (bidentate)	25.0
LYS(single)	4.7
LYS(bidentate)	.7
Backbone amide	16.6
SER	14.5
Other	10.7

Components of Specificity in Methyl-Lysine Binding Proteins

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Lysine methylation is a post-translational modification in which one, two, or three methyl groups are added to the side chain nitrogen atom of a lysine residue. This modification was first observed in histone proteins and plays a key role in the epigenetic control of transcriptional regulation. Regulation is for the most part effected indirectly through recruitment of "reader" proteins which bind to the methylated lysines.

Methyl-lysine binding proteins are specific for particular methylation states. The objective of our study is to provide a quantitative measure of how methyl-lysine interactions vary with a change in methylation state using molecular mechanics, quantum mechanics, and implicit solvent models. Our results show the following effects on specificity: (1) In small binding cavities, higher methylation states result in higher energies due to steric hindrance. (2) In larger binding cavities, molecular mechanics studies yield conflicting results regarding whether higher or lower methylation states are favored. (3) Implicit solvent studies of Lysine/Acetate residue pairs show increased Hydrogen Bond strength with higher methylation state (see Table 1). (4) Quantum Mechanical Studies of Lysine/Benzene residue pairs show a decrease in the strength of cation-π interactions with an increase in methylation state (see Figure 1).

Table 1. Implicit Solvent studies; Energies of Interaction for Acetate (as a model for acidic residues) interacting with Lysine residues in different methylation states.

Residue Pair	**Energy (kcal/mol)**
Lysine/Acetate; linear	-5.8
Lysine/Acetate; coplanar	-4.5
Mono-methyl Lysine/Acetate; linear	-7.7
Mono-methyl Lysine /Acetate; coplanar	-8.2
Di-methyl Lysine/Acetate; linear	-8.7

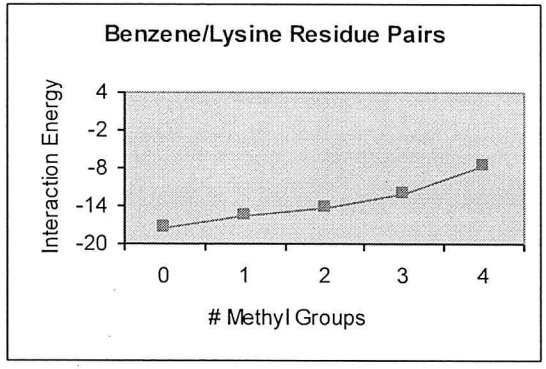

Figure 1. Quantum Mechanical Studies; Energies of Interaction for Benzene (as a model for aromatic amino acids) interacting with Lysine residues in different methylation states.

Future studies will involve quantum mechanical studies on residue pairs in different orientations and molecular dynamics on protein structures in complex with methyl-lysine residues. We anticipate that our studies will contribute to the development of precise models which can accurately reflect the magnitude of the various components of methyl-lysine binding specificity.

Inactivating RhoA with C3 Transferase in an Attempt to Decrease Inflammation

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Approximately 259,000 people in the United States live with a spinal cord injury with around 12,000 new cases recorded each year. Spinal cord injury (SCI) results in neuron death which has severe ramifications, including paralysis, absence of feeling, and allodynia or neuropathic pain. This is not just the result of the primary injury, the immediate damage to the tissue after impact to the spinal cord, but a result of the secondary injury as well. The continuous secondary injury damage induces cellular apoptosis from necrotic cells' and activated microglia's release of excessive extracellular glutamate, overwhelming the astrocytes' clearing capability. Additionally, molecules that stimulate growth cone collapse and restrict neurite outgrowth such as myelin associated inhibitors and chondroitin sulphate proteoglycans (CSPGs) are released by the degenerating myelin and the glial scar, respectively. Finally, while phagocytic neutrophils and pro-inflammatory microglia/M1 macrophages become recruited to the injury site and are necessary to clear the necrotic debris, their increasing numbers are disproportionately higher than the short lasting increase of anti-inflammatory M2 macrophages. Microglia/M1 macrophages release pro-inflammatory cytokines (e.g. IL-1β^2 and TNF-α), glutamate, and reactive nitrogen and oxygen intermediates, adding to the already cytotoxic extracellular environment. Consequently, the injured spinal cord is left in a long lasting inflamed state.

There has been much research in trying to discover a treatment that will achieve the best functional recovery after SCI through inducing neurogenesis and in finding a non-invasive method of treatment delivery. Some studies have included exogenous siRNAs, endogenous miRNAs, transplantation of stem cells, and suppression of small GTPase proteins which are up-regulated after SCI. RhoA is one such GTPase protein which becomes activated after SCI and is responsible for the formation of stress fibers in the actin cytoskeleton. When activated, RhoA causes the actin filaments in neuronal growth cones to contract, preventing them from spreading further out. RhoA also contributes to macrophage infiltration to the lesion site, ultimately amplifying spinal cord inflammation.

Assuming that suppressing RhoA would be a promising target in reducing secondary injury inflammatory damage, we conducted experiments using C3 transferase, a bacterial exoenzyme that has been shown to inactivate RhoA via ribosylation, with an HIV viral TAT peptide to facilitate cell penetration in an *in*

vitro study using THP-1 monocytes (human monocyte cell line). Cells were divided into two conditions: one group of monocytes that received PMA (phorbol 12-myristate 13-acetate) for two days to differentiate them into macrophages, and another group of monocytes that received PMA for one day and LPS (lipopolysaccharide) for one day to activate the differentiated macrophages. Three experiments were conducted using these two conditions.

The first experiment consisted of low doses of TAT-C3. TAT-C3 was applied to the THP-1 cells grown on the coverslips and subsequently stained with phalloidin, a mushroom toxin and a marker for the actin cytoskeleton. Phalloidin has a flourophore attached to it, allowing us to see the actin cytoskeleton under the fluorescent microscope. We expected the TAT-C3 treated cells to have formed protrusions and to be spread out as an indicator of C3's effect on the cytoskeleton through RhoA inactivation, as seen in previous studies. However, there appeared to be no morphological differences between the TAT-C3 treated and control cells within the two conditions, leading us to believe that the TAT-C3 doses may have been too low.

In the second experiment, higher doses of TAT-C3 were applied to the coverslips. This time, however, serum containing media, serum free media, and buffer control coverslips were used for comparison. Additionally, phase contrast images were taken after treatment and before fixation to examine the cells' health state. We then stained the coverslips with phalloidin and there appeared to be extensive cell death as evidenced by phase contrast images and the lack of phalloidin staining.

For the third experiment, we investigated the cause of cell death. To test whether the cause was the high doses of the C3 peptide that inactivates RhoA or the high doses of the TAT peptide, we applied high doses of the C3 29mer, a 29 amino acid peptide from the C3 transferase protein which only affects RhoA of the Rho GTPase family, to the THP-1 cells. Again, we had serum containing media, serum free media, and buffer control cells for comparison within the two day PMA condition and one day PMA/one day LPS condition. We stained the coverslips with phalloidin and looked at their morphology under the fluorescent microscope. Within both conditions, the cells did not appear to have any substantial morphological differences from the controls, implying that the high doses of the C3 29mer had no effect on RhoA, or that the effects were not detectable using this method. However, no cell death was observed, suggesting that the inactivation of RhoA was not the cause of cell death.

While there were no appreciable morphological differences in the *in vitro* TAT-C3 or C3 29mer studies, more experiments are being conducted to determine their effects on RhoA expression and the inflammatory response.

The Transmission of Trauma from Holocaust Survivors to Their Children

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A trauma can be so severe that its impact is felt across generations. One such trauma was the Holocaust, a devastating and demoralizing war against the Jews. Its horrific impact on the survivors requires much consideration of its effects on the next generation. Second generation Holocaust survivors, although they did not experience the Holocaust firsthand, may feel traumatized from its physical and emotional brutality. Despite the fact that the brutality was inflicted solely upon their parents, children of survivors may feel its impact in a very tangible way. Their parents may have parented in a way that reflected their inner pain, oscillating between loving and caring for their children and languishing in their memories of the past.

