

ILLINOIS MATHEMATICS AND SCIENCE ACADEMY
"A Pioneering Educational Community"

SEVENTH ANNUAL IMSA PRESENTATION DAY
APRIL 26, 1995

Lecture Hall

Session 1	8:00 - 8:20	THE FORM AND FUNCTION OF POTTERY AT THE SAN MARCOS SITE Jonathan Haas, Juanita Garcia, Earl Zaromb
	8:30 - 8:50	COMPUTER-BASED IMAGING FOR NMR APPLICATIONS Raviprasad Duvvuri
	9:00 - 9:20	THE REVIVAL OF A NEARLY LOST CULTURE: FORMULATION OF AN INTERACTIVE POTAWATOMI IMAGE DATABASE Keith Amonlirdviman, Krishna Yeshwant
Session 2	9:30 - 9:50	A COMPUTER PROGRAM TO MAKE NATIVE AMERICAN HISTORY MORE ACCESSIBLE Lillian Calendrillo-Guzlowski, Jake Gerstein, Eric Englehard, Claiborne Skinner
	10:00 - 10:20	DEVELOPING MULTIFUNCTIONAL ROBOTIC GRIPPERS Mikhail Sirotn
	10:30 - 10:50	UNITING AMERICA: AURORA, ILLINOIS, AND THE MOBILIZATION FOR THE FIRST WORLD WAR: A MULTIMEDIA PRESENTATION Keith Amonlirdviman, Gaurav Upadhyay, Krishna Yeshwant

Academic Pit

Session 1	8:00 - 8:20	LONG-TERM OXIDATION OF NEXTEL 312-BLACKGLAS CERAMIC MATRIX COMPOSITES Andrew Michael Cox, Michael McNallan, Stephen T. Gonczy
	8:30 - 8:50	INTERLEUKIN 12 REGULATION IN ETHANOL-CONSUMING C57/BL6 MICE Omar A. Latif, Carl Waltenbaugh
	9:00 - 9:20	CLASSIFICATION OF GALAXIES BY COMPUTER ANALYSIS OF CCD IMAGING DATA Ryan D. Pierce, Chris Stoughton
Session 2	9:30 - 9:50	DESIGN OF INHIBITORS FOR GLYCOGEN PHOSPHORYLASE Joe Yuen, Prabha Venkatarangan
	10:00 - 10:20	THE EFFECTS OF WHITE NOISE ON HEARTBEAT Pablo Garcia, Sarah Y. Song, Charles L. Webber, Jr.
	10:30 - 10:50	DEVELOPMENT OF APROTININ FORMULATIONS: AN EXAMINATION OF VARIOUS FORMULATION FACTORS AFFECTING APROTININ ACTIVITY Krishna Yeshwant

Auditorium

- Session 1 8:00 - 8:20 A HISTORY OF SEAFARING: A VISUAL MODULE
Jake Gerstein, Pam Rawe, Eric Engelhard, Sindhu Revuluri,
Michelle Gervais, Eric White, Ryan Pierce, Claiborne Skinner
- 8:30 - 8:50 HEIDEGGER IN RUINS: A DOCUMENTARY FILM
Jeffrey Van Davis
- 9:00 - 9:20 O, L'AMOUR!
Anna Yusim, Masum Momaya, Jackie White
- Session 2 9:30 - 9:50 PAGEANTRY, HONOR, AND FORTUNE: THE SUCCESS OF HENRY V
Michele Casey
- 10:00 - 10:20 A DRAMATIC INTERPRETATION OF *THE AWAKENING*
Sara Fisher, Sara Scoles, Earl Zaromb, Heena Desai
- 10:30 - 10:50 FIVE SKETCHES FROM THE LIVES OF INDIAN WOMEN
Anjali Adukia, Anbar Ahmed, Komal Bajaj, Nalini Calamur,
Tonushree Jaggi, Veena Mandava, Masum Momaya, Haley Naik,
Charulata Ramaprasad, Jui Ramaprasad, Vidya Ravella, Sindhu
Revuluri, Anita Vijayakumar

A110

- Session 1 8:30 - 8:50 STUDENT RESPONSES TO RESIDENTIAL AND NON-RESIDENTIAL
STIMULUS
Hanh Lam, Barbara Schneider
- 9:00 - 9:20 1890-1900 ECONOMIC ACTIVITY IN DU PAGE COUNTY AND
SURROUNDING AREAS
Patricia J. Walton, Aaron Hanford
- Session 2 9:30 - 9:50 A SOCIOLOGICAL ANALYSIS OF LIFE IN RURAL VIRGINIA FROM THE
1860s TO THE 1900s
Annie Clementz
- 10:00 - 10:20 THE ARCHITECTURAL HISTORY OF THE ILLINOIS MATHEMATICS
AND SCIENCE ACADEMY
Carmen Gerdes, Clay Sewell, Timothy Klomhaus
- 10:30 - 10:50 THE THEORY AND APPLICATION OF RANDOM WALKS
Piyush Gupta

A113

- Session 1 8:00 - 8:20 A PORTRAYAL OF MAE JEMISON
Dorothy J. Pleas
- 8:30 - 8:50 JEWEL PLUMMER COBB: A GEM OF A SCIENTIST
Tiy Martin
- 9:00 - 9:20 A PORTRAYAL OF JANE COOKE WRIGHT, A PIONEERING BLACK
WOMAN
Lakeisha Heard

Session 2	9:30 - 9:50	INVESTIGATING THE EFFECTS OF GUN-RELATED INJURIES ON HEALTH CARE COSTS Alex Bonick, Angela Hong, Otto Lee, Audrey Moultrie, Tim Polko
	10:00 - 10:20	EDITORIALS ON EDUCATION: A STUDY OF FOUR NEWSPAPERS Catherine C. Veal
	10:30 - 10:50	LONGITUDINAL STUDY OF IMSA GRADUATES: A FIVE-YEAR REPORT CARD Diann Musial, Jay Thomas

A115

Session 1	8:00 - 8:20	WWW AND APPLICATIONS OF INFORMATION DISTRIBUTION SYSTEMS Jerome Budzik, Matthew Hellige, Matthew Wicks
	8:30 - 8:50	CREATING AN INTELLIGENT STREET INDICATOR SYSTEM Michael Vachanastienkul, Gordon P. Ramsey
	9:00 - 9:20	APPLICATIONS OF COMPUTER-GENERATED GRAPHICS Angela Chiu, Nathan Gettings, Jeffrey Wright
Session 2	9:30 - 9:50	PROGRAMMING SYMBOLIC ALGEBRA FOR A SCIENTIFIC VISUALIZATION PACKAGE Keith Amonlirdviman, Brad Friedman, Arvind Sekar
	10:00 - 10:20	WHAT DOES AN ORCHESTRA SOUND LIKE ON THE BOTTOM OF THE OCEAN? Emily M. Schafer, Larry Votta
	10:30 - 10:50	DEVELOPMENT OF A THREE-DIMENSIONAL QUANTITATIVE STRUCTURE-ACTIVITY RELATIONSHIP FOR AN ANALOG SERIES OF 3-QUINOLYLUREA DERIVATIVES Rebecca M. Willett, Hitesh C. Patel

A116

Session 1	8:00 - 8:20	CHICAGOLAND TV NEWS — "AN EXPERIENCE IN BROADCAST JOURNALISM" Jason Jedlinski
	9:00 - 9:20	THE INFLUENCE OF EXPECTATIONS ON THE SUBJECTIVE EFFECTS OF AMPHETAMINE IN HEALTHY NORMAL VOLUNTEERS Mila M. Verdugo, Suzanne H. Mitchell, Harriet De Wit
Session 2	9:30 - 9:50	ISOLATION AND IDENTIFICATION OF THE ANTIGEN/ANTIBODY REACTION IN HEPARIN-INDUCED THROMBOCYTOPENIA/THROMBOSIS Gaurav A. Upadhyay, Harry L. Messmore
	10:00 - 10:20	INVESTIGATION OF A MODIFIED NUCLEOSIDE AS A MARKER FOR BRAIN TUMOR RECURRENCE Patricia K. Sun, Van T. Tang, Jay Hurh, Eric Bremer
	10:30 - 10:50	REACTIONS OF 2-SUBSTITUTED CYCLIC KETONES AND POTASSIUM SUPEROXIDE IN CROWN ETHER Soojin Son, Matthias C. Lu

