Women in Science

2009-2010

Yeshiva University
STERN COLLEGE FOR WOMEN

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CO-EDITORS:

Melissa Bart (Department of Psychology)

Faygel Beren (Department of Biology)

Aviva Gubin (Department of Physics)

Hadassa Klerman (Department of Chemistry/Biochemistry)

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Tsipora Huisman	Modifying the RhoA GTPase biosensor	AECOM
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Rivkah Rogawski	Comanagement of cancer symptom clusters in geriatric cancer patients	UCLA Johnson Clinical Cancer
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Avital Bauman	Endocannabinoid protein expression in human immunodeficiency virus encephalitis	AECOM
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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 2010, Rebecca Weiss, Tsipora Huisman, and Emily Liebling attended and presented at the 239th National Meeting of the ACS, San Francisco, CA (see "Abstract Booklet of Student Research").

At the end of each spring semester, a representative of SCW is on the planning committee of the annual Yeshiva University Behavioral Science Research Day. Students, along with a faculty sponsor involved in behavioral science research at any Yeshiva University school, are invited to submit abstracts, along with a faculty sponsor, describing their original research, literature review, or research proposal to the review committee. Accepted abstracts are presented as posters at the meeting, which is held on the AECOM campus. This meeting is a forum for undergraduate psychology students to interact with graduate students and faculty of the Ferkauf Graduate School of Psychology and of the Wurzweiler School of Social Work.

In 1991, with the support of Dr. Ira Kukin, a member of the Board of Trustees of Yeshiva University, an annual chemistry lecture series was established. The invited speakers are distinguished scientists, many of them Nobel Laureates, who direct their talks to the undergraduate students. Prior to the lecture, students have the opportunity to interact with the speakers, and after the lecture, to participate in a question session. This annual lecture is attended by the undergraduate science students of Yeshiva University, selected high school students, science faculty, administrators, invited scientists from the New York area and Dr. Ira Kukin and Mrs. Doris Kukin. By attending the Kukin lectures throughout their undergraduate career, the students acheive their progressive advancement in science through their increased understanding of the lectures. These lectures serve as an encouragement for our students to select a career in science (see "Kukin Lecture Series").

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 (see "Combined Degree 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 14, 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 of the unique strengths of our students – their combination of Torah and secular studies. Volume 5 was published in the summer of 2010 (see "*Science and Ethics*" for a listing of articles that appeared in volumes 1 through 5, and a sample article).

The Departments of Biology, Chemistry/Biochemistry, Physics, and Psychology share much in common, yet each has its own distinct approach and style to educating and to stimulating learning. To become better acquainted with the sciences and with psychology at SCW, the reader is directed to the specific subsections for each department.

DEPARTMENT OF BIOLOGY

Faculty: Harvey Babich, Ph.D.; Bill Bassman, M.S.; Joseph DeSantis, Ph.D.; Marina Holz, 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.

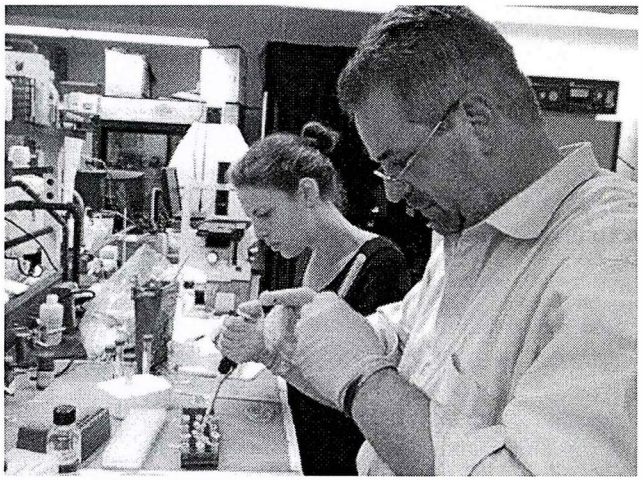
The Department of Biology offers a wide range of courses which give students a thorough grounding in the fundamentals of modern biology, as well as exposing them to the cutting-edge areas of biomedical research. Course offerings include "Anatomy," "Cell Biology," "Developmental Biology," "Ecology," "Genetics," "Histology," "Immunology," "Invertebrate Zoology," "Medical Biochemistry," "Microbiology," "Molecular Biology," "Pharmacology," "Physiology," "Reproduction Biology," "Virology," and "Women's Health." Always seeking to introduce new courses, two new 2-credit courses, "Neurobiology" and "Bioethics," were taught in the Fall semester, 2009, and an additional two new courses, "Environmental Sciences" and "Drugs and Behavior," were taught in the Spring semester, 2010.

Innovative courses for the 2010-2011 academic year include "Animal Diversity" in the Fall semester and a neurobiology laboratory in the Spring semester. "Animal Diversity," taught by Dr. Joseph DeSantis, deals with the life sustaining interrelationships that human being share with the myriad of other species on Earth. A laboratory course in neurobiology, to be taught by Dr. Richard Hunter, The Rockefeller University, is in preparation and will include 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 the growing student interest in the neurosciences. The Biology Department is offering 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 two years the Biology Department has offered a B.A. in biology with the accompanying designation, "concentration in cell and molecular biology."

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. For example, within the past four 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"), 40 brightfield

microscopes were purchased in the Summer, 2008. 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, were housed in the Sussman laboratory, a state-of-the-art laboratory utilized in the advanced biology courses.

The Department of Biology has enhanced its image from a teaching to a teaching and research department. Within the past four years, SCW has increased full-time faculty in the department by three additional members, each with her own research interest. These "junior" faculty, Dr. Margarita Vigodner (Ph.D, Department of Clinical Biochemistry, Tel Aviv University), Dr. Marina Holz (Ph.D., Department of Cell Biology, Harvard Medical School), and Dr. Alyssa Schuck (Ph.D., Department of Microbiology, New York University Medical Center), join the "senior" faculty members, Dr. Jeffery Weisburg, Dr. Harriet Zuckerbraun, and Dr. Harvey Babich, actively engaged in on-campus research in our state-of-the-art research laboratories. Undergraduates participate in projects, receiving exceptional hands-on research experiences that extend their laboratory capacities beyond what is possible in a specific course.



Dr. Jeffrey Weisburg working with Yael Hirth, a student research intern.

Drs. Vigodner and Holz are recipients of research awards from the following granting organizations:

(a) Flight Attendant Medical Research Institute (FAMRI): Dr. Vigodner is the recipient of a $300,000 grant, entitled "Second Hand Smoke as a Potential Cause of Spermatogenic Failures and Male Infertility," 7/1/2008 – 6/30/2011.

(b) Wendy Will Case Cancer Fund: Dr. Holz was awarded a $30,000 grant entitled "S6K1 in breast cancer," 7/01/2009-6/31/2010.

(c) ATOL Charitable Trust: Dr. Holz was awarded a $150,000 grant, "The role of S6K1 in breast cancer," 6/01/08-5/31/2014 (renewed for 3 years in 2010).

(d) National Cancer Institute (National Institutes of Health): Dr. Holz was awarded a $408,400 grant, "Identification and characterization of S6K1 targets in mammary cell proliferation," 6/01/2010-5/31/2013.

The publication record of the faculty in the Department of Biology is most impressive, with the following manuscripts published, within the past three years, in peer-reviewed scientific journals:

(a) 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).

(b) 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. 584:124-8.

(c) Vigodner, M, 2009, Sumoylation precedes accumulation of phosphorylated H2AX on sex chromosomes during their meiotic inactivation, Chrom. Res., 17:37-45

(d) Vigodner, M., Weisburg, J.H., Marmor R.A., and Fathy, J., 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. 336:277-286.

(e) Yamnik, R.L., Digilova, A., Davis, D.C., Brodt, Z.N., Murphy, C.J., and Holz, M.K., 2009, S6 kinase1 regulates estrogen receptor alpha in control of breast cancer cell proliferation. J Biol Chem. 284:6361-6369.

(f) Babich, H., Liebling, E.J., Burger, R.F., Zuckerbraun, H.L., and Schuck, A.G., 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.

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

(h) Schuck, A., Diwa, A. and Belasco, J.G., 2009, RNase E autoregulates its synthesis in *Escherichia coli* by binding directly to a stem-loop in the 5' untranslated region, Mol. Microbiol. 72:470-478.

(i) Schuck, A.G., Ausubel, M.B., Zuckerbraun, H.L., and Babich, H., 2008, Theaflavin-3, 3'-digallate, a component of black tea: an inducer of oxidative

stress and apoptosis, *Toxicology In Vitro*, 22:598-609.

(j) 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., 3:66-74.

(k) Holz, M.K. and Blenis, J., 2008, Ribosomal protein S6 kinase beta-1 target assessment review, Targeted Proteins Database, Current Biodata, doi:10.2970/tpdb.2008.212.

(l) Holz, M.K. and Blenis, J., 2008, Ribosomal protein S6 S6 kinase beta-2 target assessment review, Targeted Proteins Database, Current Biodata, doi:10.2970/tpdb.2008.161.

(m) Holz, M.K. and Blenis, J., 2008, Eukaryotic translation initiation factor 4E- binding protein 1 target assessment review, Targeted Proteins Database, Current Biodata, doi:10.2970/tpdb.2008.208.

(n) Weisburg, J.H., 2008, Invited perspective. Multidrug resistance in acute myeloid leukemia: potential new therapeutics, J. Nuclear Med., 49:1405-1407

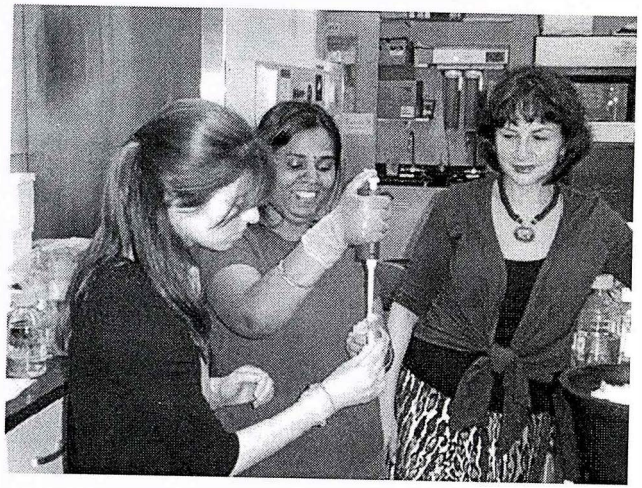
Rachel Yamnik, cited in the above-noted manuscripts, is a SCW graduate (May 2008), and was awarded the Yeshiva University Graduate Research Fellowship. Rachel spent the 2008-2009 academic year training under the guidance of Dr. Holz.

In 2010, Dr. Marina Holz presented her research, "Estrogenic regulation of S6 kinase 1 expression creates a positive feed-forward loop in control of breast cancer cell proliferation," in AACR 101st Annual Meeting, Washington, DC. In 2009, she presented, "mTOR/S6K1 and MAPK/RSK signaling pathways coordinately regulate estrogen receptor alpha serine 167 phosphorylation," in the AACR Frontiers in Basic Cancer Research, Boston, MA. In 2008, Dr. Holz presented, "Estrogen receptor alpha is a target of mTOR/S6K1 signaling in control of breast cancer cell proliferation," at the Breast Cancer Symposium, San Antonio, TX. Dr. Holz holds a secondary appointment as an Assistant Professor in the Department of Molecular Pharmacology, AECOM.

Dr. Marina Holz (far left) with laboratory intern, Miriam Steinberger, research assistant, Myriam Maruani, and research intern, Faygel Beren.

Dr. Margarita Vigodner, with her post-doctorate research associate, Dr. Vibha Shrivastava, presented their research, "Sumoylation as a sensitive marker of a tobacco-induced oxidative stress in the testis," at the May, 2010, FAMRI meeting in Miami, Florida. Dr. Vigodner presented, "Regulation of spermatogenesis by sumoylation," in April, 2010, to the Developmental and Molecular Department, Albert Einstein College of Medicine (AECOM), and in October, 2009, to the Department of Genetics and Development, Columbia University College of Physicians and Surgeons. Earlier in 2009, Dr. Vigodner presented the seminar, "Sumoylation precedes accumulation of phosphorylated H2AX on sex chromosomes during their meiotic inactivation, at the XXth North American Testis Workshop, Philadelphia, PA (April). Dr. Vigodner holds a secondary appointment as an Assistant Professor in the Department of Developmental and Molecular Biology, AECOM.

Research interns. Jordana Schneider and Leah Gutstein working in the laboratory of Dr. Margarita Vigodner.



Leah Gutstein (left) with postdoctoral research associate Dr. Vibha Shrivastava (center) and Dr. Vigodner (right)

SCW undergraduates, many of whom participated in the above-cited research projects, presented posters of their research at professional and undergraduate symposia. Listed below are some of these presentations, limited to the 2009-2010 academic year; the names of the SCW undergraduates are underlined:

(a) 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, poster presentation.

(b) 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.

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

(d) 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).

(e) 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.

(f) 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.

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

(h) 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

(i) Yamnik, R.L. and Holz, M.K., 2009, mTOR/S6K1 and MAPK/RSK signaling pathways coordinately regulate estrogen receptor alpha serine 167 phosphorylation, Frontiers in Basic Cancer Research, Boston, MA.

Off-campus research placements abound, including the Roth Scholars Program at AECOM and other research internships sponsored by Yeshiva University (see the sections, Students Accomplishments and Roth Scholars.) For additional information, see "Abstract Booklet of Student Research" and "Student Publications and Presentations."

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. Students selected as interns are engaged in hands-on experimentation in the neurosciences. For the Summer, 2010, Ashley Ansel and Faige Seligman were the designated interns.

The Biology Department hosted a spectrum of interesting seminars, both some purely scientific and others employing the *Torah U'Madda* approach. The *Torah U'Madda* seminars included:

(a) Rabbi Dr. Edward Reichman, AECOM
"If the Rambam was alive today: contemporary medical *Halakha* through the

eyes of Maimonides"
(b) Rabbi Cary Friedman, Consultant, FBI's Behavioral Science Unit "The power of Torah to illuminate the darkest places"
(c) Dr. Richard Grazi, Genesis Fertility & Reproductive Medicine, Brooklyn, NY "Assisted Reproduction: Dilemmas for Jewish Patients and Jewish Physicians"

The Biology Club organized the following research seminars:
(a) Dr. Jeffrey Segall, Department of Anatomy and Structural Biology, AECOM: "Chemotaxis and Metastasis"
(b) Dr. Martin Chalfie, 2008 Nobel Laureate in Chemistry, Columbia University: "Adventures in Non-translational Research"

The Biology Club also organized a series of career workshops for SCW Biology students:
(a) Resume and cover letter workshop for summer internship applicants
(b) Career panel featuring recent SCW alumni currently enrolled in biomedical graduate programs
(c) Meet and Munch with SCW Biology faculty

Finally, the Biology Club held its second annual fundraiser to raise awareness about breast cancer and to benefit "Sharsheret."

Dr. Brenda Loewy, a faculty member of the Biology Department, was the recipient of the 2008 Dean Karen Bacon Award for a Senior Faculty Member, Stern College for Women, Yeshiva University. One of Dr. Loewy's prime responsibilities is to serve as the college's Pre-Health Advisor, and to guide students interested in medicine, dentistry, optometry, and the Allied Health fields through the application process. Dr. Loewy organizes a series of wide-ranging seminars. Programs in the 2009-2010 academic year 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) Dr. Albert Kuperman, Associate Dean for Educational Affairs Albert Einstein College of Medicine, Founder of the Global Health Fellowship at Einstein
Topic: Initiatives in Global Health. Also at this event, several AECOM medical students discussed their experiences volunteering in Rwanda and Uganda as well as possible opportunities for undergraduate students to get involved.
(b) Ms. Cacas, Director of Admissions, University of Pennsylvania School of Dental School Medicine
(c) Dr. J Fernandez-Wilson, Clinical Associate Professor Pediatric Dentistry NYU College of Dentistry. He discussed research opportunities for undergraduates at NYU Dental School, in addition to information on admissions to the dental school.

(d) Dr. Noreen Kerrigan, Assistant Dean of Admissions at Albert Einstein College of Medicine
(e) Ms. Pamela Cooper, Presentation on the American Medical Student Program at Ben Gurion University. She also discussed the active role that Ben Gurion Medical School of International Health played in the Medical Relief in Haiti.
(f) Dr. Paul Alexander, Assistant Director of Admissions, Technion American Medical Student Program
(g) Dr. Neil Halpern, Chief, Critical Care Medicine Service, Memorial Sloan-Kettering Cancer Center.
Topic: Preparing to interview at medical school.

Dr. Alyssa Schuck (center) conducting research with research interns, Leora Lerman (left) and Sarit Cohen (right).

Lea Blau, Ph.D.; Lora Danley, M.S.; Cecily Dobin, M.S.; Donald Estes, Ph.D.; Alon Gorodetsky, Ph.D.; 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. In collaboration with Dr. Matt Jacobson at UCSF, student Chani Schonbrun co-authored a paper entitled "Automated Site Preparation in Physics-Based Rescoring of Receptor Ligand Complexes," published in *Proteins* in 2009. A manuscript entitled "A Molecular Mechanics Approach to Modeling Protein-Ligand Interactions: Relative Binding Affinities in Congenberic Series and Covalent Docking", co-authored by students Aviva Schiffmiller and Esther Leah Schonbrun, is soon to be submitted; and Aviva has presented preliminary results relating to this work at the 2009 Columbia Undergraduate Research Symposium. Dr. Rapp has recently joined the Collaborative Center for an Enzyme Function Initiative, a multi disciplinary/multi campus project, and together with student Elisa Karp, is using computational methods to study enzyme specificity in the isoprenoid synthase enzymes. Another area of interest is tyrosine O-sulfation, a post-translational protein modification, which is being studied using molecular dynamics on model tri-peptide systems as well as proteins of biological interest. Additionally, student Hadassa Klerman is running calculations in implicit solvent to determine ideal hydrogen bonding distances between sulfated tyrosines and positively charged amino acid residues, and comparing those results with phosphorylated systems.

The Mintzer research group has been engaged in several studies. Chemistry major Rivkah Rogawsky and biochemistry major Juliet Meir, both entering their senior years at Stern, are investigating the interactions of the biologically active lipid lysophosphatidic acid (LPA) with lipid bilayers (Fig. 1); Ms. Rogawsky presented their findings at the annual meeting of the Biophysical Society in San Francisco in February and at the Columbia University Spring Undergraduate Research Symposium in March. Biochemistry major Rebecca Weiss, a senior, is currently establishing the conditions for an assay to measure the extent of LPA-induced membrane leakage, while Tsipora Huisman, a biology major, is studying the surface properties of LPA using a Langmuir surface balance.

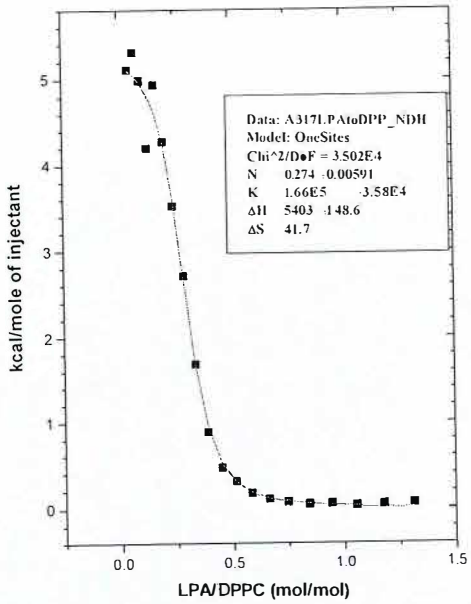


Figure 1. Binding heat of LPA to di-palmitoylphosphatidylcholine (DPPC) vesicles.

In an unrelated collaborative investigation with Dr. Kathryn Uhrich of Rutgers University, senior Danielle Lent (a biochemistry major) is examining surface activity of amphipathic polymer/lipid aggregates (Fig. 2) and Nasim Tishbi, a biochemistry major entering her sophomore year, is performing experiments to determine their thermodynamic stability.

In the laboratory of Professor Colin Nuckolls at the Department of Chemistry of Columbia University, under the mentorship of Dr. Alon Gorodetsky, the student Tzippora Kanal studied the self-assembly of materials that enable the conversion of sunlight into electricity. Her work could potentially lead to new types of organic solar cells. Also in Professor Colin Nuckolls' laboratory and in collaboration with Dr. Mark Hybertsen of Brookhaven National Laboratory, mentored by Dr. Alan Gorodetsky and assisted by Hanfei Wang, student Avigail Soloveichik is researching DNA-modified carbon nanotube-based field effect transistors (CNT-FETs) as sensitive, nanoscale biosensors. This project holds potential for not only the detection of DNA-binding proteins but also of other cancer biomarkers in a clinical setting.

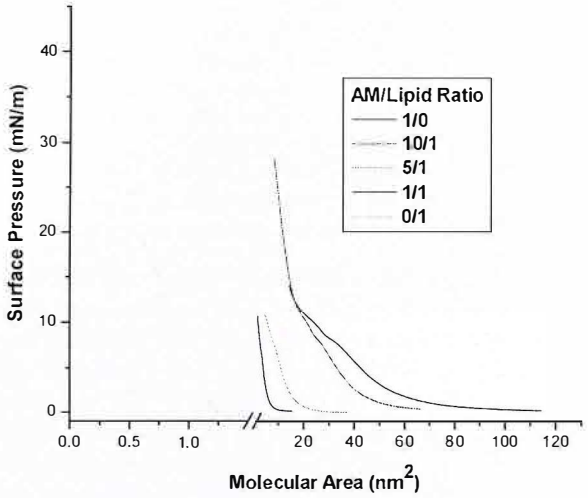


Figure 2. Isothermal compression of AM/lipid mixed monolayers.