The question of whether this inner pain caused by the trauma was indeed transmitted down through the generations is subject to much debate. Nonclinical studies have not found any significant differences between second-generation Holocaust survivors and comparison groups. However, most clinical studies done thus far have found that children of survivors suffer from this trauma. Many of these studies point to the parents' unresolved mourning of the trauma which prompted their irregular parenting styles and helped form disorganized attachment styles with their children. Parents tended to keep their Holocaust experiences secret from their children, hoping to shield them from horrors which could impede normal development, but the children find it difficult to relate to their parents without a more complete knowledge of their parents' life experiences. Because some survivors keep silent about the Holocaust, their children digest nonverbal communication about it without quite understanding the mixed messages that their parents unintentionally sent. Whether through nonverbal communication or through genetic predisposition, "survivor guilt," irrational remorse for having outlived loved ones, seems to have been transmitted to the next generation. Children of survivors feel guilty that their parents are suffering, even though they are entirely blameless. This susceptibility to feeling "survivor guilt" in the same way as their parents points to the conclusion that trauma from the Holocaust does, indeed, transmit to the next generation.

To resolve the debate of whether transmission of trauma to the next generation exists, the Transcending Trauma Project originated the idea that all impacts of the Holocaust, from survivor resiliency to transmission of trauma, are based on a continuum. Some second-generation Holocaust survivors are traumatized from

vicariously enduring the Holocaust, and others are unscathed. Some are traumatized in one aspect of their lives and function normally in other realms. The outcome essentially depends on how the survivors conduct their significant relationships, particularly the relationship they have with their children.

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Differentiated Localization Pattern of SUMO Proteins in Testicular Tumors

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Testicular cancer is the most common cancer in men aged 20-39 years old. Each year in the United States, between 7,500 and 8,000 diagnoses of testicular cancer are made. More than 90% of testicular cancers are germ cell tumors, meaning the cancer arose from immature germ cells that failed to differentiate properly. Common testicular germ cell tumors include seminomas, embryonal carcinomas, yolk sac tumors, and teratomas. Seminomas and embryonal carcinomas are much less differentiated, while yolk sac tumors and teratomas are much more differentiated. These tumors offer diverse histopathologies and clinical behaviors.

Small-ubiquitin-related-modifiers (SUMO) are small proteins which attach to other proteins in a process known as sumoylation. Sumoylation is a post-translational modification involved in numerous cellular events. SUMO proteins have recently been localized in normal testicular cells; however, their role in normal and impaired spermatogenesis is still widely unknown. The goal of our research was to determine the possible role of SUMO proteins in the development of testicular cancer. As part of our research, we looked at a variety of tumor tissue arrays from patients with different types of testicular tumors to discover a possible connection between the expression level, localization of SUMO and the type of tumor.

The tumor tissue arrays used included seminomas, embryonal carcinomas, yolk sac tumors, and teratomas. We screened the arrays on slides and were able to visualize the expression and localization of SUMO using immunohistochemistry. Immunohistochemistry detects the presence of proteins in tissues by utilizing the principle of antibodies binding specifically to antigens (in this case, SUMO proteins). In our research, we used SUMO antibodies to detect the presence of SUMO proteins.

The first part of our experiment focused on seminomas. We first looked to see whether or not the tissue samples tested positive for SUMO. We then looked at the level of SUMO expression by focusing on the intensity of the color stain. Next, we looked at the localization of the SUMO by comparing the level of nuclear expression to the level of cytosolic expression. We based color intensity on a numerical scale from 0.5 to 5, with 0.5 being little intensity and 5 being highest intensity. Overall, 84 seminoma samples were used.

Our results indicated that despite the same diagnosis, seminomas could be further subdivided into three major groups based on different patterns of SUMO staining (Table 1). The first and most prominent group (67%) showed an average to bright SUMO staining in the nucleus and a light SUMO staining in the cytosol. The second group (21%) showed an average to bright SUMO staining in the nucleus and the cytosol of the cells. The third group exhibited a very light to light cytosolic and nuclear SUMO staining (12%). The next step to our research will involve the usage of proliferative and differentiating markers in order to find possible differences in the progressive stage of the three seminoma groups. Experiments in the laboratory are in progress to determine SUMO localization pattern in non-seminoma tumors. Together these studies will determine whether SUMO can potentially be used as an additional marker for an accurate diagnosis of testicular germ cell tumors.

Table 1. Color intensities of SUMO staining in the nucleus and cytosol of 84 seminoma samples.

Nucleus	Cytosol	Percentage of Samples
Average to Very Bright (2-5)	Very Light to Light (0.5-2)	67% (56 samples)
Average to Very Bright (2-5)	Average to Bright (2-4)	21% (18 samples)
Very Light to Light (0.5-2)	Very Light to Light (0.5-2)	12% (10 samples)

Radiopurity of Cyclotron Produced 18F Sodium Flouride

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^{18}F is a bone seeking tracer whose use is increasingly favored in Positron Emission Tomography (PET) scanning. It is used in PET scanning since it emits positrons whose annihilation with electrons cause the release of gamma rays detectable by the PET scanner permitting an image to be observed. Radionuclides used in PET scanning have a relatively short half-life since they emit positrons which in turn cause radiation to the body. If a radioactive isotope's half-life is long it can cause excess radiation that may be harmful to one's body. The measured half-life for ^{18}F is 110 minutes, long enough to obtain useful images, but short enough to limit biological radiation exposure, explaining its use in PET scanning. The objective of this study was to measure the radiopurity of the ^{18}F tracer. Residual radioactivity in a syringe from three $Na^{18}F$ sources (IBA Molecular) was retained from three specimens. After intravenous injection the fluoride ion attaches to bone crystal, permitting images of many bone disorders and diseases before they might appear on X-rays. The first sample of NaF was left over from a study performed on a rat model of fracture healing (B. Strauch, PI) performed at the M. Donald Blaufox laboratory for Molecular imaging. The second and third specimens were residuals retained after injection of patients at Montefiore Medical Park: residual activities were brought to the M. Donald Blaufox Laboratory for Molecular Imaging. Each syringe as well as two additional syringes containing ^{18}F fluorodeoxyglucose (FDG, another radiotracer, but which is chemically different, and prepared differently from NaF) was measured in the well counter daily for 10 minute counting intervals with date and time noted. Background activity was subtracted to determine net radioactivity of the isotope. The log of the net activity vs. time was plotted. Through comparison the decay rate of the sample was observed to be much longer than 110 minutes, the half-life of 18F. It was therefore determined that a contaminant was present in the $NA^{18}F$ isotope. This contaminant was not observed to be present in the two samples of FDG.

The Effects of Directed Goal Writing on Low Levels of Depression and Anxiety

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Previous research has begun to explore how directed writing can have a positive impact on mental health. Specifically, goal writing was found to have a more positive effect on mood and psychological wellbeing in comparison with writing about trauma both immediately after writing and long-term (King, 2001). The proposed study will demonstrate that directed goal writing significantly lowers levels of depression and anxiety. Participants will be randomly assigned to a directed goal writing group or a non-directed writing group and asked to write for 20 minutes twice a week for two weeks. Measurements for levels of depressive and anxious symptoms will be taken using the Beck Depression Inventory-II and the Beck Anxiety Inventory before and after writing. It is expected that the change in depression and anxiety levels from pre to post-writing should indicate the effectiveness of goal writing as a tool for reducing levels of depression and anxiety. Implications for implementing directed goal writing as an effective and efficient supplement to other forms of therapy will be explored. As low levels of both depression and anxiety are quite common in the college population, such a tool can be utilized across campuses if found to be effective.