A117

- Session 1
- 8:00 - 8:20 WHAT ARE THE CONCENTRATIONS OF INTERLEUKIN-2 DURING VARIOUS STAGES OF ANGIOGENESIS?
Komal Bajaj, Veena Mandava, Lisa Duffner, Jonathon Holmes
- 8:30 - 8:50 SYNTHESIS OF SOLID-STATE MIXED-CHALCOGENIDES
Michael J. Choi, James A. Ibers, Jason A. Cody, Michael A. Pell
- 9:00 - 9:20 ISOLATION OF THE ACTIVE ANTIMALARIAL SUBSTANCES IN KNOWN ANTIMALARIAL HERBS
Robert Chapman, Bruce Currie, Heena Desai, Si-Yong Yi
- Session 2
- 9:30 - 9:50 EQUILIBRIUM RELATIVE HUMIDITY OVER SATURATED SALT SOLUTIONS
Tarun Kukreja, Jon Philips
- 10:00 - 10:20 STATISTICS AND THE SIZE AND SHAPE OF BASIDIOSPORES
Joanna Lahey, Gregory M. Mueller
- 10:30 - 10:50 BLINK CONDITIONING IN AGING MICE: MODELING ALZHEIMER'S COGNITIVE DEFICITS
Visveshwar Baskaran, Imran Hirani, John Disterhoft, Craig Weiss

A121

- Session 1
- 8:30 - 8:50 TRANSDERMAL IONTOPHORETIC DELIVERY OF AZT IN RABBITS
Andy Chen, Vijay Karunamurthy
- 9:00 - 9:20 ISOLATION OF GENOMIC DNA OF THE SMUT FUNGUS *Ustilago violacea*
Audrey M. Chen, Carl Zha
- Session 2
- 9:30 - 9:50 COMPARISON OF STAR DISTRIBUTION WITHIN OUR GALAXY WITH GALACTIC MODEL STAR-COUNT PREDICTIONS
Nsesa Kazadi, Timothy McKay
- 10:00 - 10:20 DEVELOPING AN AMATEUR ASTRONOMERS' METHOD FOR FINDING THE PERIOD OF A BINARY STAR SYSTEM BY CCD PHOTOMETRY
Karen Ballinger, Anne Hanna, Edward Moyer, Jr.
- 10:30 - 10:50 DEVELOPING PROCEDURES FOR THE IDENTIFICATION OF GEL INKS
Christopher S. Palenik, Larry Olson

A149

- Session 1
- 8:00 - 8:20 INVESTIGATIONS OF OXIDATION AS AN ANTIMALARIAL MECHANISM OF ACTION
Nina Chinosornvatana, Becky Wang, Cindy Angerhofer, Patti Kloss
- 8:30 - 8:50 CHOLESTEROL AS AN INHIBITOR OF HUMAN SPERM CAPACITATION
Maria Gunaratnam, R.S. Jeyendran
- 9:00 - 9:20 DEVELOPMENT OF AN *IN VITRO* METHOD FOR MEASURING TRANSEPIDERMAL WATER LOSS
Laura Dabbish, Richard Brucks

Session 2	9:30 - 9:50	EPSTEIN-BARR VIRUS: THE ROLE OF CD 45 IN LYMPHOMA DEVELOPMENT Anjali Adukia, Julia Sibley, Ben Z. Katz, Babak Salimi
	10:00 - 10:20	THE EFFECT OF ENTEROPATHOGENIC <i>Escherichia coli</i> INFECTION ON INTESTINAL EPITHELIAL CELL FUNCTION Eric C. Mak, Gail A. Hecht
	10:30 - 10:50	INCLUSIONS IN THE AXTELL CARBONACEOUS CHRONDRITE METEORITE: A WINDOW ON THE FORMATION OF THE SOLAR SYSTEM K. Amanda Leach

A150

Session 1	8:00 - 8:20	ELECTRONIC MODELING OF AMPEROMETRIC GAS SENSORS Allen Lee, Phil Loeb
	8:30 - 8:50	ANESTHETIC EFFECTIVENESS OF SOLVENTS Amir Malik, Richard Hahin
	9:00 - 9:20	THE RELATIVE ABILITY OF DIFFERENT CHEMICALS TO DONATE NITRIC OXIDE (NO) Laura Lanwermyer, K. H. Ramsey, B. J. Plotkin
Session 2	9:30 - 9:50	C ₁₈ REVERSED PHASE HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY AND MASS SPECTROMETRY OF OLIGONUCLEOTIDES Jacob Lai, Donald Park, Richard Van Breemen, Chou Ren Huang
	10:00 - 10:20	ANTILIPOPROTEIN ANTIBODIES IN PATIENTS WITH STROKE Toshio Kimura, Tedd Vanadilok, Milenko Lazarevic, John Skosey
	10:30 - 10:50	NUCLEAR VOLUME OF BRAIN TUMORS IN MICE WITH CEREBRAL GLIOMA AND INTERLEUKIN-2/INTERFERON- γ -TRANSFECTED FIBROBLAST TRANSPLANTS Anna Harr, Saroja Ilangovan, Marc Reyes

A151

Session 1	8:00 - 8:20	INVESTIGATION OF THE POSSIBILITY OF RELATIONSHIPS BETWEEN NUMBERS OF NEURONS IN THE HIPPOCAMPUS AND VARIOUS DISEASES Mini Son, Saroja Ilangovan, Marc Reyes
	8:30 - 8:50	THE EFFECTS OF DOMINANT NEGATIVE FGF ON PRE-IMPLANTATION MOUSE EMBRYOS Daniel Rappollee, Yogesh Patel, Soldrea Roberts
	9:00 - 9:20	TESTING A NEW SYSTEM FOR MAINTAINING FAVORABLE CALCIUM CONCENTRATIONS IN AQUARIA HOUSING CORALS Mary Carter, Karen Kimball, George Parsons
Session 2	9:30 - 9:50	LEVELS OF DEGRADATIVE ENZYME mRNA AND PROTEASE INHIBITOR mRNA IN THE STROMAL AND EPITHELIAL LAYERS FROM PATIENTS WITH KERATOCONUS Masum Momaya, Brent Whitelock, Beatrice Y. J. T. Yue
	10:00 - 10:20	METHOTREXATE TREATMENT AFFECTS LYMPHOID TISSUE CELL ADHESION MOLECULE EXPRESSION IN RECIPIENTS OF RAT CARDIC ALLOGRAFTS Justus C.L. Morris, Irene K. Lewis, C.J. Ciesielski, J.J. Pflug
	10:30 - 10:50	THE EFFECTS OF PHOSPHATES IN CLOSED-SYSTEM AQUARIA Jennifer Mui, Dan Christopher

Lunch

11:00 - 12:00

All Mentors with their students please go to the Cafeteria area.

Special Event: "Never Again"

Time: 1:30pm

Place : Academic Pit

You are cordially invited to attend a part of the National Holocaust Memorial Week organized by the IMSA student body. Dr. Clay Skinner, a member of the History and Social Science faculty, will begin with an address concerning the Holocaust. There will be a brief sampling of the week's activities, as well as the showing of the award-winning film, "In Memory of the Camps." An open forum for comments and questions is also planned. All are welcome.