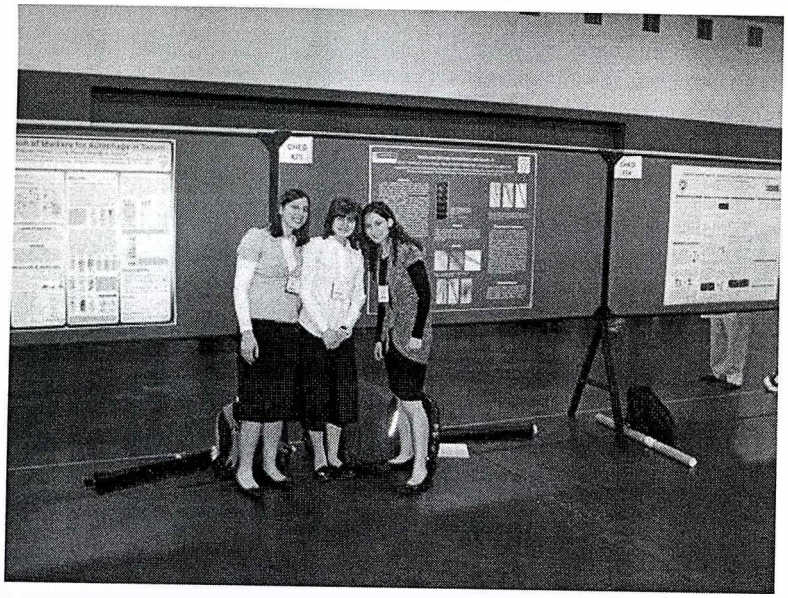
In the laboratory of Professor Ioannis Kymissis at the Department of Electrical Engineering of Columbia University, under the mentorship of Dr. Alon Gorodetsky and Marshall Cox and in collaboration with Professor Colin Nuckolls, student Ilana Shimunova is developing a process to coat metal surfaces with a fluorinated silane material. The development of a fluorinated silanization process would enable highly flexible and previously impossible optoelectronic fabrication steps, such as inkjet-based surface modification.

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*. The students presented their work at the College and a manuscript is in progress.

The Stern College Chemistry Club, advised by Drs. Estes and Mintzer, is an award winning affiliate of the American Chemical Society (ACS), and has earned three Innovative Activities Grants and one Community Interaction Grant over the past four years. 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.

Dr. Evan Mintzer with students at the undergraduate poster session of the 2009 ACS meeting in Salt Lake City.



Rebecca Weiss, Emily Liebling, and Tsipora Huisman, the student presenters at the 2010 ACS meeting in San Francisco, at the undergraduate poster session.

Eliana Shaul, a student in organic chemistry, with money to burn in the magic show.

Geulah Ben-David, a student in general chemistry, 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. The laboratory course in organic chemistry has been upgraded as a result of the purchase of an NMR spectrometer and a polarimeter. 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.

In response to students who have expressed greater interest in chemistry as it pertains to the life sciences, the Biology and Chemistry Departments have

collaborated in the initiation of the biochemistry major. Since its inception, interest in this area has grown. During the 2007/2008 academic year the biochemistry major was approved by the New York State Education Department. In May 2009, four students received a bachelor's degree in biochemistry and two students were awarded a bachelor's degree in chemistry. In May 2010, six students received a bachelor's degree in biochemistry and three students were awarded a bachelor 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 experimental facilities in the National Laboratories and major research centers through collaborative research and education programs that the Physics Department has created. Such exposure to first class science and the atmosphere of discoveries plays a major role for undergraduate students shaping their career plans.

The Physics Department offers B. A. Degrees in Physics and Physical Sciences. Recent graduates went to 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 refereed 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, quantum computing, among many others. Her research is supported by a grant from the Research Corporation. Dr. Prodan's interests are in strongly correlated systems, bio-materials, charge and spin transport. His research is also supported by a grant from the Research Corporation. Dr. Edelman is a theoretical physicist who specializes in chaos theory 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 to students and faculty members.

The department is also engaged in enhancing the participation of women in physics and promoting gender equality in science. In this context, Dr. Santos was selected as one of 70 applicants from the United States to join a US delegation at the 3rd IUPAP International Conference on Women in Physics in South Korea. She wrote an article describing the repercussion of this conference at Stern College, which was published in a newsletter by the American Physical Society.

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 more often categorized as a social science, 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. Additional courses in "Behavioral Endocrinology" and "Neuroscience" are being developed by our faculty. 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.

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 gain invaluable experience outside the classroom by learning about the fundamental role of research in theory and practice of psychology as they work 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 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. 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 areas of research are 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 individuals with multiple sclerosis and 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 "Honors 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," and "The Psychology of Women." 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. Her most recent project investigates the effects of aging on object memory and spatial abilities in men and women. She enjoys teaching at Stern and offers a

number of courses including "Introductory Psychology," "Developmental Psychology: Life Span," and "Psychobiology."

Dr. Marcel Perlman earned his B.A., M.A., as well as his 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 and Stony Brook University (SBU). Students in the joint YU-Columbia 3+2 plans attend SCW for 3 years, take the prescribed coursework, and, with recommendation of the Pre-Engineering advisor, may be admitted to Columbia University's School of Engineering and Applied Science (SEAS). After successful completion of the 2-year program at Columbia, SCW awards the B.A. in Pre-Engineering, and Columbia awards the B.S. in Engineering. In addition, students can fulfill requirements for a minor in physics at SCW. Under the 4+2 plan, the student completes a B.A. degree at SCW, while fulfilling prerequisites for SEAS. After two additional years of study at Columbia, the student receives the M.S., bypassing the bachelor's degree in Engineering.

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

Nursing - B.A./B.S.N./M.S.N.
Stern College offers a combined program in nursing with Johns Hopkins University. Students spend three years at Stern College completing college requirements and pre-requisite courses for a total of 111 credits, followed by a one-year accelerated program at Johns Hopkins. Upon successful completion of these studies, students earn a B.A. from Stern College and a B.S.N. from Johns Hopkins. Students may then continue on for a Masters degree. Depending on the major selected, these additional studies leading to the MSN may take one or two years.

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

Optometry - B.A./O.D.
Stern College and the State University of New York State 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 3-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 Stern College 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.

KUKIN LECTURES

In 1991, with the support of Dr. Ira Kukin, a member of the Board of Trustees of Yeshiva University, an annual chemistry lecture series was established. The invited speakers are distinguished scientists, many of them Nobel Laureates, who direct their talks to the undergraduate students. Many students have the opportunity to interact with the speakers prior to the lecture and to participate in a question and answer session afterward.

This annual lecture is attended by the undergraduate science students of Yeshiva University, selected high school students, science faculty, administrators, invited scientists from the New York area, and Dr. Ira Kukin and his family.

Dr. Richard Silverman, the 2009 Kukin lecturer, with Mrs. Doris Kukin and students at the Wilf campus.

Dr. Richard Silverman, the 2008 Kukin lecturer, giving a talk at Stern College.

Dr. Harry Gray with students from Stern College.

Date	Guest Lecturer	Title of Lecture	Affiliation
1991	Roald Hoffmann	Logical Structure of Modern Chemistry	Cornell University
1992	Jerold Meinwald	The Chemistry of Everyday Insect Life	Cornell University
1993	Elias J. Corey	Molecular Robots, Small Molecules as Enzyme-Like Catalysts	Harvard University
1994	Derek Barton	How to Win the Nobel Prize	Texas A&M
1995	Ephraim Katchalski Katzir	A Scientist as State President: Experiences and Expectations	Weizmann Institute
1996	Alfred Bader	The Chemist as Entrepreneur	
1997	William N. Lipscomb	Chemistry of the 20th Century: The Structure-Function Relationship	Harvard University
1998	Dudley Herschbach	The Impossible Takes a Little Longer	Harvard University
1999	Sylvia Ceyer	The Unique Chemistry at Surfaces: Splats, Hammers, and Sinkholes	MIT
2000	Julius Axelrod	Neurotransmitters and Psychoactive Drugs	NIH
2001	Mary Good	Science and Technology Policy: Why You Should Care	University of Arkansas
2002	Mario Molina	The Antarctic Ozone Hole	MIT
2003	Ronald Breslow	The Chemistry-Biology Interface	Columbia University
2004	Jacqueline K. Barton	DNA Charge Transport: Chemistry and Biology	California Institute of Technology
2005	Martha Greenblatt	The Beauty and Fascination of Solids	Rutgers University
2006	Cynthia M. Friend	The Wonderful World of Surfaces	Harvard University
2007	George M. Whitesides	Biomaterials Science	Harvard University
2008	Harry B. Gray	The Grand Challenge of the 21st Century: Making Fuel from Sunlight and Water	California Institute of Technology
2009	Richard B. Silverman	Drug Discovery: Ingenuity or Serendipity?	Northwestern University

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, 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 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
Tamar Belsh
Nomi Ben-Zvi
Deena Blanchard
Yael Boyarsky
Zahava (Nilly) Brodt
Aliza Charlop
Tzipa Chaim
Esti Charlop
Elana Clark
Davida Cohen
Michelle Cohen
Ellen Dinerman
Abigail Feldman
Tova Fischer
Aliza Forman
Rena Frankel
Caryn Gamss
Julie Gilbert
Aviva Ginsburg
Ariella Glueck
Reena Gottesman
Batya Hertzberg
Ariella Hollander
Wendy Hosinking
Julia Josovitz
Chava Kahn
Lea Kozirovsky
Aimee Krausz
Malka Krupka
Yosefa Lerner
Elisheva Levine
Emily Liebling
Ariella Nadler
Helen Nissim
Yardanna Platt
Tehilla Raviv
Yael Raymon
Tamar Riegel Weinberger
Shuli Roditi-Kulak
Shira Roszler
Rachel Rubinstein
Debbie Rybak
Naomi Schneider
Chana Schonbrun
Nechama Mina Shoshani
Michelle Simpser
Shani Snyder
Tehilla Stepansky
Temima Strauss
Debbie Rybak
Yehudit Weinberger
Amanda Weiss
Meredith Weiss
Sahar Zaghi

Academic Year: 2009-2010
Departments of Biology, Chemistry/Biochemistry, Physics, and Psychology

Graduating Seniors

Discipline	Number of Students	Professional/Graduate School
Allopathic Medical School	16	AECOM (12 students); Suny Buffalo; NY Medical College; Technion
Dental School	4	Columbia Univ.; NYU; McGill Univ.
Optometry	2	SUNY
Holistic Medicine and Acupuncture	1	Pacific College of Oriental Medicine
Naturopathy	1	Bastyr University for Naturopathy
Ph. D. Program	1	School of Pharmacology and Toxicology, University of Toronto
Psychology (Ph.D./Psy.D.)	7	Ferkauf Graduate School; Rutgers Univ.; Pace Univ.
Psychology (M.S.)	1	Queens College
Engineering	2	Georgia Tech; Technion
Physics, graduate program	1	Hunter College
Law school	1	Harvard Law School
Physical Therapy	4	Columbia Univ.; Hunter; Touro College
Physician assistant	2	Touro College
Pharmacy	3	Hebrew Univ.; Touro; Univ. of Illinois (Chicago)
Pharmacology, M.S.	1	Univ. of Toronto
Nutrition, M.S.	1	Columbia University
Applied Physiology and Nutrition, M.S.	1	Columbia Teacher's College
Occupational Therapy	10	Columbia Univ.; NYU; Downstate; Seton Hall; Boston Univ.; Thomas Jefferson Univ.; Midwestern Univ.
Nursing	15	NYU; UMDNJ; Columbia Univ.; Fairleigh Dickinson Univ., Johns Hopkins Univ.; Loyola Univ., Univ. of Oklahoma; Rutgers Univ.
Social work (M.A.)	3	Hunter; NYU (clinical social work)
Education (M.A)	2	Teacher's College; Bank St. College of Education
Cardiovascular Diagnostic Imagine	1	Downstate

Summer 2010 – Undergraduate Internships

(also see: "Summer Research at the Albert Einstein College of Medicine")

Shaine Abbani: Queens College (Dr. Storbeck)

Daniella Ahdout: SCW, Department of Psychology (Dr. Freyberg)

Raquel Amram: SCW, Department of Psychology (Dr. DiLorenzo)

Ashley Ansel: Rutgers-Yeshiva Summer Undergraduate Research Program, Dr. Grumet

Yael Ausubel: SCW, Department of Psychology (Dr. Bacon)

Rachel Aviv: Montifiore Medical Center, Neurology lab (Dr. Rabinowich)

Johanna Banoun: Dental office (Dr. Epdelbaum)

Alanna Barak: NYU Rusk Institute (Cardiopulmonary Unit)

Laura Barnett: Jewish Board of Family and Children's Services

Melissa Bart: SCW, Department of Psychology (Dr. Freyberg)

Geulah Ben David: Harvard Medical School (Dr. Reiss)

Faygel Beren: SCW, Department of Biology (Dr. Holz)

Nina Berg: SCW, Department of Physics (Dr. Prodan)

Arielle Blum: Rutgers University (Dr. Schachner)

Emily Borck: NYU Rusk Institute (Physical Therapy)

Jessica Bruder: AECOM (Dr. Moadelle)

Sarit Cohen: SCW, Department of Biology (Drs. Schuck and Babich)

Chana Cooper: SCW, Department of Physics (Dr. Frenkel)

Sarah Ezaoui: St. Luke's-Roosevelt Hospital (Nephrology)

Elizabeth Friedman: Downstate Medical Center (Dr. Daniel Cukor)

Avigayil Ginsburg: Ohio State Medical School; Cancer Research Center

Miriam Gofine: Bloorview Research Institute

Dina Golfeiz: SERC Intern, AECOM

Sharon Gordon: Beth Israel Medical Center

Michelle Gorelick: NYS Psychiatric Institute, Child Psychiatric Epidemiology Group

Batya Gounder: Yeshiva College (Dr. Peter)

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

Fiona Guedalia: Massachusetts General Hospital (Dr. Geller)

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

Orli Haken: Roth Scholar, AECOM

Emily Harris: PROP intern, Mount Sinai School of Medicine

Yael Hirth: Department of Biology, SCW (Dr. Weisburg)

Dana Horowitz: NYU, Department of Psychology (Dr. Jost)

Tsipora Huisman: Roth Scholar, AECOM

Michal Jaff: NYU School of Dentistry (pediatric dentistry)

Kira Joel: SCW, Department of Physics (Dr. Prodan)

Elisa Karp: SCW, Department of Chemistry/Biochemistry (Dr. Rapp)

Dena Katz: Yavneh Olami, Israel (Occupational therapy)

Sarah Kellerman: Children's Hospital of Los Angeles

Hadassa Klerman: Roth Scholar, AECOM

Miriam Koolyk: SCW, Department of Physics (Dr. Prodan)

Jennifer Kraut: Roth Scholar, AECOM

Cheryl Krietman: NYU Rusk Institute (Occupational therapy)

Shira Kruger: Citromax

Batsheva Kuhr: Johns Hopkins (Dr. Brant)

Danielle Lent: Roth Scholar, AECOM

Leora Lerman: SCW, Department of Biology (Drs. Babich and Schuck)

Rikah Lerer: Summer Intern Research Program of the Feinstein Institute for Medical Research at North Shore Long Island Jewish (Dr. Patricia Mongini)

Elizabeth Lobell: Nephrology Transplant Unit, Weill Cornell Medical College

Hannah Marmor: SUNY Syracuse Upstate Medical University, Department of Biochemistry

Nicole Moskowitz: NY Institute of Technology (Dr. Z. Iqbal); SCW, Department of Physics (Dr. Frenkel)

Kate Rosenblatt: Houghton/Wolchok Laboratory, Sloan-Kettering Cancer Center

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

Jordana Schneider: SCW, Department of Biology (Dr. Vigodner)

Shani Schreiber: Miami Children's Hospital

Rachel Schultz: NYU Rusk Institute (Physical therapy)

Faige Seligman: Rutgers-Yeshiva Summer Undergraduate Research Program

Ilana Shimunova: Research Program for Undergraduates in Nanotechnology, Columbia University

Hadassah Shulman: SCW, Department of Physics (Dr. Prodan)

Avigail Soloveichik: SCW, Department of Chemistry/Biochemistry (Dr. A. Gorodetsky)

Tirtza Spiegel: SCW, Department of Biology (Dr. Holz)

Laura Taieb: SCW, Department of Physics (Dr. Edelman)

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

Rachel Waltuch: JFK Medical Center (NJ); Emergency (ER) Medicine

Malka Weil: Central Park Zoo

Rebecca Weiss: University Fellow, AECOM

Temima Wildman: Robert Wood Johnson Medical School, NJ

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

STUDENT PUBLICATIONS AND PRESENTATIONS

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

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).

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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 online; 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.

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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.

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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.

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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.

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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.

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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.

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Babich, H., Zuckerbraun, H.L., **Barber, I.B.**, Babich, S.B. and E. Borenfreund,

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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.

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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.

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Presentations at Scientific Conferences

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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.

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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.

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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

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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.

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

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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, first 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).

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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

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

ABSTRACT BOOKLET OF STUDENT RESEARCH 2010

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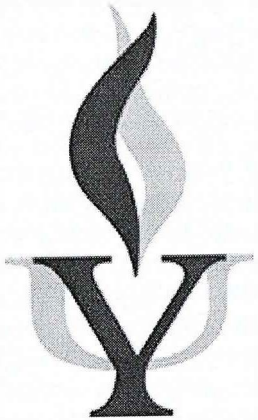

DEPARTMENT OF BIOLOGY
DEPARTMENT OF CHEMISTRY/BIOCHEMISTRY
DEPARTMENT OF PHYSICS
DEPARTMENT OF PSYCHOLOGY

The Smell of Success: Examining the Effect of Fragrance on Social Interaction through Video Analysis

By: Melissa Bart, Daniella Ahdout, and Robin Freyberg
Department of Psychology, Stern College for Women, Yeshiva University, New York, NY

Although most people do not spend much time thinking about odors they smell every day, previous research has demonstrated that odors have a strong influence on us. Specifically, odors can impact our mood, our behavior, and our relationships. The current study was designed to test what would happen if a person's usual fragrance is replaced with an alternative fragrance. We hypothesized that introducing a different fragrance into an interaction between friends would have a significant negative impact on their behavior during the interaction and their perceptions about the interaction.

Female participants were tested in pairs for two sessions. In session one, two close friends interacted for 15 minutes. Heart rate was recorded throughout this interaction. After the interaction, both female participants were given questionnaires to assess mood, enjoyment of the interaction, and their perception of their relationship with their partner. In session two, one member of the dyad continued the experiment with her regular fragrance routine. However, the second member of the dyad completed the interaction while wearing an alternative perfume ("Rain", by Demeter fragrances). As a control, some participants were given a different watch to wear rather than the alternative perfume. The purpose of the different watch was to ensure that any results we obtained were due specifically to the change in fragrance, and not just the fact that something in the environment was changed.

As we expected, enjoyment decreased in session two for participants exposed to the alternative perfume. Among regular perfume wearers, enjoyment of the second interaction significantly decreased only for the participants wearing the alternative fragrance ($p = .05$). In contrast, enjoyment did not decrease for participants in the control watch condition. Additionally, participants exposed to the alternative perfume reported less closeness with their partner during the interaction ($p = .01$). Results also indicated that there was a trend for heart rate to increase in session two for participants wearing the alternative fragrance, but decrease for participants wearing their favorite perfume ($p = .057$). Such findings indicate that the participants wearing the alternative fragrance may feel greater anxiety during session two compared to participants who maintained their regular fragrance routine.

Drosophila SAS-6 tetramers are intermediates in the formation of the centriole central tubule

By: Geulah Ben-David[1], Marcus Basiri[2], Jayachandran Gopalakrishnan[2], and Tomer Avidor-Reiss[2]

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Centrioles are cylindrical microtubule-rich organelles that display radial nine-fold symmetry. A pair of centrioles within pericentriolar material forms the centrosome. Centrosomes are the major microtubule-organizing centers of eukaryotic cells and centriolar defects often result in non accurate cell division and cancers. Importantly, centrioles are required for the formation of cilia, microtubule-based organelles that facilitate cell motility and sensory functions; lack of cilia often results in multiple developmental defects including blindness and male sterility. Centriole duplication is a unique process in which each centriole in the pair facilitates the production of a new centriole. It involves the establishment of a centriole precursor including an early "cartwheel" structure. This cartwheel is composed of a central tubule and molecular spokes that are thought to translate the nine-fold symmetry to the microtubule perimeter.

It has been demonstrated that SAS-6 is a component of the central tubule, and mutations in SAS-6 eliminate the nine-fold symmetry of the centriole. Thus, it is hypothesized that the central tubule may be responsible for establishing the characteristic nine-fold radial symmetry of the mature centriole (Figure 1).

In vitro experiments have demonstrated that SAS-6 self-assembles to form tetramers that are stable within the cytoplasm. It is possible that these represent structural intermediates in the overall assembly of the central tubule. In order to understand whether interactions between these SAS-6 tetramers are sufficient for the formation of the central tubule, several point mutations were generated in a highly conserved domain of the SAS-6 protein to inhibit the formation of the central tubule without disrupting its tetrameric self-assembly. In western blot analysis, third-instar larval brains were extracted and probed with anti-SAS-6 in order to understand the expression of both native and recombinant SAS-6 in each generated mutant. With this, it was determined that the mutant flies expressed the recombinant protein efficiently, allowing for further studies investigating the details of central tubule formation and centriole assembly in the specific mutant backgrounds.