Research conducted as part of a senior honors thesis at Stern College for Women, advised by Dr. Robin Freyberg.

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Circadian RNA Editing in Zebrafish

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RNA editing is a process by which genetic information is altered after transcription but before translation. In A-to-I substitution, for example, ADARS (adenosine deaminases acting on RNA) replace adenosine [A] in the pre-mRNA with inosine [I], which is read like guanine [G] during translation. If RNA editing occurs in the coding sequence (CDS), it can change codons and call for different amino acids during translation. In our research, however, we are focusing on A-to-I editing that occurs in the untranslated region (UTR), which affects various regulatory processes such as translation and degradation.

Though research has shown that RNA editing occurs, very little is known about its ultimate function. We propose that RNA editing is related to the circadian rhythm of the body, exhibits day and night specificity, and plays a significant role in the patterns of sleep and wake in zebrafish. The zebrafish model combines the power of invertebrate-like genetics with vertebrate brain structures. Additionally, there are many other advantages to zebrafish, such as transparency, rapid development rate, and the convenience of being able to raise and maintain them in large numbers in a small room. Importantly, like humans, zebrafish are animals that are highly influenced by the day and night cycle, sleeping during the night. As such, RNA was sampled from zebrafish larvae, 6 dpf (days post fertilization), during the day (ZT5, 5 hours after first light) and at night (ZT17, 3 hours after light to dark transition). cDNA of four genes of interest was synthesized and amplified and afterwards compared to the original DNA to see if RNA editing occurred and whether it exhibited day/night variation.

We found that the levels of A and G fluctuated constantly amongst different samples, suggesting variation in RNA editing between day and night. This work, however, is preliminary and requires further sampling and analysis to determine if this difference is significant. Nevertheless, our data looks promising and provides an opportunity for future research that will shed light on the mysteries of circadian and sleep-dependent RNA editing.

Rapamycin as an Important Therapeutic Agent in Breast Cancer Treatments

By: Naamah N. Plotzker, Jonathan Maik, Davita Wachsstock, Miriam Maruani, and Marina K. Holz, Ph.D.

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Breast cancer cell proliferation is caused in part by gene expression mediated by estrogen receptor α (ERα). ERα is activated by the phosphorylation of Serine-167 by the enzyme S6 kinase 1 (S6K1). Because breast cancer cell proliferation is often facilitated by ERα/estrogen, breast cancer is usually treated by anti-estrogen therapy. However, this treatment is not always effective since there exist estrogen-independent pathways of ERα activation. One pathway, called the MEK pathway and inhibited by the drug U0126, is activated by serum growth factors. The second pathway, responsive to growth factors, insulin and nutrients, is called the mTOR pathway which activates S6K1. The drug rapamycin has been found to inhibit mTOR, and thus S6K1, preventing breast cancer cell proliferation. Our lab set to demonstrate how rapamycin, in concert with the drugs that inhibit the estrogen-dependent pathways and the serum-induced pathway, is more effective in preventing breast-cancer cell proliferation than anti-estrogen therapy alone. Our research contributes to the personalized medicine approach, which aims to treat cancer by determining the right combination of drugs that most effectively address active cellular pathways unique to each individual patient's cancer.

Antiproliferative and Pro-Apoptotic Properties of Ellagic Acid to Oral Carcinoma HSC-2 Cells

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There is a growing interest in natural phytocompounds for cancer prevention and possible treatment. Ellagic acid ($C_{14}H_6O_8$) is a simple polyphenol present in fruits, such as pomegranate, and in berries, such as strawberry, raspberry, and blackberry. *In vitro* studies with mammalian cells in culture have demonstrated that ellagic acid had antiproliferative and pro-apoptotic effects on cancerous cells derived from the skin, esophagus, pancreas, colon, breast, prostate, and neural tissues. However, the effects of ellagic acid on cancer cells from the human oral cavity have not, as yet, been studied. Thus, the target cells used in research herein were human oral carcinoma HSC-2 cells.

Ellagic acid, at a concentration range from 25 to 200 μM, did not affect the viability of HSC-2 cells during a 24-hr exposure. Toxicity was noted, however, for longer exposures, with a midpoint toxicity value slightly greater than 200 μM for a 2-day exposure and at 125 μM for a 3-day exposure. As shown by bright field microscopy for a 2-day exposure of cells treated with ellagic acid and subsequently stained with aceto-orcein, increasing the concentration of ellagic acid increased the occurrence of cytopathologies, as noted by decreased cell numbers and by cells with diffuse cytoplasm and condensed nuclei.

Ellagic acid caused cell death by apoptosis, as seen by fluorescence microscopic examination of cells treated with ellagic acid and stained with acridine orange. As the concentration of ellagic acid was progressively increased for a 2-day exposure, the numbers of cells exhibiting hypercondensed nuclei, blebbing, and apoptotic bodies increased (Figure 1). Biochemical indicators of apoptosis were studied by immunoblot analysis of specific apoptosis marker proteins. Caspase-3 is a key executioner of apoptosis; its activation is indicated by cleavage of the pro-enzyme at aspartic acid 175, yielding 17/19 kD and 12 kD active products. Immunoblot analyses of cell lysates treated with 100, 175, and 200 μM ellagic acid for 2 days showed activation of caspase-3 protein. Another marker of irreversible apoptotic cell death is the cleavage, and thereby inactivation, of poly(ADP-ribose) polymerase (PARP) by caspase enzymes. PARP cleavage products, were detected in protein lysates of cells exposed for 2 days to 100, 175, and 200 μM ellagic acid, but not in untreated cells (Figure 2).

Polyphenols can act both as antioxidants and as prooxidants. The FOX assay was used to quantify the generation of hydrogen peroxide in cell culture medium amended with ellagic acid. Although hydrogen peroxide was detected, the amounts were minimal. These data supported the finding that pyruvate, a

scavenger of hydrogen peroxide (pyruvate + hydrogen peroxide → acetate + carbon dioxide + water) did not protect the cells against exposure to ellagic acid. Apparently, the levels of hydrogen peroxide that were generated were insufficient to evoke a cytotoxic response.

However, there was some indication that ellagic acid acted as an antioxidant. The diacetate ester of 2', 7'-dichlorodihydrofluorescein (DCHF-DA) is a colorless, nonfluorescent, nonpolar molecule that passively diffuses into cells and is used to detect intracellular hydrogen peroxide. Within the cell, esterases cleave the two acetates to form DCHF, a nonpermeable, polar molecule. Oxidation of the trapped nonfluorescent DCHF yields the fluorescent product, 2'7'-dichlorofluorescein, which can be visualized by a fluorescence microscope. Minimal fluorescence was observed in HSC-2 cells, both control and those exposed to 33.1 μM ellagic acid for 4 hr, whereas cells exposed to 200 μM hydrogen peroxide for 4 hr fluoresced brightly. Intracellular fluorescence was not observed in HSC-2 cells coexposed to ellagic acid + hydrogen peroxide, thus indicating the antioxidant property of ellagic acid.

Ellagic acid was a potent inducer of apoptosis and inhibited proliferation of oral carcinoma cells. These studies suggest that consumption of ellagic acid-containing fruits and berries may play a role in cancer prevention in the oral cavity.

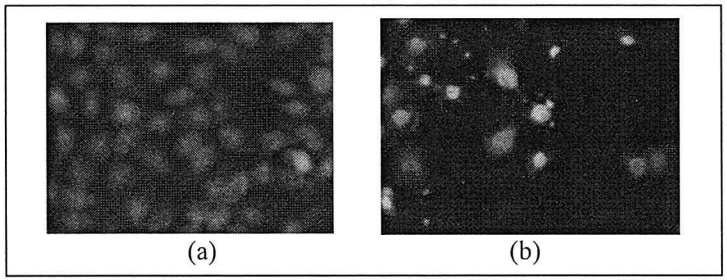

Figure 1. HSC-2 cells: (a) untreated control; (b) treated with 175 μM ellagic acid; apoptotic bodies indicated by arrowhead. Acridine orange stain; magnification 320X.