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ABSTRACTS

FIVE SKETCHES FROM THE LIVES OF INDIAN WOMEN

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- Komal Bajaj, 4B23, Illinois Mathematics and Science Academy, 1500 West Sullivan Road, Aurora, IL 60506, U.S.A. 708/907-5452 (phone)
- Nalini Calamur, 4D21, Illinois Mathematics and Science Academy, 1500 West Sullivan Road, Aurora, IL 60506, U.S.A. 708/907-5441 (phone)
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- Veena Mandava, 7C25, Illinois Mathematics and Science Academy, 1500 West Sullivan Road, Aurora, IL 60506, U.S.A. 708/907-5735 (phone)
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- Sindhu Revuluri, 2A25, Illinois Mathematics and Science Academy, 1500 West Sullivan Road, Aurora, IL 60506, U.S.A. 708/907-5248 (phone)
- Anita Vijayakumar, 7C14, Illinois Mathematics and Science Academy, 1500 West Sullivan Road, Aurora, IL 60506, U.S.A. 708/907-5706 (phone)

Through our readings and discussions over the past semester and our experiences both in the United States and in India, we have found that one adjective best characterizes female Indian culture—diverse. Our own differences in regional, cultural, and linguistic background are evidence of this. We have taken the artistic expressions of various contemporary Indian women and have synthesized them to create portraits of our own feelings. We will present our interpretations of these differences through five three-minute sketches in Indian dance, song, visual art, pop culture, poetry, prose, and scriptures.

EPSTEIN-BARR VIRUS: THE ROLE OF CD 45 IN LYMPHOMA DEVELOPMENT

Anjali Adukia, 2A15, Illinois Mathematics and Science Academy, 1500 West Sullivan Road, Aurora, IL 60506, U.S.A. 708/907-5220 (phone)

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Ben Z. Katz, Department of Pediatric Infectious Diseases, Children's Memorial Hospital, 2300 Children's Plaza, Box # 20, Chicago, IL 60614, U.S.A. 312/880-4187 (phone)

Babak Salimi, Department of Pediatric Infectious Diseases, Children's Memorial Hospital, 2300 Children's Plaza, Box #20, Chicago, IL 60614, U.S.A. 312/880-4187 (phone)

The immune system plays a limited role in preventing cancer. While most patients with immunodeficiency do not succumb to common cancers (*e.g.*, lung cancer), there are cancers (lymphomas) that are more common in the immunosuppressed. Epstein-Barr virus (EBV) has been associated with many lymphomas in immunosuppressed individuals. Immunodeficient (SCID) mice inoculated with EBV-infected cells also usually develop lymphomas. However, when the inoculated EBV-infected cells are of marmoset origin, lymphomas do not develop. Therefore, the EBV-infected marmoset cell must lack a factor necessary for lymphoma development—one that is present in human EBV-infected cells. CD 45 is an antigen not present in EBV-infected marmoset cells, but present in human EBV-infected cells. Its protein product is thought to play a role in lymphoma development. We introduced CD 45 into EBV-infected marmoset cells (cell lines B95-8, FF41, W91). We will then inoculate them into SCID mice and score for lymphoma development. Our results should provide an indication as to whether CD 45 is related to lymphoma development in immunosuppressed patients.

PROGRAMMING SYMBOLIC ALGEBRA FOR A SCIENTIFIC VISUALIZATION PACKAGE

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Arvind Sekar, 1B25, Illinois Mathematics and Science Academy, 1500 West Sullivan Road, Aurora, IL 60506, U.S.A. 708/907-5147 (phone)

Mentor : Karl E. Knapp, Numerical Algorithms Group, 1400 Opus Place, Downers Grove, Illinois 60515, U.S.A. 708/971-2337 (phone)

We are working on a library to incorporate symbolic algebra into the scientific visualization package *Iris Explorer*. This will allow the visualization of theoretical models based on functions rather than models based on empirical or existing data. We are representing and evaluating functions as binary trees. The modules we wrote utilize recursion to efficiently traverse and evaluate the binary tree. Utilizing this structure, we coded separate modules for manipulating and evaluating the function. The function, as stored into a binary tree by one module, may be passed directly to an evaluator module. We will finish our library by modifying the evaluator so that it will create data sets, based on the function, for *Iris Explorer* to model, and by allowing the function to be passed to another module, such as one to perform symbolic integration, which simplifies the function. By passing the function through a symbolic integration module, for example, the evaluator would be able to produce more accurate data sets more efficiently. The theoretical data sets would be used to visually compare empirical data with an ideal or fitted function to test the validity of the data. We will present completed modules, source code and examples of possible applications.

UNITING AMERICA: AURORA, ILLINOIS, AND THE MOBILIZATION FOR THE FIRST WORLD WAR: A MULTIMEDIA PRESENTATION

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In an effort to effectively communicate the content/concepts of a modern history course, we have created a vehicle through which the political, economic, and psychosocial aspects and effects of various historical events can be presented. By integrating still images, motion video, statistics, sound, and the ability to interact with the program, our multimedia presentation is intended to implant impressions/sensations/learnings simultaneously with supporting data. Our presentation specifically deals with the mobilization of Aurora, Illinois, for World War I, and how such localized mobilization was necessary for the United States to succeed in its undertaking in Europe. Through examination of the mobilization statistics for Aurora and for the United States as a whole, similarities quickly become apparent. America would not be ready to enter such a war until such small communities as Aurora was then became economically and psychologically prepared.

THE REVIVAL OF A NEARLY LOST CULTURE: FORMULATION OF AN INTERACTIVE POTAWATOMI IMAGE DATABASE

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We are working on the development of a database of three-dimensionally and two-dimensionally represented images of Potawatomi artifacts, from which an assortment of digital pictures may be extracted. We developed, at the National Museum of the American Indian in New York City, three methods to authentically represent these artifacts. By means of standard 35-mm cameras, tripods, a turntable, and strobe lights, we took several images and stamped them onto Kodak CD. With the help of Potawatomi elders, descriptions for the images acquired will be produced and integrated into the database. It is essential that these descriptions be recorded because the elders in question represent the last generation of Potawatomis who understand the significance and meaning of these artifacts. In addition to an image archive, a World Wide Web page will also be created. This page will provide means by which we and the elders can effectively communicate ideas and information to interested scholars and to our prime target group, the Potawatomi students in Hannahville, Michigan.

WHAT ARE THE CONCENTRATIONS OF INTERLEUKIN-2 DURING VARIOUS STAGES OF ANGIOGENESIS?

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Lisa Duffner, Department of Ophthalmology, Loyola University Medical Center, 2160 South First Avenue, Maywood, IL 60153, U.S.A. 708/216-5184 (phone)

Jonathan Holmes, Department of Ophthalmology, Loyola University Medical Center, 2160 South First Avenue, Maywood, IL 60153, U.S.A. 708/216-9281 (phone)

The naturally occurring protein Interleukin-2 has been implicated in the process of angiogenesis (the proliferation of blood vessels). In premature infants, abnormally heightened angiogenesis can result in blindness. An understanding of the relationship between Interleukin-2 and angiogenesis might therefore have relevance to future medical developments in this area. Normal retinal angiogenesis occurs postnatally in neonatal rats. We hypothesize that as angiogenesis progresses, the levels of the Interleukin-2 receptor (IL-2R) should rise gradually. We are now attempting to determine the concentrations of the IL-2R during various stages of normal angiogenesis in the neonatal rat retina. The eyes of 18 rat pups at postnatal days 1, 3, 5, 7, 10, and 18 (N=3) were surgically removed. They were immediately fixed and cryopreserved by placing them in 4% paraformaldehyde for 1 hour, followed by a 30% sucrose solution for 1 hour prior to snap freezing in liquid nitrogen. The eyes were stored at -70°C until sectioned for immunohistochemical staining. 14-micron-thick frozen cross-sections that had been postfixed for 5 minutes in acetone (-20°C) are being stained for the presence of IL-2R, using the streptavidin-peroxidase method of immunohistochemical staining. After exposure to the stain, the HRP reaction product will be visualized by exposure to 3,3' diaminobenzidine. The slides will then be graded by assigning 0-3 in a masked fashion—3 indicating intense staining, and 0 indicating no staining. As of yet, we have no results. At the time of our presentation, however, we should have some to report.