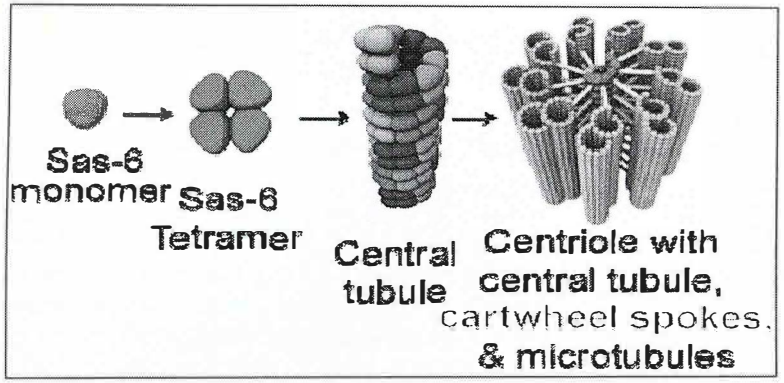

Figure 1. The central tubule hypothesis: SAS-6 monomers self assemble into stable tetramers that assosciate to form the central tubule which dictates the 9-fold symmetry of the centriole.

Determining the effects of estrogen receptor α on S6K1 gene regulation via dual luciferase reporter assay

By: Faygel Beren, Tirtza N. Spiegel, Miriam Steinberger, Myriam Maruani, B.A., and Marina K. Holz, Ph.D.

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Estrogen receptor alpha (ERα) is overexpressed in nearly 60% of breast cancers and stimulates cancer proliferation via upregulating genes involved in cellular growth. ERα acts as a transcription factor when estrogen, a steroidal hormone, binds to the receptor and induces ERα to dimerize. Patients who have ER+ breast cancer receive endocrine therapy to target estrogen-ERα binding. However, many patients develop resistance to endocrine therapy as ERα still acts as a viable transcription factor without effective estrogen-ERα binding. Phosphorylation of serine residues on the AF-1 transactivation region of ERα may contribute to ERα's ligand-independent activity. S6K1, the 40S ribosomal S6 kinase, has been found to phosphorylate Ser 167 on the ERα AF-1 transactivation region enhancing ERα's transcriptional activity. S6K1 is a serine/threonine kinase that acts downstream of mTOR (mammalian target of rapamycin) and is involved in regulating protein translation and cell proliferation. The S6K1 gene, *RPS6KB1*, is often overexpressed in breast cancer cells as its chromosomal region 17q23 is amplified in these cells.

The objective of the current research was to test whether ERα serves as a transcriptional activator at S6K1's promoter region. Such a mechanism would create a positive feedback forward loop wherein S6K1 increases ERα transcriptional activity and ERα enhances S6K1 transcription. This positive feedback forward loop would explain why both S6K1 and ERα are both frequently co-overexpressed in many breast cancers.

We employed a dual luciferase assay to test whether a positive feedback forward loop does indeed exist between the activities of S6K1 and ERα. Three breast cancer cell lines, MCF7 (ER+), BT474 (ER+), and MDA-231 (ER-) were transfected with plasmid vector pSGG containing the promoter region of S6K1 controlling the firefly luciferase gene. The luminescence produced by firefly luciferase was normalized by renilla luciferase (under the control of a general promoter). The ER+ cell lines were treated with different dosages of estrogen (E_2) while the ER- cell line was treated with different dosages of estrogen along with or without ERα coding plasmids. The results show greater S6K1 promoter activity in the presence of ERα and higher dosages of E_2 (Figures 1 and 2), which leads us to conclude that ERα transcriptional activity contributes to the expression of the *RPS6KB1* gene.

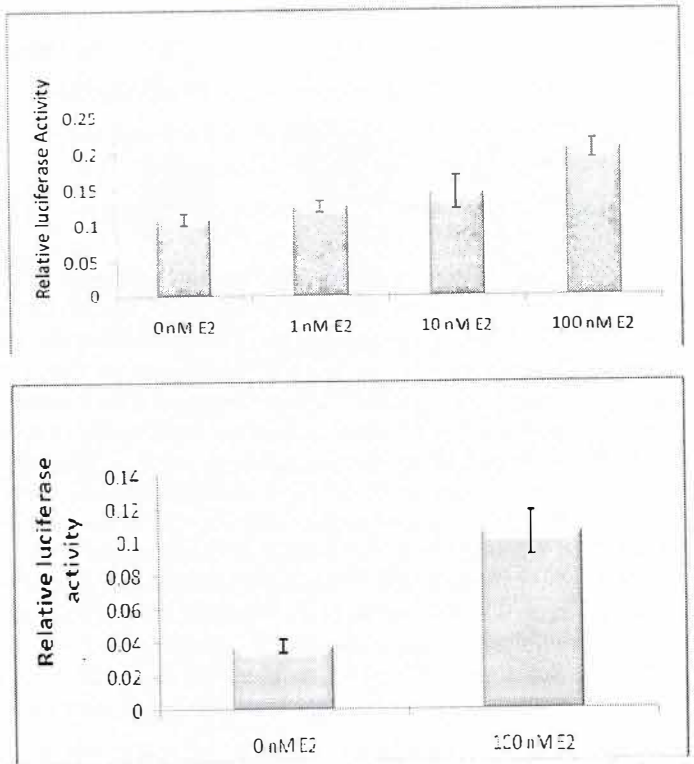

Figure 1. Top: S6K1 promoter activity, as measured by relative luciferase activity, increases when estrogen-depleted MCF7 ER+ cells are treated with increasing dosages of E_2. Bottom: S6K1 promoter activity is significantly greater when estrogen-depleted BT474 ER+ cells are treated with E_2.

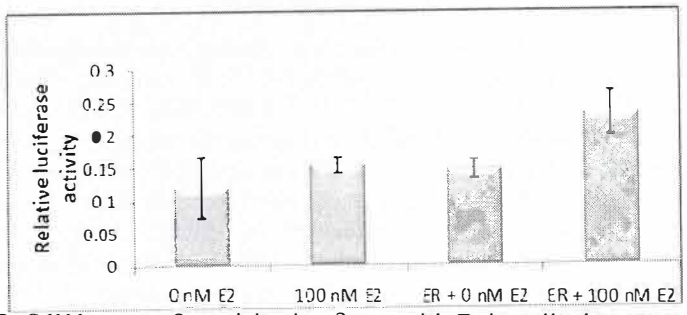

Figure 2. S6K1 promoter activity increases with E_2 in cells that express ER in ER-negative MDA-231 cells.

Glycan mimics grafted onto collagen hydrogelpromote recovery in mouse femoral nerve injury model

By: Arielle Blum[1], Jian Chen, M.D., Ph.D.[2], Melitta Schachner, Ph.D.[2], Shirley Masand[3], David Shreiber, Ph.D.[3], and Asra Khan[4]

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In contrast to the central nervous system, the peripheral nervous system can regenerate and reinnervate after injury. However, when the gap size resulting from injury is too large, complete functional recovery does not occur. This deficit has been attributed to the inability of neurites to bridge the gap size and aberrant regrowth towards inappropriate targets. After injury of the nerve trunk, axons first grow randomly towards both motor and sensory targets. Overtime, the number of correctly projecting motonuerons increases in a phenomenon termed preferential motor reinnervation. Past studies have focused on the role of glycans, specifically human natural killer-1 (HNK-1) and polysialic acid (PSA) glycans, in encouraging preferential motor reinnervation. Because of the difficulty in isolating and synthesizing these glycans, peptide mimics have been discovered as a potential therapeutic for nerve injury. In this present study, PSA and HNK-1 peptide mimics were grafted onto a type I collagen hydrogel in order to promote recovery in 5 mm gaps in adult mice femoral nerves. In addition to providing mechanical support, the collagen hydrogels would also limit the diffusion of the peptide mimics away from the injury site. Mice were either treated with saline, native collagen, scrambled peptide which was used as a HNK-1 control, HNK-1 mimic, PSA mimic, or a mixture of HNK-1 and PSA mimics. Functional recovery was analyzed by measuring the foot-base angle from behind as the mouse walked on a horizontal beam. The hind limb protraction length ratio was also measured by allowing a mouse to voluntarily grasp a pencil with its front paws. In both of these measurements, HNK-1 mimic, PSA mimic, and the mixture of the two promoted functional recovery. Morphological recovery was analyzed by quantifying the number of motoneurons which successfully extended their axons into the quadriceps muscle branch through retrograde labeling. The motoneurons were also stained for the presence of the neurotransmitter acetylcholine transferase (ChAT) in order to measure the "health" of these motoneurons. An additional parameter of motoneuron "health" was the area of somata. Despite positive functional recovery results, the results from the morphological recovery analysis were insignificant. This could have resulted from a low sample number, high variability in the technique, or inadequate imaging mechanisms. In the future, we will attempt to use confocol imaging to create optical slices and to reduce background of the tissue samples. We expect that this will increase the power of the technique and usefulness of the metric.

Olive extract's pro-oxidative and pro-apoptotic effects on cancer cells

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For years, olives have been known to have many health benefits, placing them into the category of nutraceuticals, foods that improve health or protect against diseases. Olives contain polyphenols, a class of molecules that has been proven by others to act as antioxidants and as anticarcinogens. Our laboratory has shown that certain polyphenols can also have pro-oxidative effects, especially on cancer cells.

Experiments were conducted using normal fibroblast (HF-1) and human squamous carcinoma (HSC-2) cell lines, both derived from the human oral cavity. Neutral red (NR) assays indicative of cell viability have shown HSC-2 cancer cells to be more sensitive to the cytotoxic effects of olive extract than are HF-1 cells. In trying to determine what specifically causes the cells to die, we treated cells with olive extract, together with cobalt (II), pyruvate, or catalase, which decrease oxidative stress caused by reactive oxygen species in the cells. NR assays showed that these antioxidants protect cells from death by olive extract. Additional neutral red assays demonstrated that buthionine sulfoxamine, which prevents the replenishment of the cell's internal antioxidant, glutathione, enhances the sensitivity of the cancer cells to the cytotoxic effects of olive extract. These results bolster the theory that oxidative stress is what causes the death of cancer cells treated with olive extract.

The suggested mode of death is apoptosis, programmed cell death, which can often be a direct result of oxidative stress. Induction of apoptosis was indicated by fluorescent microscopy of HSC-2 cells treated with olive extract. These cells demonstrated characteristic signs of cell death, including hypercondensed nuclei and decreased cytoplasm. Gel electrophoretic experiments were also conducted in order to detect shearing of DNA that is a hallmark of apoptosis; however, results have thus far been inconclusive. Experiments are currently being conducted to confirm olive extract- induced apoptosis, such as flow cytometry and Western blot analysis of enzymes involved in apoptosis, including PolyADP-Ribose Polymerase (PARP) and Caspase-3.

In summary, evidence provided by our lab demonstrates that olive extract has anticarcinogenic effects due to the induction of oxidative stress, which may lead to apoptosis cell death.

Drosophila melanogaster double balanced stocks

By: Avigayil Ginsburg[1] and Maki Asano[2]

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The Asano lab studies different aspects of DNA replication, focusing on replication initiation factors. Some of the current projects are the mechanisms of endoreplication, the function of ORC1 outside of DNA replication, and the study of Anaphase Promoting Complex (APC).

Endoreplication supports the growth of cells, without subsequent division. Cells that are undergoing mitotic replication have four phases: G_1, S, G_2, and M. During G_1 the cell grows in preparation for subsequent DNA replication in S phase. The cell grows more during G_2 to prepare for cell division. During M phase the cell replicates and the end product is two identical daughter cells. Endoreplication only contains the S and G phase. The cells grow in size, but not in number. The Asano lab uses *Drosophila Melanogaster* (fruit flies) to study many different aspects of DNA replication, including an upcoming project to screen for all endoreplication specific proteins using RNAis to downregulate proteins.

Balancer chromosomes are very important tool in using *Drosophila* to study genetics. Balancers have many inverted sequences to prevent recombination of homologous chromosomes during meiosis. They usually have a visible dominant phenotype and are homozygous lethal, so it is very easy to determine the genotype of a fly by its phenotype.

A double balanced stock has two balancers on either the second or third chromosome (there are balancers for the x chromosome but they are more harmful for the flies and the fourth chromosome is too small for recombination to occur). Because balancers are homozygous lethal, the genotype of the chromosome containing two balancers cannot change, so there is no need to constantly screen each generation for mutations.

This summer I created multiple double balanced stocks that will be used in different future experiments. First, P-element transformation was used to inject a w^+ transgene (which codes for red eyes) into an embryo. The resulting flies have mosaic eyes; only some of the cells received the transgene, so the eyes will have spots of white and spots of red. These flies are crossed to flies with white eyes (Figure 1), but are otherwise wildtype. The progeny will have either fully white or red eyes. From this cross I selected the flies with colored eyes, meaning they fully carry the transgene. I then took these males and crossed them to wR13S virgin females. wR13S flies carry two balancers on both the second and third chromosome. The second chromosome contains the Sp and CyO balancers on separate homologues (Figure 2), while the third chromosome contains the Sb and TM2 balancers on separate homologues.

From the progeny of this cross I took males with CyO, TM2, and the transgene using the phenotypic indications of those balancers. I crossed these flies to wR13S virgins again. From the progeny of this cross it is possible to collect flies with three balancers and the transgene.

Looking at this progeny also allows for mapping of the transgene to determine what chromosome it is on. If flies with red eyes have Sp, CyO, and either TM2 or Sb then the transgene must be on the third chromosome. If flies with red eyes have either Sp or CyO along with the other two balancers then the transgene must be on the second chromosome. If the transgene is on the third chromosome, then crossing CyO, Sp, and TM2 males with virgins creates a stock where there are two balancers on the second chromosome. If the transgene is on the second chromosome, then crossing CyO, Sb, TM2 males and virgins creates a stock with two balancers on the third chromosome. The chromosome with two balancers will never change genotype, but the other chromosome may become homozygous for the transgene, which would usually result in a darker eye color.

The stocks that I have created will be used in multiple experiments to track genes of interest. The genotype of progeny from different crosses will be known simply by observing the phenotype.

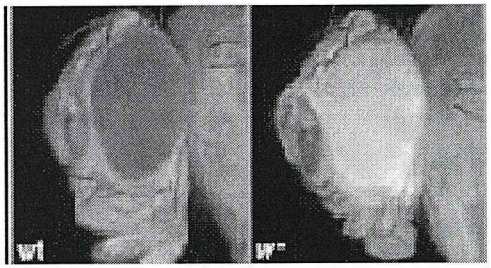

Figure 1. Left: Wildtype fly with red eyes. Right: w^- fly with white eyes.

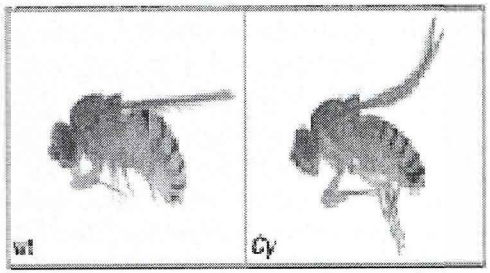

Figure 2. Left: Wildtype fly. Right: Fly with the CyO balancer on the second chromosome causing the phenotype of curly wings.

An evaluation of educational websites for children about chronic conditions

By: Miriam Gofine[1] and Amy McPherson[2]

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Children, including those with disability or chronic illness, frequently use the internet as a source of healthcare information. Other studies demonstrate that the quality of online healthcare information varies, although there is a dearth of reliable and valid assessment tools, especially when evaluating information for children. This study had two objectives: (1) to evaluate the reliability and quality of online information for children about treatment of long-term conditions (chronic illnesses and disabilities) and (2) to assess the reliability of the DISCERN evaluation tool with children's online information.

Websites about pediatric long-term conditions aimed at children were identified through online search engines, snowball sampling, and direct contact with relevant organizations. Quality and reliability of information was assessed by one reviewer using the DISCERN. Test-retest reliability and inter-rater reliability were calculated.

One hundred sixty-five websites were initially identified, with 100 included in the sample. The mean DISCERN score of all sites was 48.16 (SD=7.97, range 28-71, min 15- max 75). Both reliability (median = 31, score range 16-39) and quality (M=17.7, scores range 7-35) scores varied across the sample. DISCERN's internal consistency (Cronbach's $\alpha = 0.64$) and inter-rater reliability (ICC=0.40, 95% CI 0.21 – 0.68) were both lower than previously reported in studies assessing information for adults.

There were relatively few websites about pediatric long-term conditions aimed at children and those that existed varied widely in quality and reliability. However, given DISCERN's low consistency when used with information for children, users should be cautious when employing the tool to evaluate online healthcare information for this population.

Studies of organic anion transport protein 1a1: preparation and expression of p3xFLAG construct

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Organic anion transport protein1a1 (oatp1a1) is expressed on the basolateral plasma membrane of rat hepatocytes where it mediates uptake of amphiphilic molecules and xenobiotics from the blood. Oatp1a1 is a 12-transmembrane domain integral membrane protein that has a PDZ consensus site at its C-terminus and binds to PDZK1. The long-term goal of the present study is to determine whether oatp1a1 forms homooligomers. The short-term aim of this study was to prepare an expression plasmid encoding oatp1a1 in which a 3xFLAG sequence is expressed at its N-terminus.

Oatp1a1, polymerase chain reaction (PCR) amplified using primers devised to add *NotI* and *KpnI* restriction sites, was inserted into the multicloning region of the p3xFLAG expression plasmid. DH5α *Escherichia coli* were transformed with this plasmid and grown on agarose plates using ampicillin as the selection marker. Minipreps of randomly selected bacterial clones were performed in which extracted DNA was digested with *NotI* and *KpnI* and subjected to enzyme digestion as well as DNA sequencing, as indicated. Several plasmids with the correct cDNA sequence were obtained and were used to transfect HEK293T cells. Forty-eight hours after the transfection, cell lysates were prepared and subjected to Western blotting to assay for expression of p3xFLAG-oatp1a1 protein using oatp1a1 and FLAG antibodies.

P3xFLAG-oatp1a1 was prepared successfully and confirmed by DNA sequencing. Transfection of HEK293T cells with this plasmid revealed abundant expression of a protein that reacted with both FLAG and oatp1a1 antibodies on Western blot.

A plasmid expressing p3xFLAG-oatp1a1 has been prepared successfully. Cotransfection of HEK293T cells with this plasmid and a plasmid encoding oatp1a1 linked to a different marker (e.g. GFP) will permit studies to determine whether immunoprecipitation of one oatp1a1 will contain the other, indicating that they are bound in a complex. This plasmid should provide an important tool in which to conduct oatp1a1 dimerization studies in the future.

Acknowledgements:
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The impact of parental exposure to violence and trauma on children of First Responders

By: Michelle Gorelick[1] and Christina Hoven[2]

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It is widely recognized that children are particularly vulnerable to developing mental health problems following exposure to mass disasters and traumatic events---especially if these events are terror related. However, what is less known is that in addition to their own exposure, children may also suffer indirectly from traumatic events experienced by their parents. Parents working as First Responders (i.e. firemen, policemen, EMTs) have particularly high levels of exposure to large-scale violent and traumatic events in the course of their work, in addition to being exposed to other acts of individual violence and trauma. The current study aims to assess the relationship between parents' exposure to violent incidents and mental health problems in their children and determine if the relationship is (1) mediated by parental factors (2) confounded by the child's personality and/or socio-demographic factors. To achieve this, a two-site longitudinal study is currently being conducted in the United States (New York City) and Israel (Tel Aviv) in attempt to understand the different types of mass violence. New York City allows for closer examination of the impact of *isolated* mass violence (i.e., World Trade Center attack), while Israel provides information about *repeated* exposure to mass violence. The samples are comprised of children between the ages of 9 and 16 whose parents are First Responders, compared to matched children in the same age range. Three separate in-person interviews are conducted with the First Responder, her/his spouse or partner, and the index child using standardized instruments and questions designed to assess child mental health status and exposure to violence, as well as parental exposure to violence and stress level. The study allows us to better understand the possible mechanisms behind familial transmission of trauma and in doing so will enhance our knowledge of how parental exposure to work-related violence can influence the well-being of the child. With the information provided from the study, improvements can be made in the mental health services for children of First Responders and other children whose parents witnessed a mass disaster.

Quantum many-body systems: the transition from metal to insulator

By: Aviva Gubin, Aviva Schiffmiller, and Lea F. Santos

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Of the many materials to which we may be exposed in nature, some can be considered metals and others insulators. A metal is a material in which particles can move easily; we say that it conducts. An insulator, on the other hand, is a material in which particles cannot move easily, they are trapped; we say that it does not conduct. Our research was in regard to the factors which affect material conductivity. We began by studying the static properties of a material, using those properties to make predictions about how the material would behave through time. Instead of using actual material samples, we performed numerical experiments.

Our study of the static properties of a one-dimensional chain of particles concluded that as we increase the amplitude of interaction between adjacent particles, the system behaves more like an insulator. Furthermore, when we add defects (on-site disorder) to the chain, the system also behaves more like an insulator, due to the differing energy levels of adjacent sites. Our subsequent study of the system through time supported these results, as we found that in systems with very large interactions or with defects, the particles are confined to small regions of the chain.

Technically the procedure was the following. First we wrote a Hamiltonian to describe the quantum many-body system in one-dimension. Open and closed boundary conditions were analyzed. By adjusting the parameters of the Hamiltonian and then diagonalizing it, we were able to study all the eigenstates of the system for various interaction strengths and amplitudes of disorder. From the structure of the eigenstates we inferred when the system would conduct and when it would not. We then considered different initial states and investigated their time evolution, which confirmed our predictions.