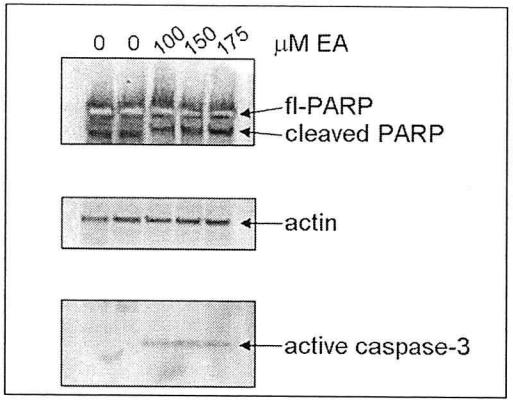

Figure 2. Immunoblot analysis of PARP cleavage (top panel) and caspase-3 activation (bottom panel) in HSC-2 cells untreated and exposed to increasing concentrations of ellagic acid for 48 hr. Actin levels were detected as a loading control (center panel).

Clinical Outcomes of Delirium in Elderly Patients Admitted From the Emergency Department
&
Quality Assurance Evaluation of Delirium in Patients in the MICU, SICU, and CSICU

By: Samantha Selesny[1], Koral Dadon[1], Hannah Esan[1], Michael Shusterman BS[2], Krishna Aparanji MD[3], Su-Bin Park MD[3], Purnema Madahar MD[3], Jean Hsieh MD[3], and Michelle Gong MD, MS[3]

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Objectives

(1) To measure the prevalence of delirium and its psychomotor subtypes in Emergency Department patient greater than or equal to 65 years of age who are admitted to the hospital inpatient wards.
(2) To test the association between delirium and subsequent morbidity and mortality after admission.
(3) To evaluate the prevalence of delirium in the medical intensive care unit (ICU), the surgical ICU, and the cardiothoracic ICU.

Background

Delirium has been defined as a syndrome involving acute alterations in mental status with a fluctuating course and inattention [1]. In older patients, delirium has been associated with multiple negative consequences, including increased mortality, hospitalization, increased costs of care, and greater risk for cognitive decline [2, 3]. In the Emergency Department (ED) as many as 8% of older patients may have delirium and 76% of these cases may be missed by ED physicians [4]. However, previous studies have not analyzed the association between of delirium in older ED patients and subsequent inpatient outcomes. This study aims to analyze the hypothesis that patients diagnosed with delirium at the time of admission from the ED will present with worsening outcomes and increased mortality and morbidity. The determination of such a correlation would allow for the implementation of earlier delirium interventions both in the ED and the inpatient wards.

Methods

Approval for the study protocol was provided by the Einstein-Montefiore institutional review board. Our study involves a prospective observational cohort of 200 elderly patients. Inclusion criteria for the study were patients in the Emergency Department, of an age equal to or greater than 65 years, with planned admission to the Moses or Weiler divisions of Montefiore Medical Center. Patients were excluded for being non-English speaking, refusing consent or having a surrogate refuse consent, having an altered mental status and no surrogate to consent for them, being admitted to the medical ICU, surgical ICU, cardiothoracic ICU, or critical care units, having psychiatric illness, being in a comatose state, or suffering from severe dementia or neurocognitive disease at baseline such that the patient was nonverbal or unable to follow basic commands (mild to moderate dementia was not excluded). Patients were enrolled while in the ED through an oral consent performed by a research assistant.

Research assistants assessed the patient level of consciousness in the ED and determined the delirium status of the patient through the CAM-ICU protocol [5]. The CAM-ICU involves a short two minute assessment of inattention, disorganized thinking, and altered level of consciousness. CAM-ICU assessment was performed on the first day in the ED and over the subsequent two days during the patients in-patient stay until hospital day three. If a patient was determined to not be delirious, research assistants performed an assessment of cognitive functional status by employing the Memory Impairment Screen (MIS) and a Katz Activities of Daily Living assessment [6, 7]. Additional data was also collected from non-delirious patients regarding occupational status, educational levels, and leisure activities. For delirious patients a shortened Informant Questionnaire on Cognitive Decline (IQCODE) for the elderly was administered to a healthcare surrogate along with the Katz and other baselines assessments. The MIS or IQCODE and Katz were performed on the same day.

Over the course of the study medical records were analyzed to collect ED laboratory data and vitals and inpatient medical history, consultations, and other outcomes. Data was collected through 28 days or until hospital discharge. All patient data was made anonymous through assignment of a unique study number and electronically secured behind password protected databases. Any identifying information is to be destroyed at the conclusion of the study.

Results and Conclusions

Both the clinical study and the quality assurance project are ongoing and no definitive results have been obtained. Currently 501 patients have been screened for the study and 67 patients have been recruited (Figure 1). Of the 67 recruited patients 5 were CAM positive for one day during the three day screening period and 62 were CAM negative for every day within the three day screening period. We project the trial recruitment to be complete within the next two to three months.

References:

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2. Sanders AB. Missed delirium in older emergency department patients: a quality-of-care problem. Ann Emergency Medicine. 2002; 39:338–41.

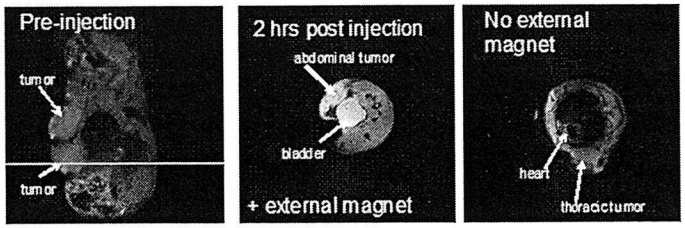

Figure 1. MRI Imaging of Mouse with Two Mammary Tumors
After the pre-injection imaging session an external magnet was placed on the lower abdominal mammary tumor for 30 minutes after tail vein injection on nanoparticles. Imaging was performed two hours after injection. We observed increased intensity of the abdominal tumor where the magnet was positioned and the bladder compared with the heart and thoracic tumor. Mammary tumors typically have the same intensity regardless of the position of the animal (see the pre-injection imaging).

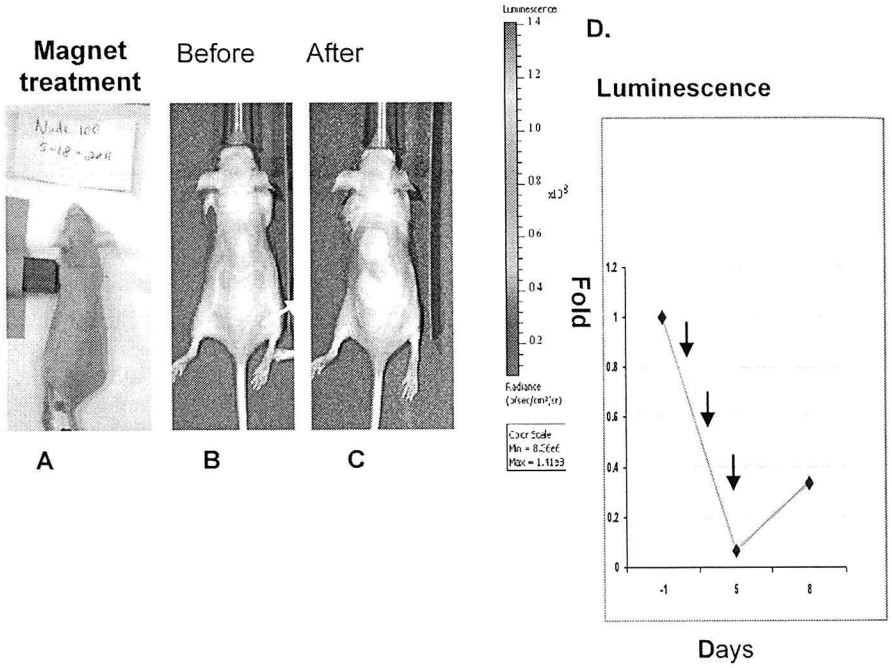

Figure 2. Bioluminescent Imaging
A mouse carrying one tumor in the chest wall (not in bone) was injected with 1 mg/kg ADM-MNP three times (every 2 days) and treated with a magnet for 30 minutes. The mouse was imaged before and after the treatment (D, pointed by black arrows) and then 3 days after the last treatment (D, 8 days). Notice at the end of 3 treatments, luminescent signaling in the magnet treated tumor decreased by over 80%. The signal partially recovered 3 days after the treatment was ended.