DEVELOPING AN AMATEUR ASTRONOMERS' METHOD FOR FINDING THE PERIOD OF A BINARY STAR SYSTEM BY CCD PHOTOMETRY

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CCD (charge-coupled device) photometry uses a CCD camera to obtain very accurate measurements of the brightness of stars by counting the photons that strike each pixel on the camera's recording chip. Using these measurements, we will observe a W Ursa Majoris eclipsing binary stellar system and use the variances in brightness to determine the system's period. We hope to discover, from our experiences, the problems that amateur astronomers may encounter with CCD photometry and offer possible solutions and procedural guidelines. During each observing run, we plan to take several different types of pictures: frames with the shutter closed, frames of a comparison star and its background sky, frames of a uniform field (an area where no stars are visible), and frames of our binary system. The first three types of frames will be taken so that we may determine the amount of background noise, which we can then subtract from the frames of the system. In the preliminary stages of our experiment, we have encountered many technical difficulties of sorts that we have not seen described in print. We overcame these obstacles by buying additional instruments: a guidance motor, a focusing device that is placed between the camera and the telescope, and an instrument to increase the focal length of the telescope.

BLINK CONDITIONING IN AGING MICE: MODELING ALZHEIMER'S COGNITIVE DEFICITS

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John Disterhoft, Department of Cell and Molecular Biology, Northwestern University Medical School, 303 E. Chicago Avenue, Chicago, IL 60611, U.S.A. 312/503-7982 (phone)

Craig Weiss, Department of Cell and Molecular Biology, Northwestern University Medical School, 303 E. Chicago Avenue, Chicago, IL 60611, U.S.A. 312/503-3112 (phone)

Previous research involving eyeblink conditioning in rabbits, rats, and humans has indicated that aging decreases the learning capabilities of animals. The Morris water maze, Y-maze, and eyeblink conditioning paradigms are all dependent on the septo-hippocampal pathway. This system is damaged by aging and by Alzheimer's disease. Using the laboratory mouse as an inexpensive model of human learning, we may be able to illustrate the effects of aging and of Alzheimer's disease on learning. We used mice of two ages (young adult and middle-aged) in experiments testing their septo-hippocampal pathway. Spatial learning in a Morris water maze, natural spatial performance in a Y-maze, and learning in eyeblink conditioning were compared to gain understanding of each animal's cognitive and associative abilities. We are now investigating the nature or absence of correlations among the performances of the three tasks so as to determine if performances of the different tasks are similarly affected by aging. If the tasks are shown to not be similarly related to aging, then this will indicate that aging may be selective in its destruction of learning ability.

INVESTIGATING THE EFFECTS OF GUN-RELATED INJURIES ON HEALTH CARE COSTS

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We are attempting to determine if a correlation exists between the incidence of gun-related injuries and the cost of health care. We first examined the extant literature on health care and gun injuries. Health care providers and professionals in the field of violence prevention were also consulted. Based on all this information, we developed a survey and distributed it to all the hospitals in Illinois. Among other questions, the questionnaire inquires as to the total annual emergency room costs at the hospital, the total number of patients treated each year, the number of gun-related injuries treated in the emergency room each year, the average cost of the gun-related injuries, and the numbers per age group of the gunshot victims. Responses to this survey are still being received. The data generated by this study and the conclusions drawn from them will, we hope, prove useful in shaping public policy.

WWW AND APPLICATIONS OF INFORMATION DISTRIBUTION SYSTEMS

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We wrote information distribution systems using standard UNIX tools and resulting in Bourne shell scripts and C++ code that comply with World Wide Web/Common Gateway Interface (WWW/CGI) standards. We developed web services with the following applications: job tracking, server usage and management tools, and abstract searching tools. The tools we wrote are user-friendly, fast, and comprehensive. Our web server systems are used by thousands of Internet users around the world and by administrators and employees of Fermilab.

A COMPUTER PROGRAM TO MAKE NATIVE AMERICAN HISTORY MORE ACCESSIBLE

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As a part of a cooperative project of the Illinois Mathematics and Science Academy, the Hannahville School of the Potawatomi Nation, the National Museum of the American Indian, and the Smithsonian Institution, we have been working on a computer display which traces the migrations of the Great Lakes Indian tribes in the period 1600-1820. The complex migration patterns, alliance systems, and historical chronology of these peoples is normally not accessible, in any meaningful way, to non-specialists. By means of computer graphics, we intend to create a learning tool which will make these peoples and events accessible for high schoolers and college students, both indigenous and non-indigenous. This project will eventually be merged with a similar project for the period 1820-1995 and being done by the students at the Hannahville School of the Potawatomi Nation. The program will consist of a series of maps displaying the location of the various nations at significant moments in the history of the region: 1615, 1670, 1701, 1755, etc. Accompanying the maps will be files which can be accessed to explain the events represented on the maps. Thus the resource may be used as intensively as the student wishes. It may serve as either a reference tool or as a detailed text, depending on the needs of the student. There is no such document presently available, and so this should prove to be a work of genuine value for both instruction and scholarship.

TESTING A NEW SYSTEM FOR MAINTAINING FAVORABLE CALCIUM CONCENTRATIONS IN AQUARIA HOUSING CORALS

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The calcium concentration in coral reef tanks tends to drop below the needs of the coral. We have constructed a calcium hydroxide drip system to deal with this problem. The system is designed to maintain the ideal calcium level (400 ppm) by means of constant addition of water and of calcium hydroxide. This is to create an equilibrium between average water/calcium loss and the amount of water/calcium hydroxide added through the drip system. The drip system was constructed to handle two experimental tanks. A control tank without a drip system and to which calcium chloride is added periodically is also being maintained. Calcium chloride is the customary source of calcium in coral reef tanks. Calcium levels in the tanks are ascertained weekly by means of a standard aquarists' calcium indicator test. Each tank contains several corals and clown fish. At the end of a ten-week trial, the system will be evaluated as to its effectiveness.

PAGEANTRY, HONOR, AND FORTUNE: THE SUCCESS OF HENRY V

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Mentor : Nancy Arnesen, English Department, North Park College, 3225 W. Foster Avenue, Chicago, IL 60625-4987, U.S.A. 800/888-6728 (phone)

I examined Shakespeare's *Henriad* and compared the ways in which Richard II and Henry V use pageantry, honor, and fortune to their advantage during their respective periods of rule. I discovered that Richard II uses empty pageantry to support a hollow kingship that is empty of real honor. Consequently, the forces of fortune overwhelm Richard and destroy him. Henry V, in contrast, abandons pageantry and founds his kingdom on the principles of true honor. Two of the young prince Henry's companions teach him about honor and pageantry—Falstaff shows the prince how empty pageantry is, and Hotspur demonstrates that honorable action does not stem from the need to maintain a reputation. As Henry the prince becomes Henry V, the king, he takes the lessons he learned with him and uses them to improve his kingdom. Therefore, Henry V controls the forces of fortune and rules successfully.

ISOLATION OF THE ACTIVE ANTIMALARIAL SUBSTANCES IN KNOWN ANTIMALARIAL HERBS

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Malaria is prevalent in many countries today in spite of the antimalarial drugs that have been developed. Resistance to drugs in some strains of the parasites is partially responsible for this. In order to find new antimalarial substances, we are investigating herbs with reported or known antimalarial activity. The rhizomes of the plant *Cyperus rotundus* and the woody part of the plant *Arcangelisia flava* have been reported to have antimalarial activity. We ground the rhizomes and wood mechanically and extracted them by percolation with ethanol. Complex mixtures of substances were obtained. We employed thin-layer and column chromatography in order to further separate the mixtures' constituents. The University of Illinois at Chicago's (UIC) College of Pharmacy is now engaged in the bioassay-directed isolation of active compounds from our extractions, and is testing the fractions from our chromatographic separations for activity against two parasites that cause malaria, *Plasmodium falciparum* and *Plasmodium vivax*. This assay measures the uptake of tritium-labeled hypoxanthine by infected red blood cells. Live malarial parasites increase this uptake by RBCs, and so low uptake is an indication of parasite mortality. Our fractions of *C. rotundus* and *A. flava* are also being examined at UIC for general cytotoxic activity. At the time of our presentation, we may have results to report concerning the UIC experimentation.