We illustrate our results below with two examples, where the initial state consists of all particles in the first half of the chain. We have 8 sites, 4 particles initially in the first half of the chain, and open boundary conditions. The parameters are: J – coupling strength (sets the energy scale), Jz – interaction strength, t – time. Figure 1 corresponds to a clean chain (no defects) and small interactions. This is a good conductor: the particles move freely through the chain and are soon spread through all sites. Figure 2 corresponds to a chain with small interactions, but large disorder. This is an insulator: the particles are trapped around their initial positions.

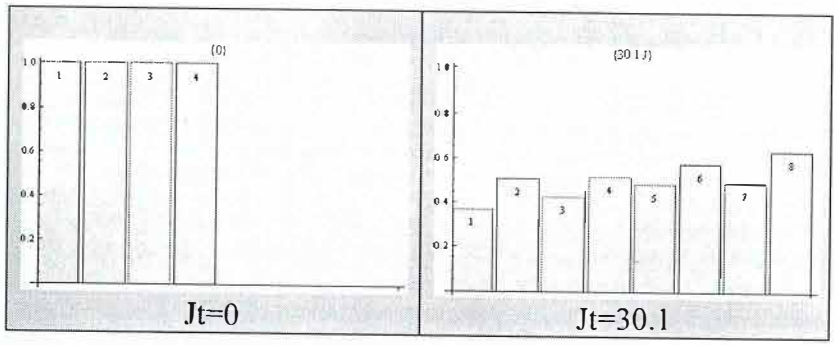

Figure 1. Clean System with small interaction (Jz/J=0.5), a good conductor.

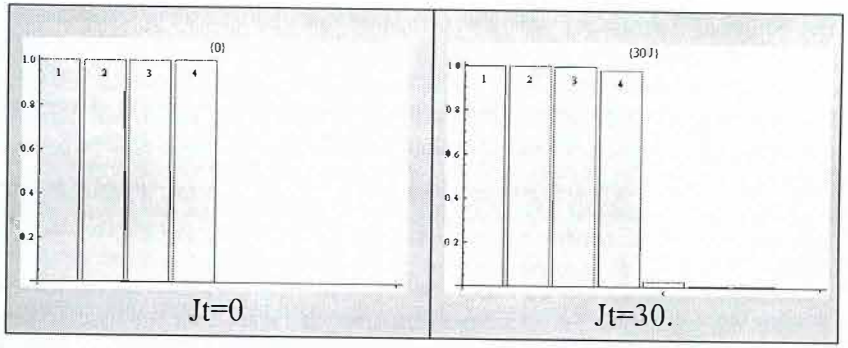

Figure 2. Disordered System with small interaction (Jz/J=0.5) and large random Gaussian disorder (average over 10 realizations), an insulator.

Parl localization during embryonic kidney development

By: Orli Haken[1], Zhongfang Du[2], Jonathon Barasch[3], Anne Muesch[4], Katalin Susztak[4], and Kimberly J. Reidy[2]

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The glomerulus is the filtering unit of the kidney, and consists of capillary loops which are surrounded by epithelial cells called podocytes connected by slit diaphragms. During podocyte development, columnar epithelial cells of the S-shape body evolve into highly structured and polarized cells. The arborized structure of the podocyte is required to maintain the integrity of glomerular filter and is disrupted in proteinuric kidney diseases like focal glomerulosclerosis (FSGS).

The family of Partitioning defective (Par) proteins plays a role in establishing cell polarity in columnar epithelial cells and neurons by asymmetric localization of Parl and the Par3/Par6/aPKC complex to distinct cell membrane domains. It has been shown that the Par3 complex localizes to the podocyte slit diaphragm, and that the complex is required for normal podocyte structure. We have identified expression of Parla/b kinases in podocytes and in developing nephrons. We hypothesize that Parla/b contributes to podocyte differentiation. The objective of our research was to examine the expression of Parla/b during embryonic kidney development and in adult podocytes.

Immunogold labeling of Parla in kidneys examined by electron microscopy allowed us to localize Parla predominantly to the podocyte cell body and foot process cytoplasm. Within the foot process, the majority of Parla localized to apical or basal aspects of the foot process, rather than at the slit diaphragm. Consistent with this, Parla in adult glomeruli co-localized with the apical podocyte marker podocalyxin on confocal immunofluorescence. Next, embryonic rat kidney tissue was co-stained for Parla/b and for WT-1 or Pax-2, which demarcate the metanephric mesenchyme (MM) and developing S-shape nephrons. Parla/1b were expressed in the MM and in S-shape nephrons. Quantification of Parla/1b expression was examined using western blotting, demonstrating increased expression in embryonic day 15 kidneys, at which time glomeruli begin to form.

Together, these data suggest that Parla/1b may play a role in podocyte differentiation. Further studies are necessary to define Parla/b function in the developing and mature kidney.

Acknowledgements:
AECOM - SURP 2010; Roth Scholars Program; Dr. Frederick Kaskel, M.D., Ph.D. - Program Mentor

Serum neutralizing antibody titers of NYC residents against the 2009 pandemic H1N1 influenza virus

By: Emily Harris[1], Christopher Basler[2], and Tshidi Tsibane[2]

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Influenza, commonly known as flu, is a disease that can spread through animals as well as humans, whether it be during a seasonal outbreak or a pandemic. It is a negative sense, single stranded, segmented RNA virus within the *Orthomyxoviridae* family. Influenza A viruses have 8 viral genomic RNA segments that encode at least 11 proteins, including hemagglutinin (HA). HA binds to cell surface receptors, and its specificity towards specific sialic acid receptors influences host cell susceptibility to infection. The viral HA contains 5 antigenic sites (Sa, Sb, Cb, Ca1, and Ca2) on the surface of the globular domain to which the host's humoral (antibody) immune response is directed.

On June 11, 2009, the World Health Organization announced a new influenza pandemic of swine origin which spread globally. This new H1N1 virus contains a unique combination of Eurasian and North American swine lineage gene segments. The HA originates from the classical swine lineage, thought to be a spill over of infection from humans to pigs in 1918. The pandemic H1N1 HA is also closely related to the NJ76 virus, a pig virus which skipped into humans.

Our hypothesis was that individuals born around 1918, those exposed to 1918-like influenza, or those vaccinated against NJ76 virus will possess neutralizing antibodies against the H1N1 CA04 virus because such individuals will have been exposed to viruses with "swine-like" H1 HAs. Such antibodies should be detectable by hemagglutination inhibition (HI) assay.

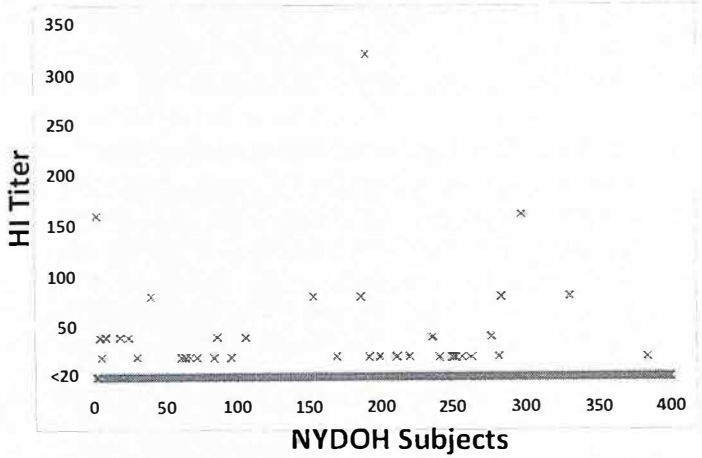
The goal of this study was to test the HI activity of a set of serum samples that are representative of the population of New York City and which were collected before the pandemic by the New York City Department of Health and Mental Hygiene (NYCDOHMH) against the H1N1 CA04 virus. This was done by subjecting the 400 human sera samples to a trypsin-heat-periodate treatment to inactivate non-specific inhibitors of virus hemagglutination. An HI assay was then performed to determine the titer levels of the various sera samples.

In our results (see Figure below), subjects with a titer of <20 are negative/have undetectable levels of anti CA04 antibodies in their sera. Subjects with titers of 20 and above are regarded as positive for and have specific antibodies against the CA04 virus in their sera. These subjects may have been exposed to the CA04 or a closely related virus. HI titers of 40 and above are believed to be protective against infection. All these samples were taken before the H1N1 outbreak in 2009 and so those subjects with high titers are most likely older people who have previously been exposed to or vaccinated against a virus closely related to the CA04 (such as the 1918 or NJ76). Therefore, Table 1 shows that as many as

9.5% of NYC residents may have had pre-existing, neutralizing antibodies at the time of the 2009 pandemic.

The lab will further continue this research by testing these 400 samples against 1918 and H2N2 VLPs, as well as NJ76 and H3N2. Currently, we don't have any demographic information about the 400 subjects, but once all the HI titer data has been collected and we are told specifics about each sample we can draw further conclusions from our results.

Summary Results: NYDOH Samples HI Titers (CA04 Virus)



Note: This graph does not include sample 229 (titer 1280) because it is an outlier.

Table 1. HI Titer Percentages of NYDOH Sera Samples 1-400.

HI Titer	Number	Percentage
<20	362	90.5%
20	21	5.25%
≥40	17	4.25%

Decrease **in**

Intracellular glutathione and induction apoptosis in HSC-2 carcinoma cells from the human oral cavity due to pomegranate juice extract

By: Yael A. Hirth, Harriet L. Zuckerbraun, and Jeffrey H. Weisburg

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

Previous work in our laboratory showed that pomegranate juice extract (PJE) behaved as a prooxidant, generating hydrogen peroxide (H_2O_2) in cell culture medium, and inducing oxidative stress in the target cells. A hallmark of oxidative stress is the lessening of the intracellular level of reduced glutathione (GSH) in cells exposed to the test agent. Reduced glutathione, a thiol-containing tripeptide, is the main intracellular antioxidant in the cell's repertoire against oxidative defense. HSC-2 cells treated with increasing concentrations of PJE demonstrated a progressively decreasing content of intracellular GSH (Figure 1).

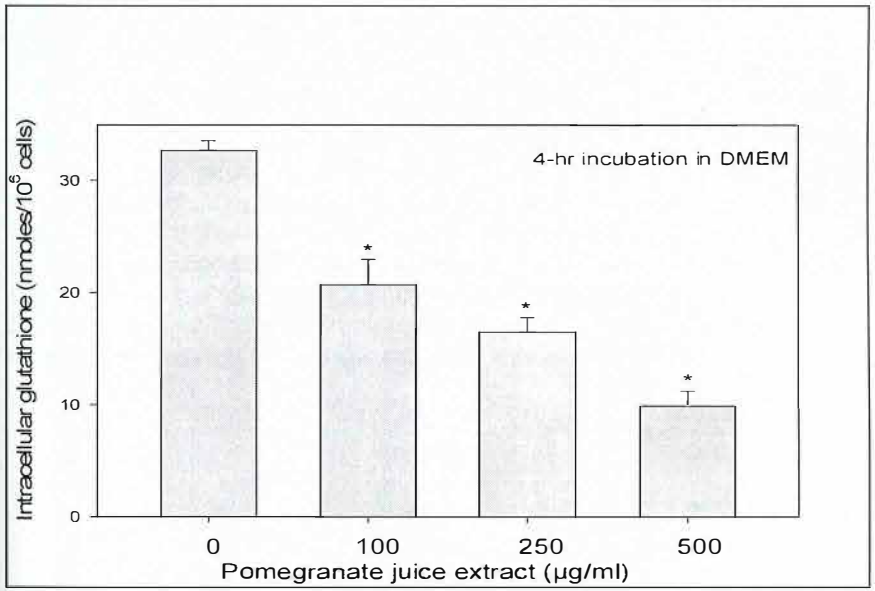
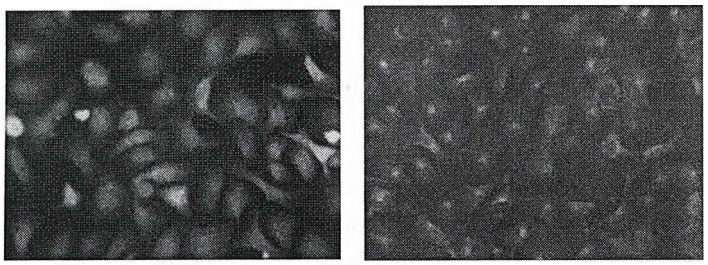


Figure 1. Reduction of the intracellular content in HSC-2 carcinoma cells after a 4-hr exposure in cell culture medium (i.e., DMEM) amended with pomegranate juice extract.

Depletion of intracellular GSH upon exposure to PJE was confirmed by fluorescent staining of intracellular thiols using Cell-Tracker™ Green CMFDA 5-chloromethylfluorescein diacetate. The intensity of the green fluorescence was a function of the concentration of intracellular thiol-containing molecules.

Control cells not exposed to PJE stained bright green, whereas little fluorescence was noted in HSC-2 cells exposed to PJE (Figure 2).



A B

Figure 2. A 4-hr exposure HSC-2 cells exposed (A) to medium lacking PJE and (B) medium amended with 250 μg/ml PJE. Cells were stained with Cell-Tracker™ Green CMFDA; 320X.

Oxidative stress is a known inducer apoptosis, flow cytometric analyses of HSC-2 cells untreated and treated with PJE showed that as the concentration of PJE increased, the number of viable cells decreased and the numbers both of apoptotic and non-viable cells increased.

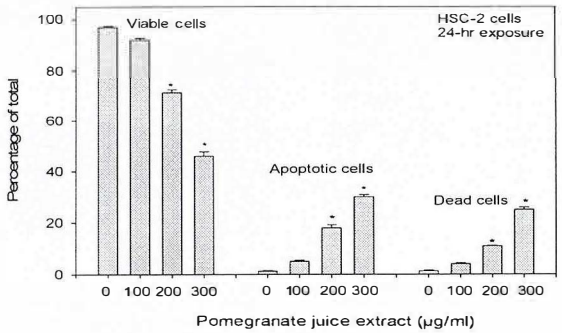


Figure 3. Proapoptotic inducing ability of PJE to HSC-2 cells upon a 24-hr exposure to PJE.

The efficacy of hypnosis in pediatric cancer care

By: Dana Horowitz and Terry DiLorenzo

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The use of hypnotic techniques in clinical practice to alleviate pain, nausea, and anxiety is increasing. While pharmacological methods are available to mitigate pain, nausea, and anxiety, they are not effective in every patient, nor do they alleviate all side effects, thereby necessitating other forms of interventions. There is a growing body of literature documenting significant decreases in self-reported procedural pain, the dosage of medical analgesics, chemotherapy-related nausea and vomiting, and anxiety from various forms of hypnosis in oncology patients. Interventions with pediatric oncology patients are particularly successful, perhaps due to the fact that they are more hypnotizable given children's proclivity toward imagination and fantasy. While investigators conceptualize hypnosis in different ways, including visualization, guided imagery, progressive muscle relaxation, and other relaxation techniques, hypnotic analgesia in pediatric oncology patients typically encompasses physical relaxation, supplemented with guided imagery, providing an alternative focal point to painful sensations. In regard to anxiety, research has suggested that the cancer experience can be quite distressing, possibly even leading to posttraumatic stress disorder in both young patients and their parents. Thus, the benefits of hypnosis can extend to both the patient and caretakers in minimizing distress and preventing subsequent psychopathology. Recommendations for future research include comparing the institutional costs of hypnosis with pharmacologic treatments in pediatric patients and the association between the stage of cancer and efficacy of hypnosis. Finally, research in this area can be limited by the use of self-report measures of outcome; therefore, studies measuring anxiety via physiologic measures would be beneficial.

Philosophy of life

By: Dana Horowitz[1], and A. Nilsson[2]

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Silvan Tomkin's Polarity Theory suggests a polarity between humanism, which portrays humans as inherently valuable, and normativism, which portrays humans as lacking inherent worth, only able to attain value by conforming to societal norms. The study Philosophy of Life investigates the underlying emotional and moral foundations of these two opposing concepts. Humanism was postulated to have a prescriptive moral orientation, which centers on courses of actions that should be taken, and normativism was postulated to have a proscriptive moral orientation, which centers on transgressions that one should not engage in. These differences may be due to distinctions within each individual's system which control behavioral activation (proclivity towards desirable actions) and behavioral inhibition (avoidance of punishment). Additionally, humanism was expected to be positively correlated with happiness and satisfaction, whereas normativism was expected to be negatively correlated with hostility and shame, with life satisfaction tied to perceived success, as operationally defined by grade point average.

Five studies were conducted overall. Studies 1, 2, and 3 tested the hypothesis that humanism and normativism are distinct and that they are related heterogenously. In study 1, humanism and normativism were orthogonal ($r = -.04$, $p = .58$). In studies 2 and 3, humanism and normativism were negatively correlated ($r = -.54$, $p < .001$, and $r = -.22$, $p < .001$, respectively). The data from study 4 strongly supports the hypothesized association between normativism and objectivism. Study 5 supports the association between humanism and prescriptive morality, life satisfaction, and happiness. The data from this study also supports the association between normativism and dispositionally hostile affect. Humanism was found to be unrelated to dispositionally positive mood (but related post hoc). Normativism was found to be related to prescriptive morality rather than proscriptive morality.

AID and Gadd45a: Are they involved in active DNA demethylation of the 3'RR and class switch recombination?

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The production of antibodies proteins with two heavy (H) chains and two light chains helps the body fight the large repertoire of invading pathogens. A shift in expression from the IgM class to other classes of antibodies, such as IgG, IgE and IgA, occurs via H chain gene rearrangements in a process termed class switch recombination (CSR). CSR is regulated by a 3' regulatory region (3'RR), which acts at long distances on the H chain coding regions to promote H chain germline transcription required prior to CSR. The Birshtein lab has shown that the 3' RR undergoes progressive DNA demethylation during CSR, including an early stage of replication-independent active demethylation. A question we are addressing is whether active DNA demethylation is critical for CSR. Two proteins implicated in active DNA demethylation are activation-induced cytidine deaminase (AID), a B cell-specific trans-acting protein critical for CSR, and Gadd45a, a protein involved in genomic stress.

My first project determined whether AID was involved in demethylation of the 3'RR region. My experiments showed that there was no significant difference in demethylation between wild-type (WT) and AID knockout (KO) mice. My second project involved Gadd45a. Previous experiments from our lab showed that B-cells from Gadd45a KO mice had reduced active DNA demethylation of the 3' RR during switching. However, no defects in CSR were observed in these mice. In further examination of a potential effect of Gadd45a on CSR, we performed a lentivirus-mediated shRNA knockdown of Gadd45a in the CH12 cell line, which regularly switches from IgM to IgA. Using FACS analysis, we found that there was no significant difference in switching in cells treated with control or Gadd45a-specific shRNA.

Therefore, we conclude that (1) there is no connection between AID and active demethylation of the 3' RR, and (2) there is no direct link between Gadd45a, demethylation and CSR.

Topological phonon modes in filamentous structures

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Topological phonon modes are robust vibrations localized at the edges of special structures. Their existence is determined by the bulk properties of the structures and, as such, the topological phonon modes cannot be removed no matter what changes occur at the edges. The first class of topological phonons was recently found in structures similar to that of Microtubules. The present work introduces another class of topological phonons, this time occurring in quasi one-dimensional filamentous structures with inversion symmetry. The new structures were inspired by actin and by the intermediate filaments, two filamentous macromolecules present in most live cells. They probably represent the simplest structures that support topological phonon modes, a fact that allows detailed analysis in both real time and frequency domains. We give a topological classification of such structures, present an explicit example of topological phonon modes, and analyze these modes in both frequency and time domain. We advance the hypothesis that the topological phonon modes are ubiquitous in the biological world and that living organisms make use of them during various processes.

Topological phonon modes can explain the polymerization process of Microfilaments. Microfilaments are made of the protein actin, arranged in a double-helical formation. A pool of ATP-actin monomers is present in the cell, and actin polymerization draws on this pool. The ATP-monomers collide and bond with the ends of the existing filament branches, elongating them. The bound ATP-actin hydrolyzes into ADP-actin almost instantly, releasing quanta of about 12 kT energy.

According to the Elastic Brownian ratchet model, the Microfilaments vibrate as spring-like wires and the edges adjacent to the cell membrane bend laterally, exposing the ends to the pool of ATP-actin. This allows additional actin monomers to squeeze in and attach themselves to the ends of branches. The restoring force straightens the Microfilament, which pushes against the cell wall generating the motile force.

We hypothesize that the bending of the Microfilaments is caused by topological edge modes, powered by the 12 kTs released during hydrolysis of the ATP-actin. The present work demonstrates the existence of such modes in filamentous structures similar to that o f the Microfilaments. As we see through explicit simulations, such edge modes do not allow the energy to dissipate into the bulk of the filaments, and could indeed lead to vigorous shakeup of the ends of the structures, even when excited with weak stimuli. The modes discussed in this work are of a different type from those previously found in Microtubules, which required a 2D structure and special interactions. We do not exclude that newly found modes may exist in Microtubules.