Humanin a Protector of the Mitochondrial Membrane

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Mitochondria are the major source of energy in all eukaryotic cells, producing ATP through glycolysis and via oxidative phosphorylation and the citric acid cycle. They regulate calcium homeostasis and modulate apoptosis through release of several cell death-inducing molecules. The mitochondrion has a large membrane potential across the inner mitochondrial membrane. This results from the differential charge across the membrane. This membrane potential supports a strong proton drive through ATP synthase and is a key indicator of cellular viability. The enzyme reactions responsible for the maintenance of this steady state produce a variety of highly reactive oxygen species (ROS) with the ability to damage cell structures including the inner mitochondrial membrane.

Humanin (HN) is an endogenous peptide known from previous studies to be neuro-and cardio-protective. HNG is a stable Humanin analog that can be added to cells to stimulate a thousand times the effect of Humanin, due to one amino acid substitution. However, the actual mechanism of cell protection is not well established. Humanin is known to increase ATP production, and to reduce intracellular levels of ROS, which lead us to hypothesize that Humanin's effect, extends to the mitochondrial membrane. Utilizing the fluorescent dye JC-10 as a mitochondrial probe, one can estimate changes in membrane potential ($\Delta\Psi m$) resulting from addition of the HNG peptide. JC-1O was utilized to assess mitochondrial membrane potential and the effect HNG has on the mitochondria when added to the cells. As mitochondrial membrane potential increases, JC-10 dye enters the nucleus of the mitochondria and changes color from green (when in the cytoplasm) to red. Healthy cells display an increased membrane potential, which forms J-aggregates with intense red fluorescence. In unhealthy cells with low mitochondrial membrane potential JC-10 remains in its monomeric form and displays a green dye.

Cardiac myocytes, were plated in black 96 well plates. The plates were left over a period of 3-5 days in the incubator, to achieve optimal cell density. Hydrogen Peroxide was utilized to damage the inner mitochondrial membrane of the cardiac myocytes, and to demonstrate the effects of HNG. The wells were treated with varying amounts of Hydrogen Peroxide, ranging from 10nM to 100mM, then placed in the incubator for 30 minutes in order to maximize the effects of the hydrogen peroxide. Every eight well column was treated with the same amount of Hydrogen peroxide, in order to establish 8n per amount of H2O2. After 30 minutes, the supernatant was aspirated, 1ml of JC-1O was placed in 5 ml of a buffer comprised of 100 mL of 1X HBSS with 20 mM of Hepes. Then 100ml of the mixture was placed into each well, and the plate was

incubated for an additional 30 minutes. After 30 minutes the supernatant was aspirated and the wells were washed three times with a wash buffer consisting of, 3.08mL NaCl, 0.167ml KCl, 0.12ml MgSO4, 0.06 ml NaH2PO4, 0.1ml CaCl2, 10mM of Hepes, 0.0198mg/ 100ml D-glucose. The final aliquot of wash buffer was left in the wells and the fluorescent signal was read utilizing a fluorescent plate scanner.

Our results from the fluorescent scanner were read at the wavelengths of 485-530 representing the green wavelength, and 485-590 representing red wavelength. We then divided the green unhealthy cells by the red healthy cells and got the mean of 8 samples. The lower the ratio the more cell viability, which we suspect is due to protection of HNG. This demonstrates maintenance in mitochondrial membrane potential, reflecting the driving force behind ATP production. Our data supports the hypothesis that Humanin supports the mitochondrial membrane.

Multisensory Processing in Children with Autism

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Viewing a person's articulatory movements substantially improves a listener's ability to understand spoken words, especially under noisy environmental conditions. A prominent theory in autism proposes that automatic multisensory integration (MSI) is impaired in this population, thereby inhibiting effective perception. However, direct empirical support of such deficits remains scarce. Impairment in communication is one of the hallmark symptoms of autism and the ability to perceive speech is a fundamental prerequisite for communication.

In our study, we assessed whether the integration of auditory and visual speech signals is impaired in high functioning children with ASD, by presenting them with monosyllabic words in auditory alone, audiovisual (AV) and visual (V) alone conditions, under varying signal-to-noise ratios. If MSI is indeed impaired in persons with autism, results signifying reduced gain in AV Integration would be expected. A large deficit in the ability of ASD children (ages 7-12) to integrate information from two senses was indeed expressed, as reduced AV gain, while performance in the auditory alone conditions was relatively normal. However, surprisingly, ASD children ages 13-17 exhibited comparable AV gain with TD teens, implying a recovery of MSI in the teenage years. This finding provides hope for parents of ASD children that, assuming no mechanism is inherently broken, early intervention may drastically reduce the MSI deficit exhibited by younger ASD children. Differences in how multisensory inputs are integrated, and how these differences affect higher-order processing, as well as the impact of early intervention on the pathogenesis of persons with ASD, remain to be explored.

Acknowledgements:
Student Undergraduate Research Program at Einstein (SURP), Roth Scholars Program, Lars Ross and John Butler.

Differential Expression of Lung Fractions as Determined by Quantitative PCR

By: Rebecca Tabaroki[1], Batya H. Edelman[1], Adam Z. Tepler[2], Daniel E. Green[2], Namita Sen[2], and Dr. Yakov Peter, Ph.D[2]

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Lung disease affects millions of individuals worldwide, with current therapies providing limited benefits to most afflicted patients. Stem/progenitor cell therapies provide new hope to these patients, contributing to tissue regeneration by means of self-renewal and by multipotential differentiation into more diverse and specialized cell types. However, within the lung, the existence of adult stem cells to promote repair remains unclear.

The objective of the current research is to enrich for mouse lung alveolar epithelial type-2 cells that produce Surfactant Protein C (SPC), Clara cells that secrete Secretoglobin 1 (Scgbla1), and epithelial stem cells that are reported to co-express SPC and Scbgla1 proteins. Our method of choice is equilibrium density gradient centrifugation, which separates cells by buoyant properties. Experimentally, the lung was proteolytically digested and single cells were loaded onto a column composed of five discrete fractions that ranged from 1.00-1.08 g/mL. The column was centrifuged at 400 Rcf for 17 minutes, individual fractions were collected, and RNA was purified by the TRIzol™ method. Messenger RNA was then reverse transcribed by the Superscript II kit to complementary deoxyribose nucleic acid (cDNA). Quantitative real-time PCR was performed on mouse lung cDNA from separate fractions utilizing sequence-specific primers for SPC, Surfactant Protein B, Mucin 5, Aquaporin 5, CEBP alpha, and Scgbla1 transcripts. To determine relative mRNA transcript levels, threshold cycle (Ct) values were normalized to the housekeeping GAPDH gene with negative values indicating higher mRNA levels. Our results indicated that while only fractions 4 and 5 expressed CEBP alpha, fractions 3 and 5 were enriched for cells that express SPC and Scgbla1 genes. These data provide evidence that the buoyant density of lung epithelial and double positive epithelial progenitor cells range between 1.06-1.08 g/mL.