TRANSDERMAL IONTOPHORETIC DELIVERY OF AZT IN RABBITS

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Because of AZT's short half-life (30 minutes), intermittent oral therapy cannot provide continuous levels of AZT above the therapeutically beneficial one-micromolar concentration. We are attempting to determine if transdermal iontophoretic delivery of AZT may be an effective alternative to oral therapy in maintaining therapeutically beneficial levels of AZT in HIV-positive patients. We compared passive transdermal delivery of AZT to iontophoretic delivery in rabbits. 8-10-lb. rabbits were shaved and depilated, fitted with Lectro Patch iontophoretic units, with or without current, for up to 24 hours. Serum levels of AZT were determined at 0, 3, 6, and 24 hours. Total drug delivery was determined by measuring residual AZT in the application pads. AZT concentrations in the serum were measured using a modified protocol in the ZDV-Trac-I¹²⁵ assay. Preliminary results demonstrate that AZT can be delivered through rabbit skin in a dose-dependent fashion, with or without current.

ISOLATION OF GENOMIC DNA OF THE SMUT FUNGUS *Ustilago violacea*

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Mentor : Manfred Ruddat, Department of Ecology and Evolution, The University of Chicago, 1101 E. 57th Street, Chicago, IL 60637-1437, U.S.A. 312/702-8796 (phone)

Ustilago violacea, an anther smut fungus, infects the plant *Silene alba*, completing its life cycle in the host plant's stamens. The infection results in the formation of stamens in female plants, thus producing pseudo-hermaphroditism in those plants. In order to study this phenomenon and further our understanding of *Ustilago violacea*, we are examining the genomic DNA of the smut by cloning it in a cloning vector. We have grown the smut fungi to steady state, harvested sporidia, and extracted genomic DNA. In the extraction process, we freeze-dried the sporidia and then incubated them at 50°C for one hour in lysis buffer that contained Trio-EDTA and CTAB. The mixture was then extracted with phenol/chloroform and centrifuged to separate DNA from the protein precipitates. RNase was added to remove RNA. DNA was precipitated from the lysis buffer with 100% ETOH. We are now utilizing gel electrophoresis in order to separate DNA molecules by size and to ascertain the purity of the DNA. By the time of our presentation, we will probably have some preliminary results to report from this last-mentioned analysis.

INVESTIGATIONS OF OXIDATION AS AN ANTIMALARIAL MECHANISM OF ACTION

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Approximately 200 million people are infected annually by the malarial parasite *Plasmodium falciparum*, which, in a number of countries, has developed resistance to commonly used antimalarial drugs. In the past, many antimalarials have come from natural products, but relatively little is known about how these drugs work. The mechanism of drug action that we are investigating is the potentiation of intracellular oxidative stress. Malarial parasites are more sensitive to oxygen than human cells are; therefore we are seeking drugs that will free reactive oxygen in red blood cells (RBCs) and are developing an experimental technique for testing the oxidative potential of antimalarials. We did this by comparing spectrophotometric readings taken on infected RBCs—to which test samples of antimalarials and different concentrations of hydrogen peroxide had been added—and compared these to a hydrogen peroxide calibration curve. A higher level of oxidation in the experimental samples would be evidence of oxidation on the part of the antimalarials. Artemisinin, a known oxidant, produced higher levels of oxidation than in the calibration curve. We are presently testing other antimalarial drugs for their potential as oxidants.

APPLICATIONS OF COMPUTER-GENERATED GRAPHICS

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A variety of current technologies are undergoing rapid improvement, experiencing decrease in cost and an increase in availability. Their applications, therefore, become more and more prevalent. One of these applications, computer graphics, is becoming a ubiquitous part of our culture. Through the media storm, computer-generated graphics are being showcased, sometimes quite obviously, and, at others, surreptitiously. The most notable use is for cinematographic special effects. From corporate logos and representations of spaceships to living actors appearing to shake hands with dead presidents, very few films, television shows, or commercials are made without the use of computer graphics. However, these applications represent only a small portion of the possible uses of such a versatile technology. Computer graphics can be used for medical training and visualization, for product research and development, architectural design, and for much else as well. We have been learning to use one of today's most popular 3D graphics programs for the PC: Autodesk 3D-Studio. We have prepared several short animation sequences to demonstrate its power and ease of use. These will be shown in our presentation.

SYNTHESIS OF SOLID-STATE MIXED-CHALCOGENIDES

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We are attempting to synthesize new mixed-chalcogenide compounds with Group IV transition metals, using the reactive flux technique. We have investigated the system $A/M/Q/Q'$ (A =alkali metal, Cs; M =T,Zr,Hf; Q =S,Se,Te; Q' =S,Se,Te \neq Q). The stoichiometries of target compounds were based on known phases reported in the literature. The reactants were loaded into fused silica tubes under inert atmospheres in a glove box. The tubes were evacuated, sealed, and heated to 900°C. After 6 days, the tubes were slowly cooled (3°/hr) to room temperature. The reaction product was examined under a microscope and single crystals were analyzed by EDAX (Energy Dispersive Analysis by X-Rays) using an SEM. The product is a new chemical compound previously unknown to science and which consists of selenium, cesium, and hafnium. Future tests will be conducted to determine whether this substance shows conductivity or other useful properties. X-ray chromatography will be utilized in ascertaining the molecular structure.

A SOCIOLOGICAL ANALYSIS OF LIFE IN RURAL VIRGINIA FROM THE 1860s TO THE 1900s

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Mentor: Jerome Johnson, Garfield Farms, 3N016 Garfield Road at Route 38, Box 408, LaFox, IL 60147, U.S.A. 708/584-8485 (phone)

For the purpose of preservation, I transcribed eighteen letters between a father and son living in rural Virginia after the Civil War. I then analyzed the contents of these letters in order to gain an understanding of the history of this particular family and a larger view of the lifestyle of the Southern farming aristocracy during Reconstruction. My main focus was on finding statements either supportive of or contradictory to the standard representation of this time period, with special attention being paid to social attitudes, in particular, toward economic conditions, race, and health. Preliminary impressions are that the South had not reconciled itself to its defeat. The family can also be seen to be clinging to the traditional plantation farm despite inability to produce a saleable tobacco crop. There is also much evidence for a less menial antebellum lifestyle of white women in the South as compared to their contemporaries in the Midwest. Many of these Southern women complained bitterly about the menial tasks placed upon them after the loss of their slaves. Another significant aspect of life in Virginia as depicted in these letters is the medical practice of the time. The most prevalent diseases seem to have been pneumonia and typhoid, and the remedies prescribed varied according to where a doctor was from and where he was educated; and bitter disputes often arose over these diverse methods of treatment.

LONG-TERM OXIDATION OF NEXTEL 312-BLACKGLAS CERAMIC MATRIX COMPOSITES

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Long-duration oxidative exposure tests of 24, 100, 200, 500, and 1000 hours were conducted on 270 pieces $3'' \times .25'' \times .065''$ of Blackglas Ceramic Matrix Composite at temperatures of 500°C, 600°C, and 700°C. After removal from the furnaces, the samples were analyzed in order to determine whether their properties had been retained despite any oxidation that may have occurred. Mechanical flex tests and mass change comparisons suggest a favorable retention of sample strength over time, especially at 500°C and 600°C. However, the evaluation of the longest exposure trials is not yet complete. It is hoped that the results will allow AlliedSignal to market Blackglas as a substitute for metals in certain aerospace engine components.