Enzyme specificity in the isoprenoid synthase superfamily

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Over 55,000 naturally occurring isoprenoid molecules have been identified in biological systems, ranging from the human body to certain types of plants and food. The Isoprenoid Biosynthetic Pathway occurs through chain elongation reactions in which hydrocarbon groups in allylic diphosphate substrates are added to isopentyl diphosphate. Isoprenoid synthase enzymes are selective for the chain lengths of the allylic diphosphate substrate and the final product. Our project deals with developing a protocol to predict product specificity in isoprenoid synthase enzymes by docking potential products into the enzyme active sites. The longest isoprenoid molecule that can bind favorably in an enzyme's active site is assumed to be the product of that enzyme's chain elongation reaction. Isoprenoid synthase enzyme-ligand complexes were taken from the Protein Databank (PDB). The Protein Local Optimization Program (PLOP) was used for docking by superimposing the pyrophosphate group of the ligand on the pyrophosphate group in the crystal enzyme-ligand complex and searching the conformational space of the remaining rotatable bonds. The enzyme remains rigid during the simulation.

Our test set included nine isoprenoid synthase complexes. All ligands consisted of an isopentyl pyrophosphate base elongated with isoprene units; each isoprene unit contained five carbon atoms. Ligands were either Dimethylallyl Diphosphate (DMA, C_5), Geranyl Pyrophosphate (GPP, C_{10}), Farnesyl Pyrophosphate (FPP, C_{15}), or Geranyl Geranyl Pyrophosphate (GRG, C_{20}) . We experimented with different docking protocols to determine how ligands could best be docked to the isoprenoid enzymes.

Results are reported using the root mean square deviation (RMSD) of the docked ligand against the ligand in the crystal complex from the PDB. Initial results, shown in the table below, varied depending on the case:

PDB ID	Ligand	RMSD
1uby	DMA	1.85
1ubw	GPP	1.2
1ubx	FPP	3.57
3krp	GPP	0.85
2c8x	GPP	4.54
2c90	FPP	6.08
2z4v	GRG	1.24
2q80	GRG	0.95
3cc9	GRG	14.23

To improve results for the larger ligands we experimented with imposing a constraint on a single carbon atom in the ligand to limit its range of motion during the simulation; this resulted in an improved RMSD for 3cc9 of 1.2. Changing the charge of the pyrophosphate group from -3 to -2 by protonating one of the oxygen atoms did not improve results. Finally, we experimented with enzyme flexibility by allowing side chains within 3.6 angstroms of the ligand to move during the simulation to allow for induced fit. This reduced the RMSD for 2e90 to 1.71 and for 3cc9 to 3.61, but in other cases was not helpful or caused an increase in RMSD.

Further experiments are necessary to determine the optimal protocol for docking isoprene ligands in the greatest number of cases. The protocol will then be used to dock ligands in proteins that have recently been identified as putative isoprenoid synthase enzymes and enzymes of unknown crystal structure using homology models.

Exploring the mechanisms that regulate macroH2A1 splicing

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The histone variant macroH2A1 replaces the canonical histone H2A in chromatin to regulate gene expression. The *H2AFY* gene that codes for macroH2A1 encodes two splice variants, macroH2A1.1 and macroH2A1.2, 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 many cancer types have reduced levels of macroH2A1.1 splicing. In addition, we have recently determined that macroH2A1.1 expression 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 these mechanisms are perturbed in cancer. To begin identifying the cis-acting sequences that regulate macroH2A1 splicing, we designed a "minigene" including the two alternative exons and 300 bp of surrounding 5' and 3' intronic DNA. By expressing the minigene in human cells, we were able to reproduce accurate splicing for macroH2A1.2 but not for macroH2A1.1. Using an independent approach, we sought to identify trans-acting factors affecting macroH2A1 splicing. By correlating the level of macroH2A1 splicing over 50 tissues and cell lines with available microarray expression data, we generated a list of candidate splicing factors. We developed shRNA knockdown constructs for several candidates to determine their role in macroH2A1 splicing. Through this method we have identified a splicing factor that positively regulates macroH2A1.1 splicing. Interestingly, this factor was recently identified as a potential tumor suppressor whose expression is downregulated in colon cancer.

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Autophagy in the growth of primary cilia

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Mouse embryo fibroblasts (MEFs) grow primary cilia upon serum starvation for 6-48 hr. At approximately the same time that primary cilia are forming during cell-starvation, the process of autophagy is occurring in the cells. Autophagy is a catabolic pathway that results in the degradation of cytosolic components inside lysosomes. The fact that autophagy and primary cilia formation are occurring in the cell at the same time suggests a possible functional relationship. Two forms of autophagy—macroautophagy and chaperone mediated autophagy (CMA)—are induced by starvation with kinetics similar to the induction of primary cilia. To test whether ciliary growth was affected by loss of macroautophagy, we used pharmacological modulators of macroautophagy and cells from a mouse knocked out for an essential component of this autophagic pathway. All cell lines still grew primary cilia, supporting that macroautophagy is not required for cilia formation. Interestingly, acute blockage of macroautophagy by 3-methyladenine resulted in a marked increase in the number of primary cilia even in cells grown in nutrient-rich media. Cells with chronic blockage of macroautophagy showed a similar trend, although differences with wild-type were less pronounced. Our results highlight the importance of macroautophagy in modulating the energetic cellular balance. Even if cells are growing in nutrient-rich media, when macroautophagy is blocked, cells perceive themselves as starving (maybe because of a decrease in the intracellular pool of amino acids) and will thus produce primary cilia.

Evaluation of 2 SNPs for association with IBD in the African American population

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Inflammatory Bowel Disease (IBD) is a category of illnesses that involves inflammation of the gastrointestinal (GI) tract. IBD includes diseases such as Crohn's Disease (CD), Ulcerative Colitis (UC), and Indeterminate Colitis (IC). CD is characterized by inflammation deep into the tissue of the small intestine while UC is primarily a more superficial inflammation and can occur anywhere in the GI tract. Since CD and UC have very similar manifestations, sometimes the specific diagnosis (CD or UC) cannot be determined, so a diagnosis of IC is made. Though previously IBD was not considered to be genetically inherited, accumulating evidence indicates that genes may influence whether a person develops IBD.

A previous genome-wide association study (GWAS) has discovered several loci affecting susceptibility to UC in the Japanese population. We have evaluated two of the most strongly associated single nucleotide polymorphisms (SNPs) discovered in that study, rs1801274 and rs17085007 for CD, UC, and IC patients and healthy controls in the African American (AA) population. The two SNPs were individually evaluated using Taqman genotyping assays and custom primers/fluorescent probes. Allelic discrimination plots were generated. Results for rs1801274 are summarized in Table 1. Results for rs17085007 are summarized in Table 2.

Results showed that the G allele at rs1801274 was a susceptibility locus for IBD within the AA population. The SNP was most strongly associated with AAs with UC (P= 0.0021, OR=0.611). It was also found to be associated with CD (P= 0.0839 OR=0.813) and IC (P= 0.0828 OR=0.579) among AAs. This SNP codes for part of a crucial structure in autoimmunity, FCGR2A, (FCγRIIA or the Fc low-affinity activation receptor) located on chromosome 1q23. The binding of IgG to its activation site, such as FCGR2A, is crucial to induce function, and a mutation in rs1801274 codes for a specific mis-sense mutation where the wild type His131 (the A allele) is substituted for Arg131 (the G allele). This H131R mutation has been found to be associated with other autoimmune diseases, and it has been suggested that the His131 variant of FCGR2A may be associated with hyperactivity of multiple immune cells, leading to constant inflammation of the colorectal mucosa after immune complex production by antigens. Interestingly, we found that the G allele was more common in healthy controls than in IBD affected AAs. So while the H131R mutation in FCGR2A is more commonly found in disease-affected persons in other autoimmune diseases, our study found that IBD-affected AAs have H131 more often than healthy AAs. Thus, according to our study, in AAs the H131 variant is a susceptibility allele for

IBD. A similar finding was discovered in the GWAS in the Japanese population in reference to UC patients.

In regards to the second SNP, we can rule out that the C allele at rs17085007 has a significant effect on AA IBD because though the overall IBD-affected group showed nearly-noteworthy results (P=0.088 OR=0.736), subgroups' results were not significant (P value for CD=0.16, P value for UC=0.21, P value for IC=0.31). We propose that this locus is not a susceptibility locus for the AA population and may possibly be unique to the Japanese population. This locus on chromosome 13q12 is currently considered to be intergenic.

Table 1. Summary of the SNP evaluation results for rs1801274, FCGR2A

Phenotype	No. of samples	MAF (G)	P Value	OR	95% CI
CD	294	0.49320	0.08390	0.813	(0.643-1.028)
UC	103	0.42233	0.00208	0.611	(0.442-0.845)
IC	22	0.40909	0.08282	0.579	(0.31-1.08)
IBD-Affected	419	0.47136	0.00794	0.745	(0.599-0.926)
Unaffected	268	0.54478			

Table 2. Summary of the SNP evaluation results for rs17085007

Phenotype	No. of Samples	MAF (C)	P Value	OR	95% CI
CD	291	0.09278	0.16329	0.761	(0.519-1.118)
UC	104	0.08654	0.21176	0.705	(0.407-1.223)
IC	22	0.06818	0.31466	0.545	(0.164-1.811)
IBD-Affected	417	0.08993	0.08839	0.736	(0.516-1.048)
Unaffected	266	0.11842			

Pericardial inotropic drug delivery

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Cardiac surgical patients with myocardial dysfunction are at risk for exacerbated cardiomyopathies, especially following the use of cardiopulmonary bypass (CPB). Inotropic drugs are used to increase the force of myocardial contraction and separate heart failure patients from CPB. However, systemic side effects such as peripheral vasodilation and hypotension limit their dose and utility, and often require infusion of other medications to ameliorate these peripheral effects. Local pericardial delivery may allow inotropes to work on the heart without peripheral side effects, allowing for higher drug concentrations within the myocardium and enhanced effect. The dose response to dobutamine was compared with intravenous (IV) infusion and pericardial (PC) controlled-release.

A Millar pressure-volume conductance catheter was used in rats to assess contractility. Animals were anesthetized, ventilated, and cannulae were placed in the femoral artery and right internal jugular vein. A Millar conductance catheter was advanced retrograde from the carotid artery into the left ventricle. Dobutamine was given by IV infusion or released from a PC alginate disk over a range of rates (0 to 4 mcg/kg/min). The contractility was assessed as the maximal rate of change of pressure in the left ventricle (dP/dt-max).

PC dobutamine maximally raised dP/dt-max by 83% while IV infusion raised it 24%. ED50 for PC and IV administration was approximately 0.8 and 1.4 mcg/kg/min, respectively. ED95 for PC and IV administration was 1.5 and 2.5 mcg/kg/min, respectively. At equal rates of administration, systemic vascular resistance decreased by 41% for IV infusion and only 20% for PC release.

The same drug given by different means shows not only differential potency and peripheral side effect, but also a dramatically different biologic effect. Pericardial application of dobutamine is more efficacious than intravenous infusion. These data suggest that targeted PC application of inotropes may be a valuable approach to treating cardiac surgical patients with profound cardiomyopathies.

Determination of Bucky ball pathway and binding domains via its protein interactors

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The establishment of oocyte polarity along the animal-vegetal axis is a critical process for establishing the axes of the embryo and the germline of the zebrafish embryo. The Balbiani body, an evolutionarily conserved aggregate of organelles, RNAs and proteins, is the earliest known sign of asymmetry in vertebrate oocytes. Bucky ball, a protein which localizes to the Balbiani body and has no known functional domains, is essential for the polarization of the oocyte, assembly of the Balbiani body, and formation of the first embryonic axis, as seen through the mutant phenotype. The pathway through which Bucky ball mediates this process is heretofore unknown. A yeast-two-hybrid screen of a human ovarian tissue cDNA library was performed to identify Bucky ball interacting proteins and their binding domain on Bucky ball. Through this approach we have identified multiple, unique Bucky ball interacting proteins, many of which have been implicated in infertility and cancer, but how they contribute to these diseases is not known. Interactions between truncated versions of Bucky ball protein and its binding partners in yeast is revealing regions of the Buc protein required to mediate binding, which may also represent domains of functional significance. Validation of binding between Bucky ball and its interacting partners identified in yeast through EMSA and co-immunoprecipitation studies, and using zebrafish genetics to explore the essential functions of validated proteins will provide insight into the mechanisms establishing oocyte polarity and specification of the germline.

Muscarinic acetylcholine receptor's role in Sjogren's syndrome

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Sjogren's syndrome is an autoimmune disease that occurs 90% of the time in women above the age of 40. In this disease, the body's immune lymphocytes attack cells within exocrine glands that produce saliva and tears. Muscarinic acetylcholine receptors (M3R) are G protein coupled receptors found in the plasma membranes of the secretory cells within these glands. This receptor protein, in its quaternary structure, forms 6 extracellular loops. In Sjogren's syndrome, patients are found to have auto-antibodies to this M3R protein, thereby preventing secretion of the salivary and lacrimal glands.

A major goal of this project was to develop a reliable method for detecting auto-antibodies to the M3R receptor. One approach involved an enzyme-linked immunoabsorbent assay (ELISA) for detecting antibodies specific for a peptide sequence in the 3rd extracellular loop of M3R. Normal and diseased mouse sera were tested in various ELISA assays for binding to this peptide. The diseased mice, called NOD mice, are commonly used as a model for Sjogren's syndrome because they display similarities to human SjS and have detectable auto-antibodies. We used the mouse sera in the ELISA assays to determine how much IgG antibody would bind to a plate coated with the purchased M3R peptide. Because the peptide has free cysteine groups, it is easily oxidized and extremely labile. We tried various methods with different buffers and added 2ME to keep the peptide reduced and eliminate binding problems. Our preliminary results showed higher IgG binding with sera from NOD mice than sera from wild type normal mice.

Another method we used was the staining of a Chinese hamster ovary (CHO) cell line which was transfected with the gene for the M3R membrane protein. After spinning down and washing the cells, we added an anti M3R antibody and the secondary antibody which was marked with a fluorescent marker to detect binding of the anti M3R to the receptor on the cells.

Additionally, we performed a western blot of the lysates of both non-transfected and transfected CHO cells to detect the protein present in each. We were unable to detect the 66 kilodalton M3R protein in the transfected cell lysate. This likely reflects the difficulty to recover this highly membrane integrated protein using conventional cell lysis buffer. Further experimentation would require immunoprecipitation to further purify the protein and then perform another blot and/or the use of more rigorous cell lysis procedures.

Comparative responses of HSC-2 carcinoma cells to extracts from pomegranate juice and olive fruit: correlations with their prooxidant activities

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Preliminary studies with HSC-2 cells, a carcinoma cell line derived from malignant tissue in the human oral cavity, showed their greater sensitivity to pomegranate juice extract (PJE) than to an olive fruit extract (OFE). Figure 1 shows the 24-hr cytotoxicity of PJE and OFE towards HSC-2, with cell viability quantified by the neutral red assay. Photomicroscopy of extract-treated cells showed more cellular aberrations upon treatment with PJE than with a comparable concentration of OFE (Figure 2).

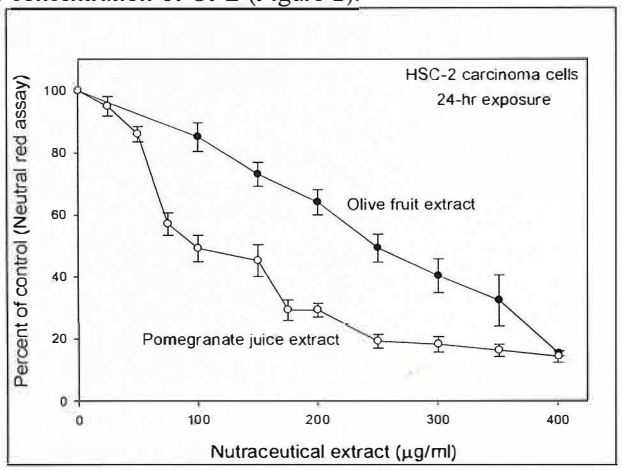
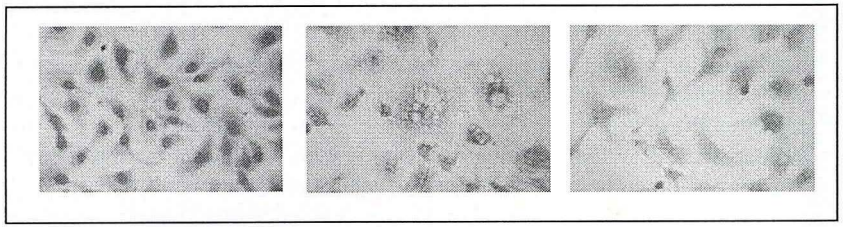


Figure 1. Comparative cytotoxicity of PJE and OFE to HSC-2 cells exposed for 24-hr in Dulbecco's modified Eagle's medium (DMEM), lacking pyruvate.



(a) (b) (c)

Figure 2. HSC-2 cells: (a) untreated control; (b) treated with 250 µg/ml PJE; and (c) treated with 250µg/ml OFE. Aceto-orcein stain; 320X.

These nutraceutical extracts contain a variety of chemical components and identifying the specific component(s) leading to the greater cytotoxicity of PJE than of OFE was not possible. Current research has indicated that extracts from fruits exhibit prooxidant activity, which may be a contributing factor towards the differential toxicities of PJE and OFE. Using the FOX assay, the generation of hydrogen peroxide in PJE- and OFE-amended cell growth media was compared. In all the commercially-available media studied (DMEM, MEM, McCoy's, RPMI), the generation of hydrogen peroxide was much greater with PJE than with OFE. Carcinoma cells are known to have compromised defense mechanisms against oxidative stress. The enhanced generation of hydrogen peroxide in PJE-amended medium, as opposed to OFE-amended medium, may explain the greater cytotoxicity of PJE than of OFE to the HSC-2 carcinoma cells. The greater prooxidant activity of PJE, than of OFE, was also noted in their comparative abilities to interact with reduced glutathione (GSH), a tripeptide and the cell's main defense against oxidative stress. In a cell-free assay, the level of authentic GSH was lessened more quickly in the presence of PJE than of OFE (Figure 3).

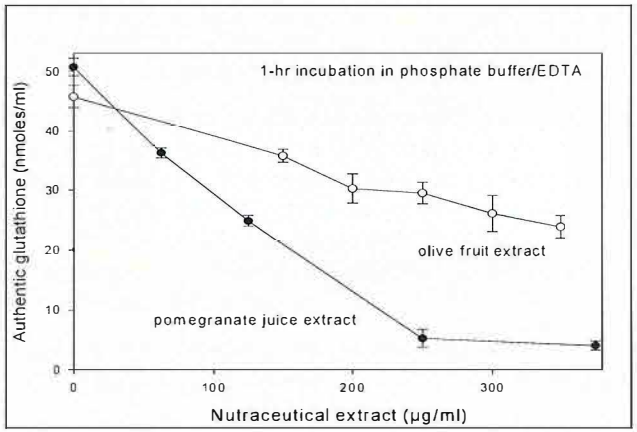


Figure 3. Direct interaction between authentic GSH and either PJE or OJE, as a function of extract concentration.

The above-noted cell culture media lacked sodium pyruvate, a scavenger of hydrogen peroxide. In a commercially-available DMEM containing sodium pyruvate and amended with either PJE or OFE, hydrogen peroxide was not detected. The toxicity of PJE, at 200 and 250 µg/ml, and of OFE, at 250 and 300 µg/ml, to the HSC-2 cells was significantly lowered when exposure was in DMEM with pyruvate (110 mg/L), than in pyruvate-free DMEM (Figure 4).

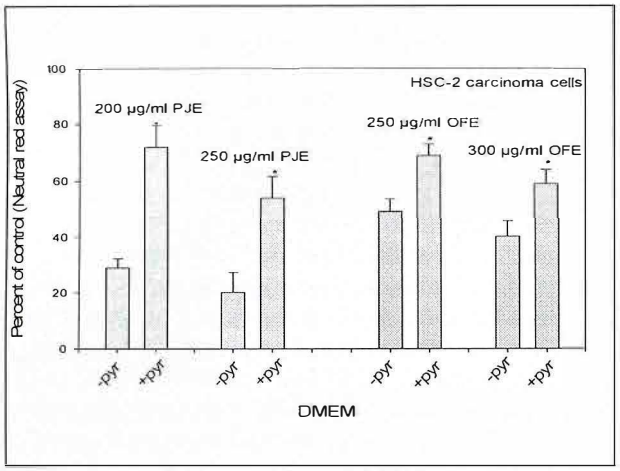


Figure 4. Comparative toxicities of PJE and OFE in pyruvate-containing and pyruvate-free media.

The interaction between the epsilon subunit and the F_1 subcomplex of ATP synthase

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ATP synthase is a rotary motor enzyme complex used to produce energy for many living things. It works by using a proton gradient to drive the oxidative phosphorylation of ADP to produce ATP. ATP is a compound often involved in numerous metabolic pathways. The enzyme complex is composed of two subcomplexes—F_0 and F_1. These subcomplexes are connected by a stator and a rotor shaft, which enable the complex to act as a rotary motor.

The goal of this research was to learn how the epsilon subunit on the rotor of the enzyme complex interacted with the F_1 subcomplex. We studied this interaction by modifying the epsilon subunit within the enzyme. This research used ATP synthase from *Escherichia coli* to observe and to study the rotary motor enzyme.

Our task was to get a truncated form of epsilon to be expressed as part of the enzyme. This truncated form of the epsilon is known as Eps88stop, as it only expresses 1-87 residues of epsilon. Epsilon in its entirety expresses 138 residues.

To accomplish this, we transferred the engineered gene for the truncated epsilon from a small plasmid to the part of the ATP operon that encodes all of the genes to express F_0 and F_1 in *E. coli*. This operon was cloned on the plasmid p3U. The small plasmid that the engineered gene came from was used for engineering this shortened gene and for expressing the shortened epsilon as a separate protein. Essentially, we attempted to substitute the modified gene for Eps88stop in place of the gene for wild type (full length) epsilon.