In summary, enrichment by density gradient centrifugation will help us understand pulmonary stem cells characteristics, compliment current methods used in stem cell purification, and contribute to the development of cell-based therapies of the lung.

New Types of Solutions of Non-Linear Fractional Differential Equations

By: Laura Anna Taieb and Mark Edelman

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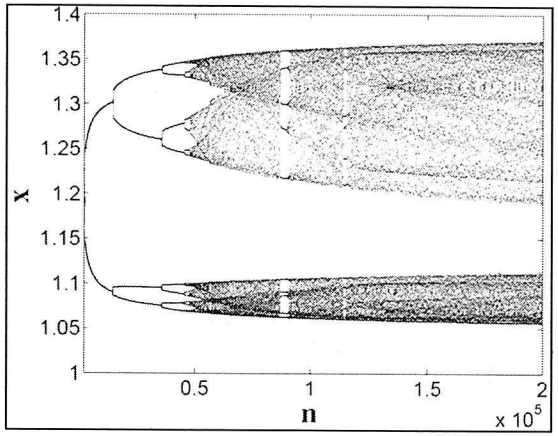
Using Riemann-Liouville, Caputo Fractional Standard Maps (FSM), and Fractional Zaslavsky Map (FZM) as examples, we demonstrate new types of solutions for non-linear fractional differential equations: attractors that overlap, trajectories that intersect, and cascade of bifurcation type trajectories.

The C codes were utilized to simulate all three maps for the derivatives of the order α from 1 to 2 and the map parameter K from 0 to 2π with step 0.4. Using Matlab, we obtained and analyzed three thousand phase portraits and presented our findings during the International meeting in Aveiro (Portugal) IDOTA 2011: Integral and Differential Operators and Their Applications.

The Typical Cascade of Bifurcations Type Trajectory (CBTT)



Interaction of the Antioxidant Resveratrol with Model Membranes

By: Nasim Tishbi and Evan A. Mintzer

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Resveratrol (*trans*-3,5,4'-trihydrostilbene; Fig. 1) displays many biological properties including cardiovascular protection, antibiotic, antidiabetic, and chemopreventive activities. Resveratrol is produced by some plants when they are exposed to injury, stress, or fungal infection. The current study investigates the interaction of resveratrol with monolayers comprised of 1-palmitoyl-2-oleoyl-*sn*-glycero-3-phosphocholine (POPC) or 1,2-dipalmitoyl-*sn*-glycero-3-phosphocholine (DPPC) as membrane models, in order to determine the affinity of resveratrol for two different membrane physical states (fluid-phase and gel-phase, respectively). The obtained results indicate that resveratrol has a higher affinity for the gel-phase compared to fluid-phase model membranes (Fig. 2).

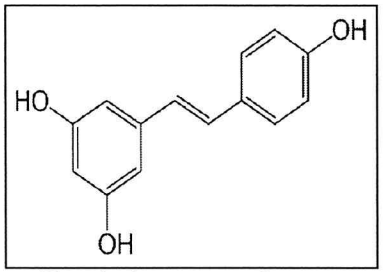

Figure 2. Chemical structure of *trans*-resveratrol.

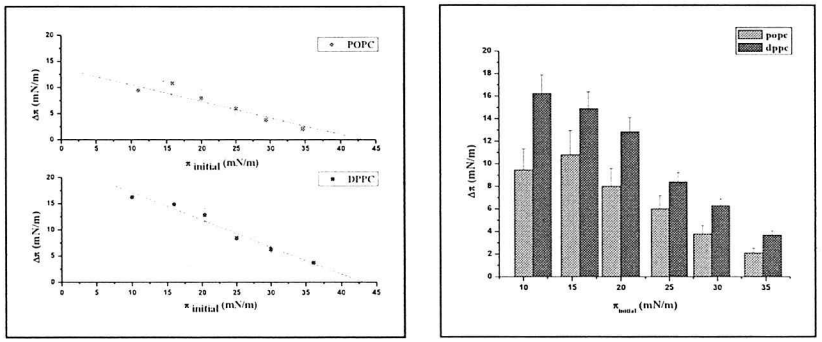

Figure 2. Insertion of resveratrol into monolayers of POPC (top panel) and DPPC (bottom panel). Extrapolating data to $\Delta\pi = 0$ yields the limiting surface pressures.

Characterizing the Role of *Orn* and Oligoribonuclease in Biofilm Formation of *Pseudomonas aeruginosa*

By: Helen Unger[1], Dorit Cohen, M.Sc.[2], and Ehud Banin, Ph.D.[2]

[1] Stern College for Women, Yeshiva University, New York, NY; [2] Bar-Ilan University, Ramat Gan, Israel

Biofilm is a preferential bacterial lifestyle in which bacterial cells adhere to a primed surface, excrete an exopolysaccharide (EPS) layer, and eventually detach in order to perpetuate the biofilm cycle. It is widely known that bacteria living in biofilm often display altered gene expression and heightened antibiotic resistance. Clinically, up to 65% of hospital-related infections today are caused by, or related to, biofilm formation. In particular, the bacterium *Pseudomonas aeruginosa* is known in the medical community for its ability to form biofilm in cystic fibrosis patients, causing chronic infections of the respiratory system and other tracts. The *orn* gene, which codes for oligoribonuclease (Orn)—an exonuclease which degrades RNA molecules 2~4 nt in length (nanoRNAs) into monomers—has been identified through a PA01 transposon mutant library screen as a gene involved in the formation of *P. aeruginosa* biofilm.

The aim of this project was to characterize the effects of *orn* and its gene product on biofilm development. The *orn* knockout strain of *P. aerugionsa* displayed several aberrant phenotypes which correlate with its increased biofilm formation; namely, we observed an increase in EPS production and autoaggregation in liquid culture, as well as a reduction of swarming and twitching motilities. It has been established in biomedical literature that the formation of biofilm, as well as these specific phenotypes, is linked to an intracellular accumulation of the secondary messenger molecule cyclic di-GMP (c-di-GMP). Upon analysis of the *orn* knockout strain, it was found that the deletion of *orn* results in an accumulation of c-di-GMP, leading us to hypothesize that Orn is involved in the degradation of c-di-GMP into pGpG, a metabolic breakdown product. Further tests will determine which step in c-di-GMP degradation Orn affects.

Additionally, it has recently been proven that nanoRNAs have the ability to prime transcription initiation *in vivo*, and that transcription start site (TSS) shifting is often caused as a result. With this information, we hypothesized that the absence of Orn, in addition to leading to accumulation of c-di-GMP, leads to nanoRNA priming in *P. aeruginosa*, causing altered gene expression which aids biofilm formation. Double-knockouts of *orn* and other genes involved in biofilm development were created, and phenotypic assays are planned for the near future.

The Proapoptotic Effects of Ellagic Acid, a Metabolite of Pomegranate Extract, on Human Oral Carcinoma HSC-2 Cells

By: Bella J. Wolf and Jeffrey H. Weisburg

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Previous work in our laboratory has shown that pomegranate extract behaves as a prooxidant, generating hydrogen peroxide in cell culture media, and inducing oxidative stress in target cells. The purpose of this study was to evaluate whether the prooxidant behavior observed with pomegranate extract was due, in part, to ellagic acid, a metabolite produced when pomegranate extract is hydrolyzed. Our laboratory demonstrated that human oral carcinoma HSC-2 cells treated with increasing concentrations of ellagic acid were killed in a dose dependant manner. This cytotoxic behavior was not due to oxidative stress, as no observations of a reduction in intracellular glutathione levels, a hallmark of oxidative stress, were seen.

Flow cytometric analyses of HSC-2 cells untreated and treated with increasing concentrations of ellagic acid showed that with increasing dosages of ellagic acid, the number of viable cells decreased while the number of apoptotic and non-viable cells increased (Figure 1).