DEVELOPMENT OF AN *IN VITRO* METHOD FOR MEASURING TRANSEPIDERMAL WATER LOSS

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Transepidermal water loss (TEWL) is defined as insensible water loss through the skin and which is unrelated to normal perspiration. The commonly used *in vivo* methods of determining TEWL are extremely time-consuming. We are attempting to develop a method for monitoring the rate of water loss through the skin, *in vitro*. A Franz diffusion cell containing Milli-Q water was placed on a magnetic stirring plate to provide adequate mixing. A membrane was mounted on the diffusion cell and secured with a Teflon O-ring. TEWL is measured using the ServoMed Evaporimeter. The Evaporimeter probe is mounted directly on the diffusion cell cap. To ensure a more complete seal, two foam rings are applied to the bottom of the probe. The probe and diffusion cell are mounted on a ringstand to provide stability. In order to reduce the effects of air currents, the system is enclosed in a cardboard box. Environmental temperature and relative humidity (RH), fluid level, cell temperature, and relative humidity above the membrane were monitored. No correlation was found between fluid level or ambient conditions and TEWL. When the cell temperature increases, however, RH above the cell and TEWL both increase. When TEWL increases, the RH above the cell increases.

COMPUTER-BASED IMAGING FOR NMR APPLICATIONS

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Mentor : Robert E. Botto, Chemistry Division - Bldg. 200, Argonne National Laboratory, 9700 S. Cass Avenue, Argonne, IL 60439, U.S.A. 708/252-3524 (phone)

I used data from nuclear magnetic resonance (NMR) imaging experiments to test the viability of developing a computer-based data network. Two different software packages, Spyglass and AVS, were compared for flexibility and practicality. Data from previous experiments were used to compare compatibility with older software and to test the abilities of the software. The software was also configured to directly capture and access data from the existing NMR data system. Preliminary results show that AVS is the more powerful software package but, owing to factors such as cost, may not be as practical as Spyglass. Both are capable of importing data as expected, with AVS being the easier to import data into. By the time of presentation, this investigation should be complete.

A DRAMATIC INTERPRETATION OF *THE AWAKENING*

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When Kate Chopin's novel *The Awakening* was published in 1899, it was criticized severely by the literary community because of its highly controversial subject matter. A novel written at the end of the 19th century, and which explored, realistically, the consequences of personal—particularly sexual—freedom for married women, was susceptible to the harshest criticism. This novel, while not intended to be a feminist work, illustrated the severe limitations placed on females during the period and was remarkable in that it completely transcended the ideals of the period. We are presenting a dramatic interpretation of Chopin's masterpiece—one that reveals some of the novel's key elements that aroused such controversy. The protagonist's transformation is explicitly portrayed through various dramatic scenes and is combined with a musical interpretation taken from classical piano selections of the period.

THE EFFECTS OF WHITE NOISE ON HEARTBEAT

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We are analyzing the effects of white noise on the cardiac cycle of a freshwater turtle (*Chrysemys* sp.). White noise is a broad-band noise that ranges from 0 Hz to infinity—our noise generator has an upper limit of 6400 Hz, which is still very high. An electrode attached to the heart, both *in vivo* and *in vitro*, is connected to a random noise generator. The heart is then stimulated while its electrocardiogram (ECG) is being recorded. Different noise levels, defined by the amplitude of the signal, are used, as well as zero noise which represents the control. Stochastic resonance is indicated when a system behaves optimally when a certain level of noise is added. Our evidence for this occurring comes from spectral analysis of the ECG data. Our data indicate the presence of stochastic resonance in the functioning of the heart. The regularity of the heart rate increases as the volume of white noise increases, until the regularity reaches a peak at a specific noise level. We hypothesize that the heart's functioning is a nondeterministic system. For a system to be nondeterministic, it must have deterministic components as well as stochastic components. In the heart, the deterministic element would be the P-Q-R-S-T waves, while the time between the T-P waves would be stochastic. In this model, the T-P period is a stationarity point where the heart is "waiting" for some type of stimulus which will cause it to go into its P-Q-R-S-T sequence. If pacemakers could function by producing white noise, then pacemaker battery life could be greatly extended because stimulation with white noise is an efficient way of increasing the heart's regularity.

THE ARCHITECTURAL HISTORY OF THE ILLINOIS MATHEMATICS AND SCIENCE ACADEMY

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By means of interviews, we are investigating the history of the facilities of the Illinois Mathematics and Science Academy (IMSA), including the main building, the seven residence halls, the athletic facilities, and all other IMSA structures. Changes have been ongoing since IMSA acquired the property in 1985. We are ascertaining why, where, how, and by whom each structure was built, from its original funding to the most recent renovations. Among other interviewees are early resident counselors (RCs) and an official of the West Aurora School District—the builder of the original facilities. Additional information was gathered concerning the student experience with IMSA's architectural developments. Preliminary findings/impressions are that modifications/renovations have been made only at the time they became needed, that the needs were created by IMSA's programs' special demands, *e.g.*, for laboratories and residence halls. The presentation will be in the form of a short walking-tour of the facilities.

A HISTORY OF SEAFARING: A VISUAL MODULE

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We have prepared a video about the history of seafaring. Sailing ships have played a major role in the development of the modern world. These ships made it possible for Europe to conquer much of the rest of the world and for the West to maintain its hegemony around the globe. Our video is intended for secondary school students and history teachers and is to provide a clear introduction to a complex subject and make the subject easily accessible through a multimedia presentation. The video consists of two parts: the first will be a video display of a series of model ships which reflect the evolution of European marine technology and will be accompanied by a narrative of the role that this technology played in world history; the second will present some of the skills of the mariner—knots, boat handling, and navigation—and how these skills allowed the operation of these ships. In combination, the two will present the technology of the sailing ship as being every bit as remarkable for its time as the space shuttle is today—and far more important. Technology, then as now, drove events.

CHOLESTEROL AS AN INHIBITOR OF HUMAN SPERM CAPACITATION

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Sperm capacitation is a process which results in a change in the plasma membrane of a sperm. This process must take place in order for the sperm to become capable of fertilizing an egg. Under natural conditions, the process takes place in the female reproductive tract. The chemical environment of some female tracts may inhibit the process, thus contributing to sterility. One substance which has been thought to perhaps contribute to such inhibition is cholesterol. In order to determine what levels of cholesterol might inhibit human sperm capacitation, we performed *in vitro* experiments by mixing sperm samples with media containing various concentrations of water-soluble cholesterol. For each experiment, a sperm sample was washed to remove seminal fluid and then mixed with media containing various concentrations (0, 5, 10, 20, 100, 200, and 300 mg%) of cholesterol. Owing to time constraints and quantity of sperm in an ejaculate, not all the concentrations were tested concurrently. The sperm/cholesterol mixtures were then incubated at 37°C for three hours to induce capacitation. After incubation, half of the sample containing 0 mg% cholesterol was aliquoted and utilized as the negative control. Sperm capacitation was evaluated by the ability of capacitated sperm to undergo acrosome reaction, which can be induced by calcium ionophore (A23187). Calcium ionophore (A23187) was added to all of the samples except for the negative control. The samples were further incubated at 37°C for 45 minutes to allow the acrosome reaction to occur. Slides were prepared from all the samples, including the negative control, and stained with lectin from *Pisum sativum* (PSA). This stain causes acrosome-reacted sperm to glow under a fluorescent light. The slides were examined to estimate the number of sperm that had undergone the acrosome reaction. The data obtained were then subjected to analysis of variance (ANOVA) to test for cholesterol effects on sperm capacitation. The results revealed that cholesterol levels of 100 mg% and above inhibited sperm capacitation to a greater extent than the lower concentrations did. The lower concentrations inhibited capacitation to almost the same degree as the negative control. Therefore, it appears that cholesterol at the concentrations tested inhibits sperm capacitation.