By modifying this epsilon subunit of the enzyme complex, we will be able to observe the rotor's behavior and interactions with the F_1 sub complex of ATP synthase.

Elucidating the interaction of LPA with model membranes

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Lysophosphatidic acid (LPA) is a bioactive phospholipid produced intracellularly and extracellularly by a variety of enzymes. Through its interaction with G-protein coupled receptors (GPCRs), LPA is able to cause a range of downstream physiological reactions. LPA is thereby implicated as a signaling mediator in a plethora of cellular processes including nociception, inflammation, chemotaxis, cell development, and cancer growth. However, in addition to its role as a ligand for GPCRs, LPA may be able to affect the physical properties of bilayer membranes due to its amphipathic structure. This could in turn affect the physical properties of nearby lipid-lipid and lipid-protein interactions, including the aforementioned GPCRs, which reside in highly ordered lipid domains. Although putatively significant, the thermodynamic and mechanistic parameters of LPA's interaction with bilayer membranes remain unknown. Using isothermal titration calorimetry (ITC), we explored the interaction of LPA with model membranes constructed of the pure phospholipids POPC and DPPC. These experiments indicated that LPA does indeed interact with bilayer membranes in an endothermic fashion. This suggests that the interaction is driven by entropic rather than enthalpic forces. Additionally, we observed that the LPA/membrane binding exhibited a breakpoint at a ratio of 0.5, implying that the LPA molecules intercalate primarily into the outer leaflet of the membrane. However, there was no indication that the LPA solubilized the membranes, showing that it acts as a phospholipid rather than a detergent. These experiments clearly indicate an interaction of LPA with membranes that may have implications for its role as a regulatory molecule in cellular signaling pathways.

An analysis of the effects of altering directives in narrative therapy

By: Esther Rollhaus and Robin Freyberg

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Previous research has shown that narrative construction leads to emotional and cognitive advancements in mental functioning (Smyth, 1998). Like in successful psychotherapy, writing provides the forum for emotional expression and regulation. In fact, studies have shown that writing about traumatic events may be as beneficial as therapy in encouraging positive emotions, cognitions, and behaviors (Donnelly & Murray, 1991). Research demonstrates that the way individuals express themselves, usually dictated by the writing task, is highly significant in determining the therapeutic outcome (Kerner & Fitzpatrick, 2007). Since individuals who write about achievement themes when asked to free-write display higher measures of psychological adjustment (Freyberg, Freyberg, Barnhill, & Ferrando, 2008), the researchers examined the relationship between a high frequency of achievement themes in directed and non-directed written samples and measures of psychological functioning and psychiatric history. This research, however, did not yield expected results because of limitations in sample size. The study rules out the possibility of diagnosing and identifying individuals with psychiatric histories based on their motive imagery frequencies. Further research should examine whether individuals with psychiatric histories have other distinctive writing characteristics.

Detection of TRP-2 antibodies in the serum of TRP-2 immunized mice

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Melanoma is the deadliest form of skin cancer. If not diagnosed and treated at an early stage, melanoma cells can metastasize, traveling through the bloodstream, and attack vital organs. Once melanoma has metastasized, it is very difficult to treat using the traditional therapies such as radiation, chemotherapy, and surgery. Therefore, immunotherapy has become an interesting alternative approach for the treatment of this disease.

The Houghton laboratory focuses on immunotherapy as a means to treat melanoma. The basic idea of cancer immunotherapy is to stimulate the patient's own immune system to reject cancerous cells. This can be achieved, for example, by actively immunizing a patient with a cancer vaccine that elicits tumor-specific immune responses targeting tumor cells. Passive infusion of therapeutic monoclonal antibodies is also a method of treatment in immunotherapy. In this case, the monoclonal antibody binds to a specific antigen (Ag) expressed on the targeted tumor cell, and stimulates the recruitment of cells of the immune system to attack those cells.

Melanoma expresses various classes of tumor-associated Ags, including melanoma differentiation antigens (MDAs). MDAs are melanosomal proteins and represent good targets for melanoma immunotherapy as they are present in melanoma cells and melanocytes, but not in other tissues. Examples of MDAs include Pmel-17/gp100, MART-1/melan-A, TYRP-1/gp75, tyrosinase, and dopachrome tautomerase (DCT)/TRP-2. Avogadri and colleagues recently found that, among different MDAs, TRP-2 is a good target for an alphavirus-based melanoma vaccine. This vaccine has both prophylactic and therapeutic anti-tumor effects, through the activation of both TRP-2 specific T lymphocytes and antibodies.

The latter evidence prompted us to better investigate the role of TRP-2 specific antibodies in laboratory models of melanoma immunotherapy. In particular a more thorough characterization of the specificity and functionality of TRP-2 specific antibodies raised in vivo by active immunization is warranted.

To achieve that goal, the generation of a cell line over-expressing TRP-2 was needed. Indeed, disposing of a cell line overexpressing TRP-2 would allow for detection of antibodies that recognize this antigen, and therefore would represent an ideal tool to characterize TRP-2 specific humoral immune responses. To this end, we first tested two commercially available TRP-2 specific antibodies. Then we used the best antibody selected above to analyze different DNA plasmids encoding TRP-2 in transiently transfected cultured cells. Finally, we used the most promising DNA construct with optimal overexpression of the TRP-2 protein to analyze the sera of mice immunized with the alphavirus-based TRP-2 vaccine.

Two commercially available TRP-2 specific antibodies were tested by Western blot and immunohistochemistry using a murine melanoma cell line called B16, which is known to express TRP-2. As a negative control in these experiments we used several 'non-melanoma' cell lines, including the murine lymphoma cell line EL-4, which do not express TRP-2. Of the two antibodies, one was a polyclonal antibody raised in a rabbit, the other a monoclonal antibody raised in a mouse. In the conditions tested, the mouse monoclonal antibody showed no specificity, whereas the polyclonal antibody produced cleaner results by both WB and IHC. Indeed, WB done with the monoclonal antibody showed unspecific bands that were present also in the various negative controls used. By contrast, the polyclonal antibody detected distinct bands of approximately 110 Kda only in cells known to express TRP-2 and not in the negative control cells. Similarly, IHC analysis of tumor tissues showed a very high background signal in the negative control and in B16 tissues that were stained with the monoclonal antibody, mainly localizing with necrotic regions of the tumor, suggesting that the staining was not specific. Tissue sections stained with the polyclonal antibody, instead, showed minor background signal and a uniform strong staining patten in B16 tumors. These experiments indicated that the polyclonal antibody had a better specificity for TRP-2 in the conditions tested.

The anti-TRP-2 polyclonal antibody identified above was then used to detect the expression of TRP-2 in 293 cells transiently transfected with different DNA constructs encoding TRP-2. A DNA transfection involves inserting exogenous DNA, in the form of a DNA plasmid, into host cells to induce gene expression and protein synthesis. Several plasmids were screened by WB to determine the optimal conditions to transiently transfect 293 cells with any of the selected plasmids. This analysis showed that the pING DNA construct encoding mouse TRP-2 was expressed in 293 cells at higher levels than the other plasmids tested. We then used protein extracts from cells transfected with the pING TRP-2 plasmid to investigate if sera from mice previously immunized with an alphavirus-based TRP-2 vaccine could bind to the TRP-2 protein overexpressed in 293 cells. Results by WB showed that sera of TRP-2 immune mice indeed recognized a protein with a molecular weight comparable to that recognized by the commercial TRP-2 specific polyclonal antibody. Similar results were obtained by flow cytometry analysis, where the antigen is recognized by the specific antibody in its native form.

With these experiments we have identified a DNA construct encoding TRP-2 that is expressed at a high level in 293 cells upon transient transfection. In addition, we have shown that TRP-2 expressing 293 cells can be a valuable tool to detect TRP-2 specific antibodies in the sera of mice immunized with TRP-2. Interestingly we found that sera of TRP-2 immune mice recognized TRP-2

expressed by 293 cells in both the denatured and native conformation, suggesting that the humoral immune response induced by the alphavirus-based vaccine is of broad specificity, perhaps explaining its surprising antitumor effect. Experiments are now ongoing to further characterize humoral immune responses in these mice.

SUMO proteins may regulate motility and stress response of human sperm

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Background: About 10% of all men in the United States who are attempting to conceive suffer from infertility. In about 80% of these cases, the causes for infertility are unknown. New insights on regulation of spermatogenesis can shed light on infertility, and possibly identify potential targets for male contraception. Small Ubiquitin-like Modifiers or SUMO proteins play a vital role in different cellular events including the stress response during spermatogenesis but the role of sumoylation in human sperm has been uncharacterized. It is known that tobacco smoke can causes oxidative stress and immobilizes human spermatozoa but the exact mechanism of this process is unknown.

Objective: Our project focused on characterization of SUMO proteins in human sperm and explored the role of sumolaytion in tobacco-induced oxidative stress.

Methods: Localization studies were performed using immunofluorescent microscope. Tobacco smoke extract was prepared by collecting tobacco smoke in a hood and condensing it into a liquid medium. Sperm samples were then treated with different concentrations of the tobacco smoke extract (1%- 25%) followed by the analysis of sumoylation using Western Blot. Furthermore, immunoprecipitation using anti-SUMO antibody was followed by Mass Spectrometry identification of SUMO-interacting proteins.

Results: Immunofluorescent studies localized SUMO to the neck area of human sperm, a region which has been implicated in the regulation of sperm motility. Interestingly, similar localization pattern was also observed in mouse and fly sperm suggesting an evolutionally conserved role for SUMO in the neck sperm region. Western blot analysis revealed a decrease in sumolaytion even at low concentrations of tobacco, beginning at 1% (nicotine concentration found in the blood of light smokers). Several proteins implicated in sperm motility and other functions were identified as SUMO –interacting partners.

Conclusion: SUMO proteins may regulate important function in human sperm. The decrease in protein sumolaytion caused by tobacco smoke can inhibit the activity of the proteins responsible for the proper motility, since SUMO localizes to a structure responsible for sperm motility, thus potentially leading to male infertility and birth defects.

The issue of "faking good" on self report personality measures in personnel selection

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The issue of "faking good", or distorting to present oneself in the best light, has serious implications for self-report personality testing in the context of personnel selection. We reviewed scientific literature on "faking good" on these measures in personnel selection and suggest future research directions.

Initially, personality tests were administered to predict an applicant's future job behaviors, (i.e. criterion related validity). Recently, employers have begun to use these measures to improve employee fit and reduce turnover rates. Nonetheless, researchers still focus on demonstrating that personality tests can effectively predict job performance.

Numerous studies have shown that the overwhelming majority of test-takers in personnel selection situations can increase their scores on desirable traits and decrease their scores on undesirable traits. Many researchers argue that "faking good" actually predicts positive job performance, since presenting oneself in line with the expectations of others involves social intelligence and cognitive ability. Others argue that "faking good" lowers criterion related validity, an argument some disregard because criterion validity of workplace performance is low to begin with. It is generally agreed that "faking good" disadvantages applicants who have not dissimulated by impacting selection decisions.

The literature indicates the need for alternative personality measures in personnel selection to undercut applicant capacity to positively distort. Future research should develop methods that correct for "faking good" including revising existing inventories, creating new inventories, and utilizing alternative measures.

Determining the optimum proliferation and differentiation media for eventual culture of post-mitotic mobile neurons

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Every 41 minutes another person in the U.S. sustains a spinal cord injury. These injuries cause primary and secondary damage to spinal cord neurons and can result in paralysis or death. Current and past attempted methods of treatment involve injecting neural stem cells through lumbar puncture or injecting mature neurons directly onto injured tissue. The first method can be comprised by tumor growth due to excessive proliferation of injected cells; the second is technically challenging and can cause further damage in the spinal cord and to the transplanted cells. Injecting mature neurons through lumbar puncture is ineffective, as these cells cannot home in on the wound, as stem cells do. In order to achieve a more effective and safer method of treatment, this project attempted to culture neurons that were post-mitotic yet still mobile. Ideally, these new neurons could be injected through lumbar puncture and home in on the injury site without the danger of potentially cancerous proliferation.

The goal of this study was to determine the optimum proliferation and differentiation media for culture of post-mitotic mobile neurons. The experiment was conducted with GE6 cells, a neural stem cell line known to produce GABA-ergic neurons. The cells were thawed in DFB media with 10 ng of EGF and 10 ng of FGF and were given these two growth factors every other day. DFB is a supportive media that can be used for either proliferation or differentiation. To prepare the cells for differentiation, the cells were grown in DFB media that had either 1 ng EGF or 0 ng EGF. After 2 days the media was switched to DFB/NDM 1:1. NDM is a media that promotes differentiation. The cells underwent a one half media change every 2 days to gradually decrease the amount of DFB media present. The cells were then pulled and fixed at appropriate time points. Antibodies used to determine the maturity of the cells and the type of cell included Ki67, TuJ1, Nestin, DCX, Galc, GAD 65/67, and GFAP. The cells were then photographed at a Zeiss fluorescent microscope and manually counted.

The results of the study were that the presence of even low levels of EGF in proliferation media prolongs the state of proliferation, even after the media is changed and differentiation is expected to begin. Ki67 (which marks proliferating cells) levels were higher and TuJ1 (which marks neurons) levels were lower in 7 day differentiated cells that had experienced EGF than those that had not. This supports the theory that EGF inhibits differentiation and keeps stem cells immature. When stained with Nestin and DCX (another marker for neurons), however, the opposite trend appeared. A possible cause is the early appearance and subsequent down-regulation of DCX in the cells with 0 ng EGF,

which would result in a transient stain.

Future studies include replications of these experiments. Also needed is a repeat of the Nestin/DCX staining with cells at more varied ages; this would investigate the appearance and fading of DCX and provide implications for the above theory.

Rapid drug delivery wafers

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Rapid drug delivery wafers, produced in thin film form, are a method for drug delivery. The wafers are composed of a blend of film-forming polymers that are combined with gums, starches, surfactants, and various taste maskers. These films disintegrate quickly and directly into the oral cavity. This technology is particularly convenient when a rapid pharmaceutical action is required. Drugs that can be formulated in oral films include anti-migraines, anti-inflammatories, PDE-5 inhibitors, drugs treating motion sickness, nausea, anti-depressives, anxiolytics and hypnotics.

Oral films have many advantages over existing tablets and other immediate-release products. Since they release the drug in the oral cavity, their action potentially occurs in less than half an hour, if absorption occurs through the oral mucosa. This would allow the drug to directly enter the blood stream, avoiding the metabolic first-pass effect. Oral films are also particularly convenient for patients who cannot swallow pills. In addition, they can improve patient compliance due to their discrete packaging and adjustable taste. From a technical point of view, wafers are required to be strong enough to be manufactured on a commercial scale and aesthetically pleasing.

The stage at IntelGenx Corp. focused on the evaluation of the film forming properties of several gums suitable for pharmaceutical use. They were tested alone or in binary and ternary mixtures with different types of polymers. Different plasticizers were tested as well. The gums under study were xanthan gum, NaCMC, carrageenans, locust bean gum and guar gum. They were used alone or mixed with film forming polymers such as HPC, HPMC, PVP, PVA, and pregelatinized starches. This required the preparation of a blend in suitable solvents and its casting in a thin film. Upon drying, the films' physical properties were evaluated to determine elasticity, brittleness, strength, appearance and compatibility between the excipients and the active ingredients.

It was observed that even though some gums have good film forming properties, they are not as effective as cellulose derivatives and PVP. Indeed they tend to form thin films, due to their high viscosity and weight loss upon drying. This makes them more suitable for food than for pharmaceutical applications. Also, they are only soluble in aqueous solvents, which can be a limitation since most actives are soluble in organic solvents. Amongst the gums tested, NaCMC was the most versatile, forming elastic and strong films both alone and in combination with other polymers. The addition of plasticizers was intended to improve the flexibility of the films, but in most cases their use was not necessary since gums are endowed with a good flexibility.

Finally, we conclude that NaCMC is the only recommendable gums for pharmaceutical application, but its use has to be limited to water based systems.

Fluorinated solvent processing for organic optoelectronic applications

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In optoelectronics, organic small molecule and polymer semiconductors are routinely processed into multi-layer multi-material devices including LEDs, photovoltaics, and transistors. These organic materials are highly sensitive to oxygen, water, and solvents, which selectively shut down their semiconducting abilities. Fluorinated silanes and fluorinated semiconducting materials possess a unique characteristic in that some are soluble in fluorinated solvents. These fluorinated solvents, much like the fluorinated material Teflon, do not energetically favor interaction with materials that do not contain fluorine. As a result, it may be possible to incorporate these materials into devices via solution processing in a way that does not interact or harm already deposited non-fluorinated organic material. This non-interacting solvent would be considered orthogonal, and allow device fabrication processes that are currently difficult or impossible.

The goal of this study was to develop an air-free silanization process to coat surfaces with a fluorinated silane material for organic optoelectronic applications. Varied concentrations of perflouroctyltrieothooxisilane and perflourotrichlorosilane were prepared in the solvent fluorinert F-77, methoxyperfluorobutane, or perfluorohexane. Polydimethylsiloxane, aluminum (Al) on glass, and indium tin oxide surfaces were submerged in the prepared concentrations. A selection of the samples for each of the surfaces tested was either kept in an air free environment (pristine) or oxidized via exposure to UV Ozone prior to being exposed to the solutions.

Contact angle measurements dictate the surface interaction. Therefore, the contact angle measurements of the treated surfaces were taken to examine how well the silanes adhered onto the surfaces. Figure 1 shows a schematic of the angle at which the measurements were taken. Consequently, bigger contact angle indicates a higher degree of fluorination.

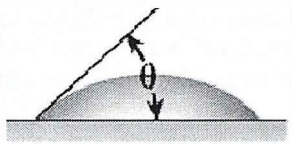
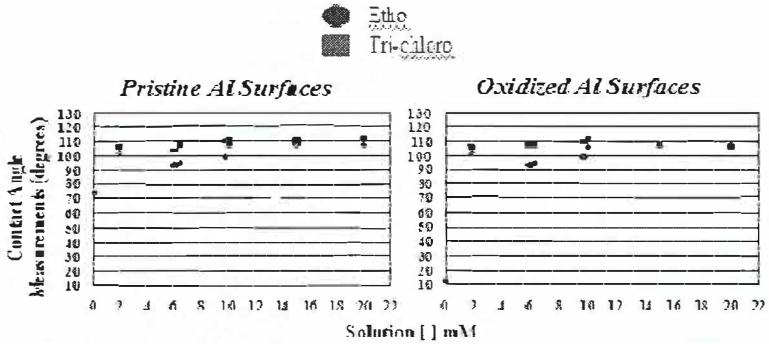


Figure 1. Sample contact angle measured.

The graph below plots the solution concentration in which the pristine and oxidized Al substrates were exposed to as a function of the contact angle measurement. (Controls plotted at point zero)



Our experiment showed the following: A) although the silanes are adhering onto the surfaces very well, oxidized surfaces had generally slightly better performance. B) The developed fluorinated system achieves very similar levels of fluorination regardless of the surface treated. C) Fluorination of the surfaces had very little dependence on concentration. D) Although all three solvents tested performed very similarly, perfluorohexane's performance seemed to exceed that of the others tried.

Study was then conducted on the addition of heat to treated surfaces to examine its affect on the self-assembly of silanes. After treatment, pristine substrates seemed to experience greater difference in terms of contact angle measurements than that of the oxidized substrates.

All surfaces were submerged in the solutions at different time intervals to analyze the effect of time on silane adhesion to a selected surface. Results show that after five minutes the contact angle measurement of a surface remains relatively constant. This indicates that complete fluorination takes place in a short time frame.

The contact angle measurements of water on extremely hydrophobic surfaces are as high as ~120°. The fact that we were able to experimentally obtain contact angle measurements in very close proximity to that (in the 113° range) shows that our system achieved almost complete fluorination. The fluorinated silanes are definitely adhering to the surfaces well and our fluorination system seems to be efficient, effective, and most importantly orthogonal.

Since our system is orthogonal, further studies include: A) The fabrication of a traditional organic light-emitting device with both a conventional (anode down) and inverted (cathode down) architecture. The order of solution-processed assembly should have no effect on the function of the device. B) The study of the semiconducting properties that our developed system exhibits by fabricating a transistor with a fluorinated organic. C) The examination of the potential of this system in selective coating via inkjet would be of great benefit in various applications.

Pomegranate juice extract as an inducer of oxidative stress to carcinoma HSC-2 cells isolated from tissues of the human oral cavity

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There is much scientific literature, both from studies with laboratory animal models and of human epidemiological data, linking the consumption of plant based foods to a reduction in cancer risk. This chemoprevention effect is associated with high levels of numerous nonnutritive phytochemicals, termed nutraceuticals, in these plant based foods. Principal amongst these phytochemicals are the polyphenols, characterized by multiple phenol rings bearing several hydroxyl groups, whose anticarcinogenic effects have been related to their antioxidant properties. Yet, there are a growing number of studies, principally conducted *in vitro* with cells in culture, indicating that plant polyphenols also exhibit prooxidant properties, which induce apoptosis preferentially in cancer cells, as they have a compromised antioxidant defense system as compared to normal cells.

Polyphenolic compounds, the largest class of phytochemicals in pomegranate juice, have an exceptionally high antioxidant activity; their prooxidant activity has been little studied. This research evaluated the comparative sensitivity of HSC-2 carcinoma cells and of normal gingival HF-1 fibroblasts, derived from the human oral cavity, to a pomegranate juice extract (PJE). As seen in Figure 1, the normal fibroblasts were less sensitive than the carcinoma cells to a 24-hr exposure to PJE, as quantified with the neutral red assay.