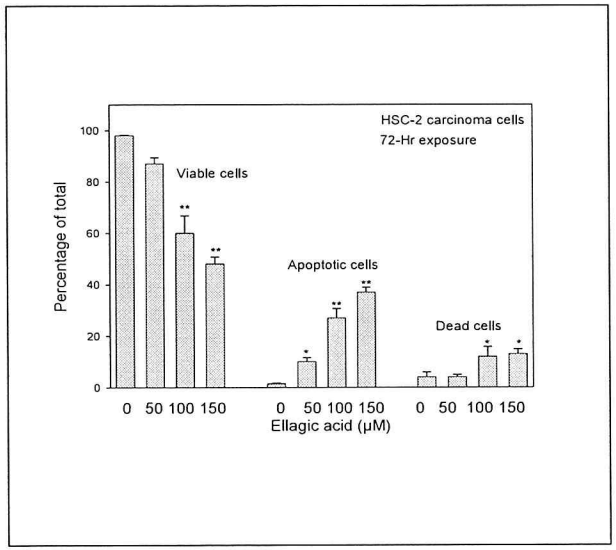

Figure 1. Proapoptotic inducing ability of ellagic acid to HSC-2 cells. Percentage of viable, apoptotic, and dead cells were measured after a 72-hr exposure to ellagic acid. Data are expressed as the arithmetic mean percent of control ± S.E.M. *P ≤ 0.01; **P≤0.05.

Increasing dosages of ellagic acid correlated with activation of the apoptotic-inducing enzymes, caspase 3 and caspase 7 (Figure 2).

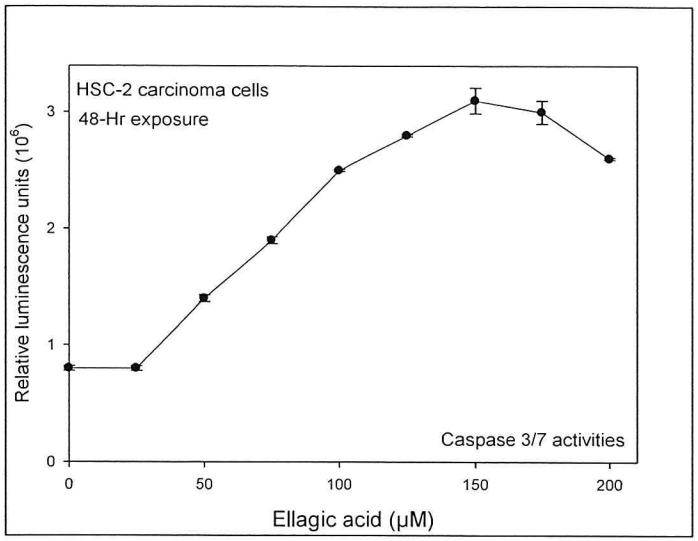

Figure 2. Activation of caspase 3/7 after 48-hr exposure to ellagic acid. Data points are expressed as the arithmetic mean ± S.E.M.

Based on these results, ellagic acid was found not to contribute to the prooxidative capabilities of the pomegranate extract as it did not induce cell death through the formation of reactive oxygen species. Apparently, ellagic acid *per se*, not its autooxidation products, was the cytotoxic agent to the oral carcinoma HSC-2 cells through its induction of apoptosis.

The Effects of Exogenous and Endogenous Hormones on Object Memory and Spatial Ability in Young and Aged Women

By: Malka Zughaft and Lauren Harburger

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The goal of the present study was to determine whether object memory and spatial ability decline with age in women. Another goal was to examine the effects exogenous (external) and endogenous (natural circulating) hormones have on object memory and spatial ability in young and aged women. Young women taking hormone birth control were compared to young women not taking birth control. Young women who were menstruating were also compared to young women who were not menstruating during the time of testing. Exogenous hormones in aged women were examined by comparing those taking prescription hormone therapy (HT) to those not taking HT. Forty young undergraduate women (ages 19-24) and forty-two aged independent living women (ages 65-95) participated in the study. Each woman was given an object array task to test object location memory and a mental rotation test to measure spatial ability. Preliminary results support our hypothesis of age-related cognitive decline in object memory and spatial ability, such that aged women performed significantly worse on all object array conditions as well as on the mental rotation test compared to young women. Aged women taking prescription hormone therapy (HT) also performed worse on all object array conditions compared to aged women not on HT. However, the same aged women on HT performed significantly better on the mental rotation test compared to aged women not on HT. Therefore, HT impaired object memory but enhanced spatial ability in aged women. In young women, neither hormone birth control nor time of menstruation had significant effects on object memory or spatial ability.

Derech HaTeva is an undergraduate publication of Stern College for Women. The articles were authored primarily by science majors, although students in other majors submitted articles. The manuscripts are a synthesis of Torah and science and represent the unique intellectual strengths and talents of our students. This journal is catalogued in the National Library of Congress.

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"The Resonance of Jericho"

by

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The story of the fall of the walls of Jericho notes that the Israelites walked around the citywalls, blew their horns, and roared in unison, procedures which fashioned the miraculous outcome of Jericho's fate. However, in an age without modern technology, how could a series of seemingly random and weak measures have caused the destruction of the walls of Jericho? Below is the text of the Biblical narrative in which it is clearly evident that "traditional" weapons were not used to invade the city – not even a bow and arrow.

> *"You and your marching men should march around the town once a day for six days. Seven Priests will walk ahead of the Ark, each carrying a ram's horn. On the seventh day you are to march around the town seven times with the priests blowing the horns. When you hear the priests give one long blast on the ram's horns, have all the people shout as loud as they can. Then the walls of the town will collapse." (Joshua 6: 3-5).*

If we dig through the *pesukim* for evidence of some type of "weapon," we could gain some insight into the type of force that the Israelites used as they approached Jericho, a city having "walls that reached to the sky" (Deuteronomy 9:1). The three instructions that G-d listed for Joshua involve some sort of mechanical force (thousands of men marching around the city) and acoustic force (priests continually blowing the *shofarot* and thousands of men yelling in unison). Actually, the narrative references what very well might have been both mechanical and acoustic *resonance* [1].

In physics, resonance is the tendency of an object to oscillate at larger amplitude at preferred frequencies. These preferred frequencies are the object's resonant frequencies. Every object, no matter how flexible or stiff it may be, has a natural frequency of vibration. If a periodic series of driving forces is applied toan object, the object will eventually begin to vibrate with the frequency of the driving force instead of its own natural frequency of vibration. If the driving frequency is close to the natural frequency, then this driving frequency is a resonant frequency, and the object will vibrate with larger amplitude. The object will vibrate with smaller amplitude if the driving frequency is different from the natural frequency of vibration of the object [2].

There are various types of resonance, one type of which we have all experienced is mechanical resonance. A common example of mechanical resonance is pushing a swing. A swing is a sort of pendulum with a natural frequency that is dependent upon the radius of the pendulum. If a series of regularly spaced pushes is applied to the swing with a frequency that matches the natural frequency of the swing, the motion of the swing, as we know from experience, will be quite large. If the frequency of the pushes is different from the natural frequency of the swing or the pushes are irregularly spaced, then the motion of the swing will not be as large and not as fun [2].

Under certain circumstances, if the frequency of the driving force is the same as the natural frequency of the object to which the force is applied, the object could vibrate at amplitude that is dangerously high. If soldiers march in lockstep over a bridge and their footsteps have a frequency equal to one of the natural frequencies of the bridge, the bridge may begin to oscillate treacherously. This is why soldiers are ordered to march in break step when crossing a bridge [2].

While the Biblical narrative of Jericho does not indicate *how* the men marched around the city, theoretically they may have marched around the city in lockstep, generating a frequency of vibration equal to the natural frequency of the walls. Thus, thousands of men marching in lockstep once a day for six days around the city walls, and seven times on the seventh day may have weakened the wall due to mechanical resonance [1].