THE THEORY AND APPLICATION OF RANDOM WALKS

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The theory of random walks has found application in a variety of scientific fields. Some of the sciences benefiting from this field are physics; chemistry; and biology, including genetics. Much of the development in application has arisen only quite recently. Comprehensive books developing the mathematical theory behind such walks have also only recently appeared. I will introduce this seemingly esoteric field and will go over some of the more fascinating aspects of application to such fields as crystallography, electrical networks, and polymer chemistry. Interrelationships between this branch of mathematics and other seemingly unrelated ones will also be demonstrated. I am now applying the techniques of random walk analysis to understanding a random walk on an infinite hexagonal lattice.

THE FORM AND FUNCTION OF POTTERY AT THE SAN MARCOS SITE

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During the fifteenth through the seventeenth centuries, enormous change occurred in the northern Rio Grande area of central New Mexico, owing in part to the intrusion of Spanish conquistadors. We are attempting to evaluate some of the effects of this early Spanish influence. We analyzed one fourth of all the undecorated pottery sherds excavated from the contemporaneous San Marcos pueblo, in respect to inferred diameter of the vessels, presence of corrugations, surface texture, and presence of blackening. These characteristics can be used in ascertaining the form and function of the utilitarian pottery of the pueblo and, by the time of our presentation, should have allowed us to determine the allocation of pottery for consumption and the allocation of pottery for storage. This information should prove useful in gaining important information regarding consumption patterns of food during this period.

NUCLEAR VOLUME OF BRAIN TUMORS IN MICE WITH CEREBRAL GLIOMA AND INTERLEUKIN-2/INTERFERON- γ -TRANSFECTED FIBROBLAST TRANSPLANTS

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We hypothesized that the length of survival of laboratory mice with cerebral glioma tumors might be correlated with the average nuclear volume of the tumor cells. A prior study had indicated that the length of survival of mice with cerebral glioma treated with interleukin-2 or interleukin-2/interferon- γ was prolonged relative to that of mice with an untreated glioma or a glioma treated with fibroblast. In the mice that had survived the longest, the volumes of the tumors were the greatest. The amount of necrosis and the number of lymphocytes had also been examined as possible indicators for the length of survival, but no correlations were found. We measured nuclear volume by examining slides of tumor sections. Each slide was randomly marked at five points. Within each mark, nuclei of 12 cells at intersections of a grid were measured. The diameter of each nucleus was used in approximating the nuclear volume. The slides used were the same as those that had been used in the previous study discussed above. No correlation was found between lengths of survival of the mice and nuclear volumes.

A PORTRAYAL OF JANE COOKE WRIGHT, A PIONEERING BLACK WOMAN

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Jane Cooke Wright was a pioneer in cancer research. Dr. Wright was born on November 30, 1919 in New York City. She graduated from Smith College. She then continued at New York Medical School where she received a full scholarship. Her internship and residency were done at New York's large Bellevue Hospital and later at Harlem Hospital. Her supervisor at Bellevue later said that she was the most promising intern who had ever worked with him. Dr. Wright contributed greatly to chemotherapy research and she developed tissue culture tests for anticancer drugs. In 1975, the American Association for Cancer Research saluted Wright for her research on chemotherapy for cancer. She denies that her famous father, Louis Wright, had any influence over her career. Wright retired in 1987 because, in her words, "I'm getting old". She doesn't believe that being either black or a woman hindered her career. Jane Cooke Wright's life, professional and private, will be portrayed and helpful hints and good advice from Dr. Wright will be given in a dramatic presentation in which Ms. Heard plays the role of Dr. Wright.

CHICAGOLAND TV NEWS – "AN EXPERIENCE IN BROADCAST JOURNALISM"

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I worked with management at ChicagoLand Television News (CLTV) to produce a 10-minute "behind the scenes" video tour of the station. The video will be shown to visitors to CLTV in order to give them an idea of how a newscast is produced at Chicago's only 24-hour cable news station. At the conclusion of showing the video, I will summarize what I have learned about preparing news for broadcast. I will also discuss the process that I used in writing and producing an original video.

COMPARISON OF STAR DISTRIBUTION WITHIN OUR GALAXY WITH GALACTIC MODEL STAR-COUNT PREDICTIONS

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There are two main galactic models which predict star distribution in our galaxy. The first is the Bachall model, which suggests that the stars should be distributed in three regions, a sphere, a thin disk, and a thick disk. The second model is one in which there would be no thick disk but only a sphere and a thin disk. Utilizing data collected by telescope onto a CCD chip, we are determining the actual starcounts for certain regions of the sky. We are comparing the starcounts predicted by the galactic models with the actual starcounts. This analysis should lead to the choice of one model over another, or, more specifically, answer the question: is there a thick disk?

ANTILIPOPROTEIN ANTIBODIES IN PATIENTS WITH STROKE

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Atherosclerosis, a form of arteriosclerosis, is associated with the formation of deposits of small fatty nodules on the inner walls of the arteries. This also leads to the deterioration of the involved area. Atherosclerosis is involved in coronary heart disease and in rupture of cerebral blood vessels, *i.e.*, stroke. Among stroke patients, dyslipoproteinemia, characterized by increased concentrations of serum triglycerides and decreased levels of high density lipoprotein (HDL), is a frequent finding. Because it has also been shown that rheumatoid arthritis patients with antilipoprotein antibodies (aLA) show a similar pattern, with increased concentrations of triglycerides and decreased HDL cholesterol, we have studied the presence of aLA in 127 stroke patients. Antilipoprotein antibodies (determined by passive microhemagglutination) were found in 38 out of 127 patients. The titer of aLA was 1:4 in 7 patients, 1:8 in 13 patients, 1:16 in 10 patients, 1:32 in 5 patients, 1:64 in 2 patients, and 1:256 in 1 patient. The presence of aLA may be the factor which disturbs lipid metabolism, thus creating the high levels of triglyceride and low concentrations of HDL. This suggests that the presence of aLA could be the risk factor for vascular complications in stroke patients.

EQUILIBRIUM RELATIVE HUMIDITY OVER SATURATED SALT SOLUTIONS

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We designed a computerized system to measure relative humidity, using a special probe that sent signals back to the computer. We used saturated salts in testing the accuracy of the setup. Use of saturated salt solutions provides a convenient and easy method for calibrating humidity sensors because, at a given temperature, the relative humidity above such a solution is a constant. By providing excess solute, the solution will remain saturated even in the presence of modest moisture sources. We tested each salt several times, and, using computer analysis and Matlab, we charted the variation in our readings. We found our system to be both accurate and consistent. The experiments were done in a jacketed diffusion chamber. The temperature inside the chamber was maintained at a constant 37°C by pumping water through the chamber's jacket from a temperature-controlled bath. The relative humidity probe was placed through a gasket in the cover of the chamber and sent relative humidity, temperature, and time readings to a computer via an RS-232 connection. The rate of air flow was monitored by a needle valve from a compressed air tank. We concluded that 95 out of 100 readings from the relative humidity probe will be accurate within 1.574%. This was similar to the figure given by the manufacturer for the VAISALA 2000 humidity sensor that we used. These results show that if the humidity probe has just been calibrated, it can be used with confidence.

STATISTICS AND THE SIZE AND SHAPE OF BASIDIOSPORES

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Shape and size of basidiospores are major characteristics used in identifying and classifying species of fungi. However, detailed analyses of the variation in spore size and shape have not been published. There are two sources of spores that can be measured—spore prints or the fruit body itself. The questions we are addressing are: 1.) Is there a difference between the measurements of spores from the two sources? 2.) What number of spores must be measured to get a statistically sufficient sample? We measured spore length and width using *Java*, a digital imaging analysis system attached to a microscope. A preliminary study, using 20-45 measurements of each spore for six species of fungi, showed variations in standard deviations and variances between samples and sources of spores. Measurements were then limited to one sample in order to study the variables more intensely. Using several hundred spores from two observers as a test base, the computer randomly generated various numbers of spores to form test groups which we are now analyzing in order to determine the minimum sample size sharing the mean and range of the total set. By the time of our presentation, the results of this analysis should be complete.