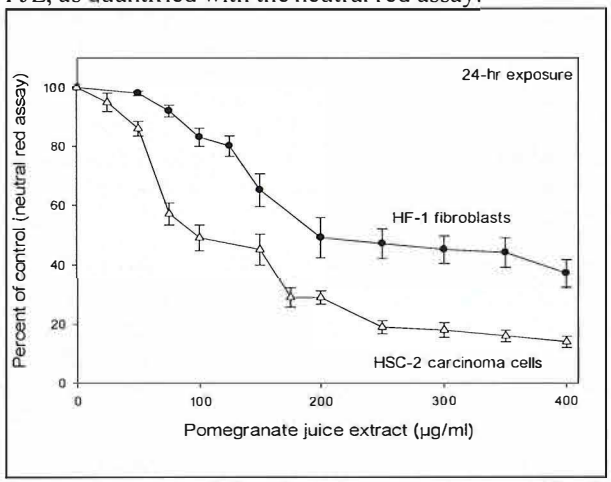

Figure 1. Comparative cytotoxicity of carcinoma and normal fibroblasts to PJE.

Prior studies in this laboratory showed that PJE exhibited prooxidant activity in cell culture medium (i.e., DMEM). These studies were continued and prooxidant activity, as quantified by the FOX assay, of the generation of hydrogen peroxide in PJE-amended phosphate buffered saline (PBS) was determined. Hydrogen peroxide generation was noted to be pH dependent, with greatest amounts in PBS at pH 7.4 and lesser amounts at pH 6.4 and much less at pH 5.4.

To evaluate whether hydrogen peroxide was implicated in the toxicity of PJE, cells were exposed to PJE in the absence and presence of scavengers of hydrogen peroxide, including pyruvate, divalent cobalt, and catalase (Figure 2).

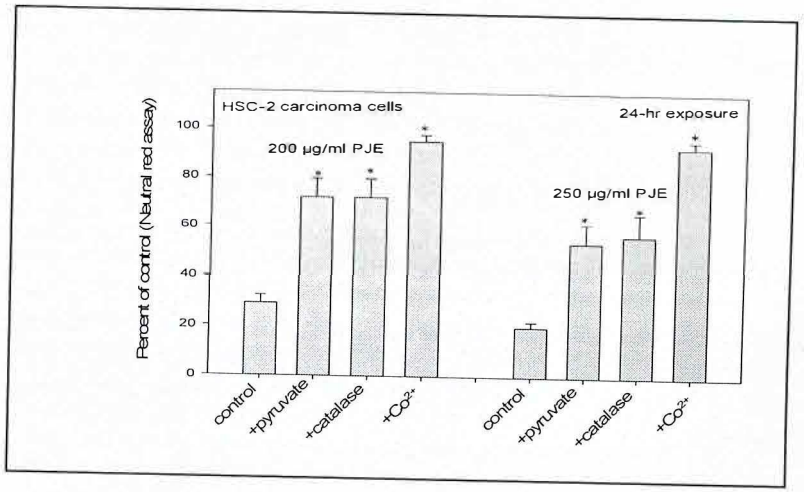

Figure 2. Reductions in the toxicity of PJE to HSC-2 cells upon coexposures in the presence of various scavengers of hydrogen peroxide.

Glutathione (GSH), a tripeptide, is a ubiquitous nonprotein, with the major role to maintain the intracellular redox balance and to eliminate the toxicity of reactive oxygen species, including of hydrogen peroxide. The lessening of the intracellular GSH to a critical level is a prelude to subsequent sensitivity to oxidative stress. Figure 3 shows that a 20 minute pretreatment with the GSH depleter, chlorodinitrobenzne (CDNB), potentiated the cytotoxicity of PJE.

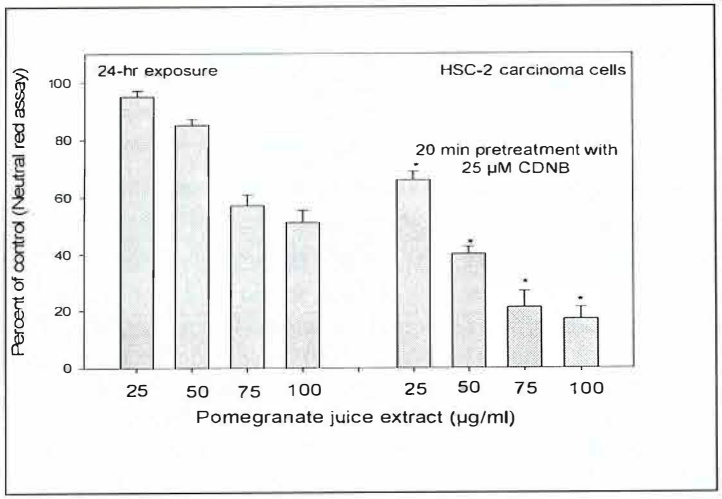

Figure 3. Comparative sensitivity of HSC-2 cells to PJE in the absence and presence of prior treatment with CDNB.

Reduction of the cytotoxicity of PJE in the presence of scavengers of hydrogen peroxide and its potentiation by pretreatment with a depleter of GSH, clearly indicated that the cytotoxicity of PJE was due, at least in part, to its generation of hydrogen peroxide.

DFT calculations of DNA-modified carbon nanotube field effect transistors

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DNA-protein binding is a fundamental feature of most cellular processes. Abnormalities in these interactions are often a cause—and an early indication—of a disease state. Detection of these aberrations would allow for early discovery and treatment of disease. Our overall objective is to create DNA-modified carbon nanotube field effect transistors (CNT FETs), which will serve as an economical and non-invasive means of monitoring DNA-protein interactions.

We have experimentally demonstrated the modification of carbon nanotubes with DNA via a pyrene moiety. Theory is necessary to facilitate and understand this experimental process; our objective therefore includes the construction of electronic pictures for the modified FETs. Previous work demonstrated that when pyrene or a pyrene derivative is adsorbed non-covalently onto a CNT, the CNT's electronic structure remains unaffected. The Nuckolls Group at Columbia University, however, has found that pyrene-modified DNA, significantly alters the CNT's conductivity. Our aim in creating an electronic picture is to explain why DNA has this effect on the CNT FETs.

Density Functional Theory (DFT) calculations with an LDA functional, computed with Jaguar and VASP, constitute our primary theoretical method. DFT calculations provide a molecular orbital picture of the CNT/pyrene complex, as well as information on the complex's structure, symmetry, HOMO and LUMO, and other related features. We have begun with smaller calculations on pyrene, circumcoronene, and graphene nanoribbons (GNRs) as a way to work up toward the more complicated nanotubes, DNA-modified pyrene derivatives, and CNT/pyrene complexes. Since GNRs and CNTs share similar electronic characteristics, we predict that the two should yield similar results in our pyrene-bound calculations.

Our preliminary results have yielded energy information for individual compounds, as well as their original and optimized geometrical structures. Altering these Cartesian coordinates should allow us to overlay two compounds as a non-covalently bound complex. Further studies involve overlaying pyrene derivatives and biomolecule-modified pyrene derviatives with graphene supercells, GNRs, and CNTs. Our ultimate aim is to explain why and how DNA affects the conductivity of CNTs and to use that information to monitor DNA-CNT conductivity for detection of healthy and cancerous biomarkers.

Time analysis of mTOR phosphorylation of the estrogen receptor

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The 40S ribosomal S6KinaseI acts downstream of the mammalian target of rapamycin (mTOR) pathway and regulates cell growth by phosphorylating sites on the Estrogen Receptor Alpha. S6K1 and ERα are frequently co-overexpressed in breast cancer cells. Phosphorylation of the estrogen receptor has been associated with endocrine resistance, causing the estrogen receptor to upregulate transcription of genes associated with proliferation. Serine 118 (ser118), a site on the Estrogen Receptor, has been seen to be phosphorylated by mapKinase. Based on our research, the mammalian target of rapamycin (mTOR) may also phosphorylate ser118. Previous literature deems the phosphorylation of ser118 as fast and transient. We sought to evaluate mTOR phosphorylation of ser118 using time course experiments. MCF7 cells were serum starved overnight and were acutely stimulated with insulin, with or without rapamycin, to activate mTOR at 0, 5, 15, 30, 60, and 90 minutes. Phosphorylation levels and mTOR activity were evaluated through Western Blotting. Kinase assays were performed to determine the interaction between mTOR and the estrogen receptor. mTOR activity and phosphorylation levels were seen to increase from 0 to 90 minutes when cells were stimulated with insulin. No changes in phosphorylation levels from 0 to 90 minutes were seen in cells treated with insulin + rapamycin. Further steps include creating alternate conditions to assess other phosphorylation pathways, which may substitute for mTOR.

Trying to remember: A literature review about improving eye-witness testimony

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In many legal situations eye-witnesses are asked to report from their memory about an event that they witnessed or about a face that they saw (Shaw, 1996). However, even though eye-witness testimony tends to be the most compelling evidence in an investigation and in trials, it is also the most unreliable (Wells, Memon, & Penrod, 2006). A main concern for lawyers and judges is how to procure accurate and complete testimony (Crombag, Merckelbach, & Elffers, 2001). Legal authorities and legal systems are constantly searching for ways to improve eye-witness testimony because unintentionally false eye-witness testimony has been responsible for many injustices (Porter, Campbell, Woodworth, & Birt, 2003). This literature review presents research which shows that through focusing on the cognitive and emotional elements of human memory an interviewer can improve eye-witness testimony. In order to improve eye-witness testimony, the interviewer should be specially trained based on psychological research. One of the specific areas that he should receive training is in the procedures of Cognitive Interviewing in place of standard interviewing (Campos & Alonso-Quecuty, 1998). Additionally, individualizing interviews, doing a proper psychologically based line-up, and the importance of securing accurate and complete eye-witness testimony will be discussed.

The effects of age on object memory and spatial abilities in women

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The goal of the present study was to determine if aged women demonstrate cognitive decline on tests of object memory and spatial ability compared to young women. Forty-three young undergraduate women (ages 19-24) were compared to twenty-nine aged independent living women (ages 71-90). An object array task was used to measure object memory and a mental rotation test was used to measure spatial ability. The object array task required participants to study black and white drawn objects and then to circle objects that they believed had moved positions or were novel to the array. The mental rotation test required participants to match objects that were rotated into different positions. Preliminary results suggest that aged women perform significantly worse than young women on all object array conditions. Also, aged women perform significantly worse on the mental rotation test relative to young women. Therefore, our results thus far suggest that there is an age-related decline in both object memory and spatial ability.

Amphiphile-lipid complexes: thermostability of a putative drug delivery system

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Insolubility and toxicity of many current chemotherapy drugs make their use problematic. Thus, increasing solubility and reducing toxicity of the delivery systems is an area of intense current research with respect to the design of successful cancer treatment regimens. A class of amphipathic molecules, designed to be non-toxic and which self-aggregate to form micelles at low critical micelle concentrations (CMC), form stable complexes when combined with a 1:1 mixture of the two phospholipids, 1,2-dioleoyl-3-trimethylammonium-propane (DOTAP), and 1,2dioleoyl-sn-glycero-3-phosphoethanolamine (DOPE). AM-lipid complexes with different mass ratios were prepared by two methods: post addition (PA), and co-evaporation (CE). The thermostability of these AM-lipid complexes was tested using isothermal titration calorimetry (ITC). In this series of experiments, complexes comprised of various AM-lipid weight ratios were titrated into the calorimeter cell containing buffer. Enthalpy changes associated with the dilution of the complexes were recorded over the course of each titration (Figure 1). The results indicate that complexes produced by the PA method, comprised of 10/1 and 5/1 AM-lipid ratios, were the most stable based on the lower amount of heat evolved. Also, titration of complexes prepared by the CE method evolved less heat than complexes prepared by the PA method at all ratios examined, suggesting that the CE method forms more stable complexes in which interactions between AM and lipid components are stronger.

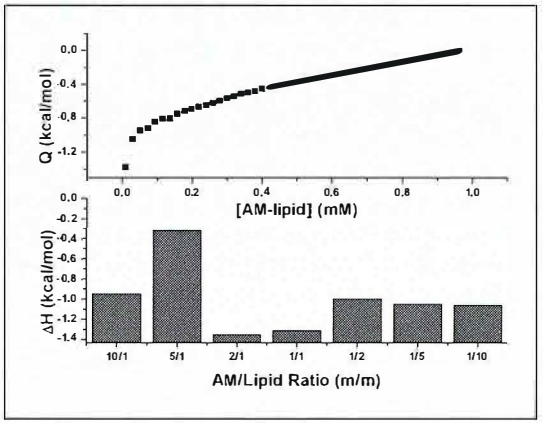

Figure 3. Top: Integrated heat signal from titration of 6 mM 10/1 AM/lipid complex prepared using the PA method. Bottom: Enthalpy changes for titration of various AM-lipid complexes into buffer.

Epigenomic regulation of the PIG-S gene in prostate cancer

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DNA methylation is an epigenomic phenomenon in which a methyl group is added to the 5 position of a cytosine pyrimidine ring in a sequence of DNA by way of either maintenance or de novo methyltransferases. The methylated DNA molecule becomes physically condensed, resulting in gene silencing and a subsequent loss of protein expression within the affected cell. Many membrane proteins are anchored to the plasma membrane via glycosylphosphatidylinositol (GPI). The GPI transamidase (GPIT) complex mediates GPI anchoring in the ER, by replacing a protein's C-terminal GPI attachment signal peptide with a pre-assembled GPI. The GPIT is a complex containing five subunits; PIG-T, GPAA1, GPI8, PIG-S and PIG-U. Each subunit is critical for maintaining the complex and is essential for the transfer of GPI to proteins. Recent studies have discovered that in many cancer types, but most clearly seen in prostate cancers, there is a progressive loss of the PIG-S polypeptide. Research has been conducted at the protein, RNA, and genomic levels to determine the cause of this loss with no conclusive results.

This study aimed to observe the relative methylation levels of the PIG-S gene in early- and late- stage prostate cancers, respectively, and determine whether or not the loss of the PIG-S polypeptide can be attributed to epigenomic gene silencing. If our hypothesis was correct, the late-stage cancer samples would show a markedly higher amount of methylation than the early-stage samples. DNA was extracted from four cancer cells lines: LnCap and 22Rv1, early stage prostate carcinomas; and PC3 and DU145, late-stage prostate carcinomas. The extracted DNA was bisulfite converted and a bisulfite sequencing PCR was run to amplify the fragment of interest. A 1.5% agarose gel was used to determine if amplification was achieved. The bands were then extracted, purified, and sent for sequencing to determine their methylation patterns. Our results showed a low level of DNA methylation across all four samples, thus ruling out epigenomic silencing in the region that was amplified, as the cause for the loss of the PIG-S subunit in cancer cells lines. Future studies will re-examine other areas of the promoter region of the PIG-S gene, as well as the genes of the other four GPI transamidase subunits, for epigenomic regulation; more extensive studies will also be conducted at the RNA and microRNA levels.

Cited3 promotes differentiation of oxidative muscle fibers

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In vertebrates, muscle development occurs through the sequential segmentation of mesodermal tissue into repetitive structures called somites. Muscle formation and differentiation in the somites is controlled by various signaling pathways. Recent spatiotemporal microarray studies have identified novel, uncharacterized transcription factors which might be involved in muscle differentiation and/or fiber-type specification. Cited3 is one such novel gene encoding a transcriptional cofactor. We hypothesize that Cited3, which is expressed in the oxidative fiber precursors of zebrafish embryos, promotes the development of oxidative fibers.

In this study, Cited3 expression was knocked down in zebrafish embryos by injecting morpholino oligonucleotides that block the translation of Cited3. The phenotypic effects on morphology and muscle fiber formation of these morphants were investigated at 30hpf. *In situ* hybridizations for various muscle-specific genes were also performed on wild type and Cited3 morphant embryos to determine whether such genes are under Cited3 regulation.

Reduction in Cited3 expression results in morphological abnormalities such as an edema in the yolk sac and a tail curvature. Slow fiber-specific immunostaining shows a reduction in slow fiber myogenesis in the trunk region of Cited3 morphants. The *in situ* results demonstrate that znf238 and stnnc are unaffected by the loss of Cited3 whereas prox1 and α-actinin expression are reduced in Cited3 morphants. Based on these findings, we conclude that Cited3 may be involved in myofibrillogenesis in oxidative/slow-twitch muscle fibers.

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The "Warrior" Gene Exemplified in Esau

(reprinted from: *Derech HaTeva, a Journal of Torah and Science*, 14:29-32 (2010)) by Leora Perlow

There is a Kabbalistic concept that the reason for Abraham to sire both Isaac and Ishmael and for Isaac to sire both Esau and Jacob was to filter the negative traits from the nation of Israel. The positive traits were harnessed within Isaac and Jacob, while directing the negative traits within Ishmael and Esau. A particularly villainous character was Esau, who exhibited aggressive behavior, uncontrolled anger, and risk-taking, as displayed by his molesting women and committing murder.

With recent advances in science, researchers' knowledge about the human genome is increasing rapidly. These advances have spurred a new trend within western society: the tendency to blame an individual's actions on his biological, biochemical, and genetic makeup, rather than hold him responsible for his actions. Recent studies have proven that the defective gene for the enzyme, monoamine oxidase A (MAO-A), when combined with a high level of testosterone, triggers aggressive behavior; this defective gene was dubbed the "warrior" gene. When defective, this gene leads an individual to have much difficulty controlling emotions and stress, resulting in a high propensity toward aggressive behavior, risk-taking, fighting, rape, and murder. An examination of Esau's life and his warrior-like actions reveals that there is the possibility that he had an MAO-A deficiency. If so, this raises an even more difficult question as to whether Esau should be held responsible for his crimes.

When functioning properly, the MAO-A gene is responsible for breaking down neurotransmitters in synapses of the brain. A study performed in 2006 on New Zealand's Maori, an aggressive population known for fighting, gambling, and addictions, showed that many of them carried a gene known to induce a similar aggressiveness in animals. Researchers theorized that this gene noted in laboratory animals was what led to the particular behavior within the Maori

population. At the National Institute of Mental Health, in Bethesda, Maryland, studies were performed comparing the responses of normal individuals and individuals with the "warrior" gene when shown frightening, emotion-inducing images such as terrified faces. Only individuals with the "warrior" gene expressed hyperactivity in their amygdalae, the area of the brain which responds to fear. The researchers hypothesized that those expressing this defective gene were unable to control their emotions, causing them to behave rashly more often. Additionally, a study performed both in Bethesda and Sweden showed that high levels of testosterone coupled with low MAO-A activity leads to anti-social behavior [1].

In 1993, a human, six generational pedigree was compiled of a European family, which included many males displaying violent or aggressive behavior. The last two generations include seven males exemplifying this behavior. Five of these seven were tested for the MAO-A mutation and all five were found to express this mutant. Eleven males in these two generations were not known for this type of behavior and of them, four were tested; all four had the normal functioning MAO-A gene. Such data provided strong scientific evidence of the behavioral effects of the "warrior" gene [2].

There is no doubt that Esau had a propensity toward fighting. Even while he was still a fetus, Esau argued with Jacob over who should exit the womb to be the firstborn. In the end, Esau won because he threatened, "If you do not let me go out first, I will kill my mother and leave through the stomach wall." Jacob then replied, "This wicked one is a murderer from his inception" and allowed Esau to exit first (Midrash HaGadol, Bereishit 25:22) [3]. According to Midrash Tanchuma (Ki Tetzei 4), when Esau did leave Rebecca's womb, he caused such damage that she was not able to bear the twelve tribes. In addition, Shocher Tov (120:7) noted that Esau hated peace [3]. Such an inclination toward fighting is characteristic of MAO-A deficiency.

Esau was also notorious for risk-taking, best displayed in the selling of his birthright. As noted in the Midrash Shir Hashirim (18), "Just as *Hashem's* name rested on Jacob, so too it rested on Esau. Esau was worthy of producing kings and Jacob of priests. But all these gifts were taken away from Esau when he sold his birthright to Jacob." In the text of the Torah, Esau asks aloud, "What use to me is a birthright?" Just as the Maori are prone to gambling, Esau is always found taking risks. Explains Tanna d'Bei Eliyahu Zuta (19), when Esau sold the birthright to Jacob, the two brothers agreed that Esau would take his portion in this world and Jacob would take his portion in the World to Come [3].

Because G-d did not want Abraham to witness the wickedness of his grandson's degenerative actions, such as rape and murder, He shortened Abraham's life by five years. The Talmud Bava Basra (16b) explains that on the day of Abraham's funeral, Esau raped an engaged woman, committed murder, denied G-d, denied resurrection of the dead, and traded his birthright. Esau was known to have raped several women in his lifetime and there is Talmudic discussion about how

many *mamzerim* came from him. In addition, Esau murdered Nimrod, to take his garments for himself (Breishit Rabba 65:16). Furthermore, Esau intended to kill Jacob after his father, Isaac, died in order to inherit his brother's lot (Shocher Tov 2:4) [3]. Such aggressiveness and uncontrolled anger are symptomatic of a mutated MAO-A gene.

Finally, Esau's "warrior" gene is possibly best expressed when he encountered Jacob on the battlefield. Esau arrived on the scene with four hundred men, each an army general (Breishit Rabba 75:12). Esau still harbored his anger against Jacob from decades earlier and was willing to risk his life to battle against Jacob. His full intentions were to murder Jacob [3]. Esau's readiness for war displayed another characteristic of the "warrior" gene within him.