Furthermore, the priests continually blew the *shofarot* as they marched around the city, once each day for six days. During the seventh circle around the city on the seventh day the priests blasted the *shofarot*, and the nation shouted in unison immediately thereafter. This may have generated acoustic resonance with the city walls which had already endured a week of mechanical resonance. The acoustic resonance may have caused further vibrations resulting in the walls falling to the ground. This hypothesis may seem unlikely, but if you think about it, the destructive consequences of acoustic resonance are not so unfamiliar. If a person sings at the appropriate pitch such that the frequency of the notes being sung matches the natural frequency of a glass, the glass will vibrate and could shatter [1].

Various theories have been proposed to explain how the walls of Jericho fell down. The wording of the 20th *pasuk* in the 6th *perek* may provide a clue:

> *"It came to pass, when the people heard the sound of the horn that the people shouted with a great shout, and the wall fell down flat, so that the people went up into the city, every man straight before him, and they took the city."*

According to one theory, the words "*every man straight before him*" suggest that not only one section of the wall shattered but that the entire wall shattered at

once, similar to the manner in which glass shatters under acoustic resonance [1].

However, this theory, which proposes that the walls shattered like glass, is not as compelling as an alternative theory which is supported by other textual clues, as well as archaeological evidence. Evidence gathered from these aforementioned sources, in fact, suggest that the earth itself vibrated at the time of the attack on Jericho. When the fate of Jericho ensued, the Biblical text uses the word "*tach'teha*" to describe how the walls fell. "*Tach'teha*" literally means "underneath it," the subject of which is the city wall. This translation does not suggest that the walls themselves were breached, but that they sank into the earth as a result of the ground opening up beneath them. This would certainly support the earthquake theory. However, modern excavations do not show evidence of the walls having sunk into the earth, but rather that the walls fell down flat, a hypothesis which still sides with the earthquake theory. Interestingly, many Biblical translations actually do interpret "*tach'teha*" to mean that the walls fell down flat. According to diagrams of Jericho designed by archaeologists, Jericho was fortified by a retaining wall 12-15 feet high on top of which stood an outer city wall reaching 20-26 feet above the retaining wall. Uphill from the outer city wall stood an inner city wall with similar dimensions. Even after the city walls fell down, the Israelites still had to climb over the towering retaining wall.

Excavations have revealed that bricks from the fallen walls fell at the base of the retaining wall forming a ramp onto which the Israelites could climb up and over. In fact, this archaeological finding matches the precise description in the Biblical text which describes how the Israelites entered Jericho: "The people *went up* into the city, every man straight before him" [3]. As a result of his excavation in Jericho in 1930-1936, Professor John Garstang emphasized that the city walls fell *outward*, such that the Israelites were able to climb over the retaining wall and up into Jericho. All archaeological sites of ancient cities in the Middle East, except for Jericho, revealed that besieged city walls fell inward simply because when invaders besiege a city they are aiming to get into the city, not out of the city. Interestingly though, Jericho's walls fell outward [4].

The Israelites did not besiege the city in the normal fashion, and thus, even had the walls fallen inward, the event would have been no less a miracle. However, the direction in which the walls fell was still an obvious convenience to the Israelites in their attack on Jericho. Was it possible for the Israelites to have caused the walls to fall in this preferred direction using resonance? Assuming that resonance caused the *walls* to shatter, it would depend on the mode of oscillation of the wall being excited by the driving force. If the walls formed a circular ring, a breathing mode of oscillation would entail expansion and contraction. The wall could technically break in the expansion part of the cycle or in the contraction part of the cycle, and thus, the wall could fall outward or inward, respectively. However, other modes of oscillation would not result in

the breaking of the wall in any preferred direction, and the wall would randomly fall in either direction.

The sounds of the *shofarot* used in the attack would have had to have a frequency value much larger than the frequency of sounds within the audible range (10 Hz-10 kHz) since the value of the Young's modulus for stone is enormous. (The Young's modulus is a measure of an object's stiffness). Thus, it is very unlikely that the Israelites would have been able to excite a breathing mode within the walls, and therefore, could not have made the walls fall in any preferred direction [5]. On the other hand, archeology shows that the walls were made of mud [3], which may be weaker and more brittle than the kind of stone we are familiar with today. But, assuming that the walls were still too stiff to excite a breathing mode within them, the walls could still have fallen outward due to chance.

Another simpler theory that assumes that resonance caused the *earth* to vibrate. According to diagrams of Jericho that were produced based on archaeological excavations, the city was built on top of a hill, and the fortifying walls were built around the city on the hill [3]. If this was indeed the case, then the location of the center of mass (or the center of gravity, which can be used synonymously in a uniform gravity field) would have predicted that the walls fall outward. The center of mass is the mean location of the object's total mass and can be used to explain how that object will respond to certain forces and torques [6]. If an inclined surface beneath a standing object were to shake, the object would fall in the direction in which gravity exerts the most force. On Earth, gravity exerts the most force on the side of the object where the center of mass lies. Likewise, the walls of Jericho, which stood on a vibrating inclined plane, fell outward because their centers of mass experienced the force of gravity most powerfully in the "outward direction." Actually, excavations show evidence of earthquake activity at the time of the attack on Jericho. However, is it physically possible that the Israelites used resonance to induce an earthquake?

According to the work performed by Nikola Tesla, a great Austrian inventor who lived in the 19th and 20th centuries, resonance can indeed cause vibrations in the earth like those from the effect of an earthquake. Tesla was prone to conjuring up very strange ideas, one of which materialized into an invention called the "Tesla Oscillator," also known as the "Earthquake Machine." Tesla performed his first experiments with resonance technology in his New York laboratory where he excited his little oscillating device causing vibrations in Manhattan for miles around his laboratory [7]. It follows, Tesla claimed, that by finding the most suitable frequency, *any* structure can be destroyed. Tesla once even "joked" that he could crack the earth using his device [8]. Tesla's experiment also showed that resonance waves become stronger with increased distance from their source [7]. This explains how the Israelites were able to produce strong resonance effects while still maintaining a safe distance from the city walls so as not to be in danger when the walls would fall down. However,

we should be careful not to place too much emphasis on the hypothesis regarding resonance as the cause of an earthquake at the time of the attack. It is mere speculation, but nonetheless, it raises an interesting topic for discussion. Still, archaeological evidence and physical probabilities in addition to the Biblical text, suggest that resonance might have somehow played a role in the attack on Jericho. If the walls of Jericho indeed fell due to resonance, was the event any less of a miracle? Absolutely not – the probability of thousands of men walking in lockstep together and at the same frequency as one of the natural frequencies of vibration of the earth or the city walls (depending on which hypothesis you accept) is quite small. Furthermore, the event of all the priests blowing the *shofarot* and the thousands of men yelling at the same frequency as one of the natural frequencies of vibration of the earth or the walls is also a small probability occurrence. Thus, even had the walls fallen due to resonance, the event is no less a miracle. And, although the event is considered a miracle, it does not necessarily follow that it occurred contrary to the laws of nature.

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The underlying theme of this journal is the integration of Torah, science, and bioethics. The goal is to demonstrate how Judaism effectively and eloquently addresses difficult ethical issues raised by the surging advances in the biomedical sciences. The articles, written and edited by the students of Stern College for Women, attempt to analyze these bioethical issues from both Torah and classical bioethics perspectives. At times, views of other major religions are presented as well. Comparisons and contrasts between the Torah's views and those of classical bioethics, and other religions, are essential components of the journal. Issues relating to genetics technology, organ donation, assisted reproductive technology, end-of-life care and other real life clinical challenges are discussed. The first volume was published in the Spring, 2006. Rabbi Dr. Richard Weiss serves as the faculty adviser.

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