Yet, if Esau expressed an MAO-A deficiency, a burning question arises: should he be held accountable for his actions? After all, he was only playing with the cards he was dealt, expressing the traits that G-d Himself had given him. According to Rabbi Akiva Tatz [4], the Westernized mindset would answer that due to Esau's genetic, biochemical mutation, he should not be punished for his actions. Esau was subject to the inherent forces which pulled him to the direction of wickedness. Thus, one cannot blame Esau for his deeds.

However, the Jewish approach disagrees. Explains Rabbi Tatz, there is a concept developed by Rav Eliyahu Dessler, that each individual has a *nekudat habechira*, a point of free will. It is in this area that one is challenged and must make decisions. Although people are not responsible for the location of their *nekudat habechira,* they are accountable for trying to overcome the challenges. G-d is not asking, "Why is your point of free will at that particular level?" Rather, He asks, "How did you cope with the tests you were given? Did you raise your *nekudat habechira* as you struggled to overcome difficulties?" [4]. Rav Natan Slifkin, in an essay on Parshat Yayeshev, stated. "It is in *Hashem's* hands alone to determine what we have. But it is in our hands alone to determine what we are." [5]

According to Talmud Sotah 13a [3], Esau died in protest of Jacob's burial in the Cave of Machpela when Chushim--the deaf son of Dan--struck him with a club, decapitating him. Esau's head rolled into the Cave, landing at Jacob's feet. That is where it remained. Wrote Rav Aharon Kotler: Esau, who learned Torah from our forefathers Abraham and Isaac, was meritorious of having his head be buried in the Cave of Machpela. Yet, since he never took this Torah to heart, since he did not use this Torah to guide his actions, only his head could be buried in the Cave [6]. Judaism holds Esau responsible for his short-temper, risk-taking, rape, murder, and overall wickedness throughout his lifetime. Indeed, he was given a difficult lot, possibly possessing the mutated "warrior" gene, but he did not live up to his potential. He did not strive to overcome this challenge. Rather, he let it dictate his actions and his life.

May we all have the strength to overcome the challenge of our *nekudat habechira*, despite whatever biochemical, genetic lots we have been given. With G-d's help, this will hasten the coming of *Mashiach, Bimheira b'yameinu*, Amen.

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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 Richard Weiss serves as the faculty adviser.

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The Ethical Dilemma Regarding Male Circumcision

(reprinted from: Science and Ethics: A Joint Perspective, 5:21-36, 2010)
by Shira Lichtman

The issues regarding male circumcision have multiple sides. To help understand these issues we will begin with a fictional story. Bobby was born to Jack and Jill twenty-one years ago. Today Bobby is suing his parents for circumcising him at birth, and for disregarding his rights to his own body. Bobby's lawyers suggest that from the moment he was born it should have been within his rights to execute decisions about his own body, regardless of the fact that he was incapable of making such decisions at the time. In addition, there was no medical necessity requiring Bobby's parents to choose the irreversible circumcision procedure on Bobby's behalf. However, Bobby's parents argue that, while there were no apparent or immediate medical indications, it was in Bobby's best interest to get a circumcision due to its potential health benefits as well as being a fundamental part of their Jewish faith.

Two perspectives can be viewed from this situation. One is the perspective of the secular medical world and, the second is that of the Jewish Law, the *Halachik* world. To understand this topic issues such as beneficence, medical indications and patient preferences will be explained. From a *Torah* (Biblical) standpoint we must understand the source and meaning of this custom as it is a cornerstone of our faith.

To start we will analyze the idea of beneficence in this case. Many studies have been done to show the health benefits of circumcision. One idea is that circumcision lowers one's chance of contracting HIV. Randomized clinical trials show that male circumcision reduces the incidence of HIV and herpes simplex virus type 2 (HSV-2) infections, and symptomatic genital ulcer disease (GUD). Gray et al assessed the role of GUD and HSV-2 in the protection against HIV afforded by male circumcision. They found that circumcision reduced GUD irrespective of HSV-2 status, however this reduction only rendered a modest protection against HIV acquisition[i].

Other studies have shown that due to the protection circumcision provides against contracting HIV, the practice of circumcision has been adopted widely in countries where HIV prevalence is high[ii]. Plank et al found that the population had a positive view of circumcision due to its protection against HIV. In their study, Plank et al administered questionnaires to mothers in Botswana and found that 92% of the mothers were willing to circumcise their sons if the procedure was available to them, primarily to prevent HIV infection[iii].

Another reason that parents choose to have their sons circumcised is because of phimosis. Phimosis is the narrowing of the preputial orifice, leading to an inability to retract the foreskin, or prepuce, over the glans penis. Severe phimosis may cause pain, urinary retention, urinary tract infections, localized skin infections, and calculi. Later in life this may also be associated with sexual dysfunction and squamous cell carcinoma. Circumcision is a standard treatment option for phimosis, although there is increasing evidence that topical steroids are also effective[iv].

Much research has been done to analyze a correlation between circumcised males and other sexually transmitted infections (STIs). One such study was conducted to assess the relationship between circumcision and syphilis, gonorrhea, chlamydial infection, genital herpes, nongonococcal urethritis, and exophytic genital warts. A cross-sectional study of 2776 heterosexual men attending an STI clinic in 1988 was used to investigate the relationship between circumcision and STIs. Men with specific STIs were compared to men who were not infected, and the data was adjusted for age, race, and residence location, other STIs, and number of sexual partners. The results showed that uncircumcised men were more likely than circumcised men to have syphilis and gonorrhea, and were less likely to contract visible warts[v].

Though it seems that circumcision may provide protection against certain health risks, especially STIs, there are complications involved in the procedure itself. Ahmed et al studied the complications of traditional male circumcision in 48 boys ages ranging from 3 days to 7 years of age, seen between January 1981 and December 1995. Hemorrhage, the most common complication, was seen in twenty five (52%) males and infection was seen in ten (21%) males; one child required castration. Some other complications observed included meatal stenosis and urethro-cutaneous fistula. Sixty-four per cent of those with hemorrhage were neonates and their hemoglobin levels ranged between 6 and 15 g/dl (normal hemoglobin for newborns: 17-22 gm/dl). Three males required blood transfusion, seven needed ligation of bleeding vessels and two required both. Overall, 21 patients (43%) required surgery with the average duration of hospital stay ranging from 2-8 days. Most complications were seen between 1991 and 1995 when surgical fees had been introduced and the number of boys circumcised in the hospital decreased[vi].

Wiswell et al analyzed the records of 136,086 males born in US Army hospitals from 1980 to 1985 and reviewed them for indexed complications related to circumcision status during the first month of life. For 100,157 circumcised males, there were 193 complications (0.19%). These included 62 local infections, eight cases of bacteremia, 83 incidences of hemorrhage (31 requiring ligature and three requiring transfusion), 25 instances of surgical trauma, and 20 urinary tract infections. There were no deaths or reported losses of the glans or entire penis. By contrast, the complications in the 35,929 uncircumcised infants were all related to urinary tract infections. Of the 88 males with such infections (0.24%), 32 had concomitant bacteremia, three had meningitis, two had renal failure, and two died. The frequencies of urinary tract infection and bacteremia were significantly higher in the uncircumcised males. Wiswell et al concluded that serious complications from routine prepuce removal are rare and relatively minor, and therefore circumcision may be beneficial in reducing the occurrence of urinary tract infections. Though some complications seem to exist as a result from circumcision, Wiswell et al believes that the benefits of the procedure may outweigh the risks involved[vii].

But what of the rights of the infant? Can a parent make such decisions for their child if no serious medical indication, such as phimosis, exists? What about the fact that the parent may be forcing religious ideals onto their child?

It has been established that an infant has no decision making capacity. Decision making capacity is defined by the Stanford Encyclopedia of Philosophy "as the ability of health care subjects to make their own health care decisions"[viii]. Because an infant cannot understand or speak s/he cannot give informed consent nor can s/he make decisions about what happens to his or her body. It has also been established that in such situations which require decision about a child's welfare, the parents are responsible and are legally allowed to make a decision

in their child's place[ix].

However, these issues are under constant debate in the medical ethics community. In another case the Delaware Supreme Court permitted parents to refuse treatment for their child suffering from Burkett's Lymphoma. Because of the low survival rate of Burkett's Lymphoma due to is rareness and aggressiveness, and the adverse effects of chemotherapy, the parents of this child refused treatment. The court ruled that in such a case the parents can make a decision based on substituted judgment and their view of the quality of life for their child who has no decisional making capacity. The believed that because the treatment would not necessarily cure their child, and instead it would cause severe discomfort, pursuing treatment would reduce their child's quality of life because it would make him uncomfortable, sick, and unhappy[x]. Diekema explains this idea of the "best interest principle" versus the "harm principle". He explains that when a parent refuses a treatment the intervention of the courts should depend on the "harm principle", meaning whether the parent's decision would create harm, not whether it would be in his or her best interest[xi].

Bobby, on the other hand, had no immediate medical indication for a circumcision; he was not suffering from any illness that required such a procedure to take place. In truth there is no medical indication for a circumcision in the newborn[xii]. This procedure therefore seemed 'elective', he believed his parents were not legally allowed to choose for such an irreversible procedure to be done. He also believed that his quality of life was diminished because of his circumcision, meaning that the procedure caused him to have less sexual pleasure. In his opinion, his parents may have wanted to prevent physical 'harm', but instead created a physiological-psychological issue.

This idea that removal of this part of the male anatomy reduces sexual pleasure and causes other trauma is discussed. An article in the Journal of Health Psychology[xiii] explains: "Some studies link involuntary male circumcision with a range of negative emotions and even post-traumatic stress disorder (PTSD). Some circumcised men have described their current emotions in the language of violation, torture, mutilation and sexual assault." Fink *et al* disagree in the Journal of Urology. They found in their study that overall, 62% of men were satisfied with having been circumcised. They concluded that "prospective studies are needed to better understand the relationship between circumcision and sexual function"[xiv].

"Circumcision is one of the most ancient of surgical operations and has been performed more than any other operation, in the past and today", one article from the Archives of Pediatric and Adolescent Medicine explains[15]. It is performed for both religious reasons and for medical indications as listed above. Different religions have different opinions in accordance with this practice. Circumcision was also frequently performed among the ancient Egyptians, as the earliest mummies were found to be circumcised. Columbus noted that many

of the Indian tribes in America also practiced circumcision. In today's day and age, the Jewish people practice circumcision as a sign of observance; it is performed eight days after the birth of a Jewish male. For Muslims the circumcision is performed between the age of 4 and 13 years. This article also cited more research has shown that among many primitive tribes in Africa and Australia, circumcision is practiced, again with religious significance. But does all of this mean that children of these religions have no rights to their own bodies? How far does the law allow for parents to force their religious beliefs on their children?

Jonsen *et al* cites an interesting case. An 11-year-old girl is brought to the Emergency Department after an automobile accident. She is unconscious, with shallow, gasping respiration and circumoral cyanosis. She suffers from severe chest contusions, and is hypotensive and tachycardic. Upon receiving the X-ray results the doctors conclude that she has an intra-thoracic hemorrhage. It is obvious that she will need a chest tube and surgery to repair the damage done to her lungs and other organs damaged in the accident. Her parents interrupt her transportation to the operating room to declare that she must have no blood transfusions because they are Jehovah's witnesses and it is against their religion to do so[xv].

Freedom of religion is highly valued in our country's constitution. Yet in the words of the Supreme Court in Prince v. Massachusetts, "Parents may be free to become martyrs themselves, but it does not follow that they are free…to make martyrs of their children"[xvi]. Therefore it seems unethical to let this child die because of the religious views of her parents. It is clear that parents can make certain medical decision for their children, such as choosing whether to vaccinate them, but they do not have the authority to impose their religious views on their children especially if it may lead to fatality.

Other regulations concerning decisions made for infants are under the Baby Doe Regulations. One such regulation states that physicians and hospitals should be prepared to bring any case involving "medical interventions of clear efficacy that can prevent, ameliorate, or even cure serious disease, incapacity or loss of life interventions that will clearly result in prevention of future handicaps or disability for the child before the Child Protective Agency and to the courts." When such a case is determined it is the subjective interpretation of "handicaps" or "disability" for the child that becomes questionable[xvii]. Bobby could argue that the risk for him to become ill from either an STD or from a urinary tract infection is relatively low, therefore circumcision was not necessary to prevent a "future handicap", yet limited sexual pleasure could and did cause a handicap. Others may disagree and state that the proven efficacy of the health protection of circumcision is advantageous and since circumcision is non-life threatening, there is no reason to disallow circumcision.

One such article echoes these ideas. Diekema proclaims, "Parents should be permitted to make decisions about circumcision on behalf of their children." In addition, this author states, "to make a case for prohibition, medical harms would have to be of such likelihood and magnitude that no reasonable potential benefit (social, religious, cultural, or medical) could justify doing it to a child." Diekema includes the following medical principles. First, informed permission from parents is essential, and must include a balanced discussion of potential harms and benefits of the procedure to the child. The consent of both parents should be required when the procedure is not medically necessary, and the procedure should not be performed if one parent does not give consent. Second, circumcision on a child should not be performed on older children if there is a lack of "assent" or "less than enthusiastic assent" (unless medically indicated). Third, circumcision should be performed competently and safely by adequately trained providers. Fourth, adequate analgesi (anesthesia) and post-operative pain control must be provided[xviii].

Diekema also analyzed the case of Jimmy Boldt. The case known as *Boldt v. Boldt* included two parents who were in a legal battle over the decision to circumcise their son. Because they were divorced and the father had legal custody rights over his son, the courts favored his argument and his wish to have his son circumcised. This author suggests that without some compelling medical reason for performing a circumcision, the procedure should not be performed in the absence of agreement between his parents. "The fact that Jimmy's father had sole custody", explains this author, "does not eliminate the mother's ethical right and obligation to look after the welfare of her son." While the mother may not have legal decision-making authority because she did not have custody over Jimmy, "Jimmy is (still) her son, and she has an interest in seeing his welfare protected." This, the article points out, is not brought about in *Boldt v Boldt.*

Now we must understand this idea from a *Halachik* standpoint. Circumcision was one of the first commandments God gave to Abraham, the first Monotheist: "This is My covenant that you shall observe between Me and you and your children after you, to circumcise every male. You shall circumcise the flesh of your foreskin, and it shall be the sign of a covenant between Me and you. Whoever is eight days old shall be circumcised among you, every male throughout your generations."[xix]It is obvious to us today that as Orthodox Jews we still hold onto this practice very strongly. Some might even say that circumcision defines a male as a true Jewish male. It is a sign of the "*brit*" (covenant) we as a nation made with God, to always be faithful in our religion and our practice and follow his commandments. There is a *Midrash* that states that when Elijah the Prophet was frustrated with the Jewish nation he called out to God and complained of their rebellion and their failures as a nation. As a result God made Elijah witness the goodness of the Jewish people for eternity by giving him a "place" at every male circumcision so that he could see that the Jewish people have indeed not failed at keeping the covenant set out by God and Avraham[xx]. This ritual unites us as a nation.

In Rabbi Simmons' article for Aish he discusses this idea of the *brit milah* (circumcision) "identifying a Jew." A "*brit* is the sign of the covenant", he explains. "So a boy who is not circumcised has basically lost his spiritual attachment to the Jewish people." Yet, Rabbi Simmons agrees, there is no "logical" reason for such a ritual to occur. However, there is a spiritual reason. In Genesis when God commanded Abram to circumcise himself, he then added a letter to Abram's name. The Hebrew letter "*heh*", a part of God's name, was added to Abram's to name to make him Abraham. By fulfilling this commandment Avraham was "adding a dimension of spirituality to the physical body"[xxi].

With all of the medical data supporting the idea that the circumcision is a healthy and effective method of disease prevention, there should be no problem giving one's son a circumcision at birth from a medical perspective. But I believe that there are bigger issues to be discussed. Though the procedure is beneficial, it still embodies the idea of forcing one's religious beliefs on a non-consenting minor.
If we truly believe that parents cannot impose their religious beliefs onto their children, how can this be allowed? There are no *current* legal restrictions from circumcision infants, as our entire population of Orthodox Jews is circumcised each day. I believe this is due to the value placed on freedom of religion in our constitution. Religious freedom is one of the founding principles of our society. The article by Boyle et al regarding the male psyche in relation to circumcision questions whether "it is timely for health professionals and scientists to re-examine the evidence on this issue and participate in the debate about the advisability of this surgical procedure on unconsenting minors", because the major ethical problem is the lack of informed consent for a non-medically indicated procedure[14].

The true question though is whether these children will one day feel resentful toward their parents for making a decision they believe their parents were not entitled to make. The other issue is how far can we use 'freedom of religion' to allow for religious practices to occur. In an extreme example, what is called female genital mutilation (FGM), often guised under the euphemism of "female circumcision", is prevalent in most sub-Saharan cultures today. An estimated 100 to 140 million girls and women worldwide are currently living with the consequences of FGM[xxii].

FGM is a severely oppressive ritual in the eyes of someone growing up in a western society such as the United States. It has absolutely no medical value, and at best results in painful intercourse and childbirth, and at worst, in infection, agony, and death. Is it possible that due to the popularity and history of the male circumcision that our society is desensitized to it as religious practice that in essence "mutilates" the body that all male infants are naturally

born with? Or perhaps due to the health benefits of male circumcision and its widespread practice within our ethical legal and medical system it is therefore allowed? Would an African tribe that believes in such a ritual be allowed to practice this ritual in America?

It should be noted here that according to *Halacha* or Jewish Law any action that is considered "self mutilation" is *assur* (prohibited). As it states in Deutoronomy 14:1-2, "You shall not cut yourselves…for you are a holy people to Hashem, your God, and Hashem has chosen you for Himself to be a treasured people, from among all the peoples on the face of the earth"[xxiii]. Due to the fact that circumcision is mandated by God Himself, it can therefore not be considered "mutilation", or "cutting oneself", under Jewish Law. Even more so because it has medical benefits it is also not considered *chavala* (self-injury) which is also prohibited. It would be paradoxical for God to prohibit His own commandment. Instead we are commanded to use this custom that was done throughout many cultures as a way to separate ourselves and become closer to God, because we are chosen and separate from the nations of the world. This idea is first introduced by the Rambam as the reason for animal sacrifice. He explains that the practice of animal sacrifice brings us as a nation closer to God by specifically using a custom known throughout the world and generally used for idolatry and recreating it as a practice used for monotheistic worship[xxiv]. Female circumcision, or female genital mutilation, on the other hand, was never commanded by God and therefore can fall under this category of "cutting oneself" and would be considered *assur* (prohibited), and because it has no medical value could also fall under the *issur* (prohibiton) of *chavala*[xxv].

Schreiber et al discusses the issue of female circumcision. "Female circumcision (genital mutilation) is a criminal violation of human rights under German law. Even with the consent of the person to be circumcised and/or her legal representative this procedure must not be carried out since consent to female circumcision is unethical and therefore void." It continues to explain the differences between female and male circumcision but informs the reader that there are also parallels. "Various reasons, partly founded in prejudice and misinformation, make people refrain from regarding circumcision of boys also as illegal." The authors of this article believe that male circumcision also represents a "bodily harm" which a doctor should only carry out after an extensive interview with the patient and "with the consent of the affected person." The article concludes that since ritual male circumcision does not serve the wellbeing of a child it is not possible for the parents to give their consent to the circumcision in lieu of the child. They argue that male circumcision should only permitted if the child has given his consent, meaning he has full decision making capacity and he is mature enough to understand the meaning and extent of such an action[xxvi].

There is a considerable amount of data that prove that male circumcision does not cause bodily harm. Research has been conducted to prove that circumcision

protects males from HIV infection, penile carcinoma, urinary tract infections, and ulcerative sexually transmitted diseases. Moses et al concludes that they were unable to find substantial scientific evidence of adverse effects on sexual, psychological, or emotional health. The only potential risks are surgical risks; particularly bleeding, penile injury, local infection, as well as the pain experienced with neonatal circumcision, which are all valid concerns of a patient or a parent and should require appropriate responses from the medical professional. Therefore, these authors conclude that "in order for individuals and their families to make an informed decision, they should be provided with the best available evidence regarding the known benefits and risks"[xxvii].

Ritual circumcision has been practiced for over 4000 years. It has played an important role in identifying oneself as Jewish, preventing disease and curing infection. I believe that this ritual procedure is done for the benefit of the child in question. However, the slippery slope regarding freedom of religion in America must be acknowledged. Though we have found data to support this ritual as being in the best interest of the child, what can we say for the fact that this child could not consent to such an irreversible procedure? To what degree will we allow ritual procedures to occur?

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[xxi] Simmons S. "Is circumcision a barbaric ritual that harms a child physically? Or is it a deep meaningful act that has both spiritual and medical benefits?" http://www.aish.com/jl/l/48959461.html

[xxii] "Female genital mutilation- Fact sheet." World Health Organization. Feb 2010. http://www.who.int/mediacentre/factsheets/fs241/en/index.html

[xxiii] Deuteronomy 14:1-2

[xxiv] Leviticus 2:11, Moreh Nevuchim (3:32)

[xxv] Nachmanides, Toras Ha'Adam, Inyan Ha'Sakana. See also Beis Yosef, Yoreh Deah 241

[xxvi] Schreiber M, Schott GE, Rascher W, Bender AW. "Legal aspects of ritual circumcision." Klin Padiatr. 221: 409-414, 2009.

[xxvii] Moses S, Bailey RC, Ronald AR. "Male circumcision: assessment of health benefits and risks." Sexually Transmitted Infections. 74:368-373, 1998.