C₁₈ REVERSED PHASE HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY AND MASS SPECTROMETRY OF OLIGONUCLEOTIDES

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Because of its high specificity, selectivity, and sensitivity of analysis, electrospray mass spectrometry, interfaced with high-performance liquid chromatography, will be essential for identification and quantification of antisense oligonucleotide therapeutic agents in blood and tissues. Members of a new class of therapeutic agents, antisense drugs, are now undergoing clinical trials for the treatment of a variety of viral infections and cancers. Without radiolabelling, the similarity of antisense agents to endogenous nucleic acids makes them difficult to detect in biological samples. This similarity necessitates the development of more specific chromatographic techniques that are compatible with state-of-the-art electrospray mass spectrometry. Our research is driven by the need for a more selective method of chromatography. We compared three HPLC stationary phases, including 1) ion-exchange, 2) reversed phase, and 3) affinity. We determined that the ion-exchange method would be incompatible with electrospray LC-MS owing to the high ionic strength of the mobile phase. Reversed phase HPLC provided separation of simple oligonucleotide mixtures and was compatible with LC-MS. Upon receiving favorable results from the C₁₈ reversed phase columns, we proceeded to immobilize two nucleic acid bases, adenine and thymine, in hopes that through affinity chromatography, columns packed with these compounds would provide more selectivity in the separation of oligonucleotide mixtures and at the same time utilize mobile phases that are compatible with LC-MS. As yet, we have not been able to get reproducible results in this experiment. Once an affinity HPLC method for separating antisense polymers is developed, quantitative LC-MS methods will be developed for analysis of antisense drugs and identification of their metabolites. Antisense therapeutic agents show promise in providing novel and practical treatments to control many chronic diseases such as cancer and AIDS.

STUDENT RESPONSES TO RESIDENTIAL AND NON-RESIDENTIAL STIMULUS

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A survey was given to twenty students at the Illinois Mathematics and Science Academy (IMSA)—a residential school—and forty-one students at the Bronx School of Math and Science—a non-residential school. Students were asked to wear a pre-programmed watch set to “beep” at various times between 7:30 A.M. and 10:30 P.M. and to respond by answering certain questions when “beeped”. The questions concerned the emotional states of the students at the time they were “beeped”. Gradients of emotional states asked about included sad to happy, excited to bored, etc. Preliminary results are consistent with the hypothesis that a student from a residential school such as IMSA is more likely to become apathetic than a student from a non-residential school such as the Bronx School of Math and Science. Further analysis using various statistical methods, such as Z-scores, to test the hypothesis should be completed by the time of our presentation, and, if they have been, our results will be discussed.

THE RELATIVE ABILITY OF DIFFERENT CHEMICALS TO DONATE NITRIC OXIDE (NO)

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Nitric oxide is a microbicidal inorganic substance produced by leukocytes and other cells which play a major role in defense against infection. We are investigating the release of nitric oxide (NO) from various NO donors in three different media over time in order to determine which will be best for use in a drug against etiologic agents of sexually transmitted diseases. We used 3-morpholinosydnonimine (SIN-1), sodium nitroprusside (SNP), and isosorbide dinitrite (ISN)—all three at both 1mM and 5mM concentrations in saline, in Mueller Hinton broth (MH), and in tissue culture (TC). The kinetics of NO release were measured by the Greiss Reaction, a spectrophotometric measure of nitrite. Nitrite is one of the two chemicals (nitrate being the other) which spontaneously form as the result of NO contacting O₂. Nitrite levels were measured at 540 nanometers. Standard controls for nitrite concentrations were done at the same time. The results indicated that for each of the NO donors, there was a much greater and faster NO release in TC than in MH, and relatively none in saline. SIN-1 had the best release results, with almost one-half of the original amount of the compound being released as nitrite in solution over 22.5 hours in TC. ISN had the worst release kinetics, releasing a concentration of only 12uM nitrite in solution in 3 hours, with only one-fourth of that remaining in solution after 22.5 hours.

INTERLEUKIN 12 REGULATION IN ETHANOL-CONSUMING C57/BL6 MICE

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We are investigating the effects of ethanol on immune function and cytokine production. It is known that alcoholics tend to have more infections than non-alcoholics. Th1 lymphocyte mediated immune function is more sensitive to modulation by alcohol than are Th2 mediated responses. Mice fed an ethanol-containing liquid diet show decreased amounts of the Th1-produced cytokine, interferon- γ (IFN- γ). Interleukin 12 appears to be necessary for the production of both Th1 and IFN- γ . IL-12 has a protein subunit of 35,000 daltons and another of 40,000 daltons. These protein subunits are designated p35 and p40, respectively. The literature suggests that p40 mRNA is transcriptionally regulated. mRNA is isolated using poly dT cellulose, from which first strand cDNA is produced by reverse transcribing the mRNA, using poly dT as primers. We used IL-12 specific oligo nucleotides to amplify IL-12 specific cDNA in a Polymerase Chain Reaction (PCR). Results of the PCR indicated the extent to which regulation of IL-12 cytokine mRNA was taking place in the alcohol-consuming mice. Experiments optimized the PCR protocol for IL-12, using IL-12 cDNA specific primers. Results suggest that IL-12 is being downregulated in ethanol-consuming mice. Phase II of the project is underway, with competitive PCR analysis being used to quantify production of IL-12. Thus our results suggest that at least a portion of the decrease in immunity in alcoholics may be attributable to downregulation of IL-12.

INCLUSIONS IN THE AXTELL CARBONACEOUS CHONDRITE METEORITE: A WINDOW ON THE FORMATION OF THE SOLAR SYSTEM

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Mentor : Shigekazu Yoneda, Department of the Geophysical Sciences, University of Chicago, 5734 S. Ellis Avenue, #389, Chicago, IL 60637, U.S.A. 312/702-9505 (phone)

Carbonaceous chondrite meteorites are characterized by pockets of minerals, called inclusions, which have remained virtually unchanged since the cooling of the solar nebula. Some of the minerals making up these inclusions are those that are predicted to have been among the first to condense from the primordial solar gas cloud. The study of these inclusions can yield evidence about the physico-chemical conditions during the formation of the solar system. I am attempting to determine the extent to which the inclusions in the previously unstudied Axtell meteorite agree with those known previously from other carbonaceous chondrites. With a scanning electron microscope, I have examined and photographed several thin sections of various types of inclusions from the Axtell meteorite. Through X-ray spectroanalysis, I have identified the minerals present in these inclusions. Preliminary results show that the inclusions appear to fit within the somewhat broad categories of a standard scheme of classification that has been developed. This indicates that the Axtell inclusions formed through a sequence of physico-chemical events similar to those responsible for the inclusions in previously studied carbonaceous chondrites. However, some inclusions show characteristics which suggest small differences in formation.

ELECTRONIC MODELING OF AMPEROMETRIC GAS SENSORS

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We tested electrochemical sensors with different physical characteristics in order to ascertain their time response to a DC step function. Their behavior correlated closely with that of a capacitor, as would be expected from their design. Using our test results, we have developed, empirically, a simple model of the sensor under DC conditions, and we have approximated the constants for that model. Our results show an initial signal spike and then gradual decay toward a baseline signal. Our model of the gas sensor, which functions as would a capacitor with relatively low leakage resistance, is similar to a previous model developed by Fidler and consisting of several capacitors and resistors. As of this writing, an adequate examination of the initial data has not yet been made and additional tests still need to be performed. At the time of our presentation, we should have more information, some of which should prove useful in designing future sensors.

THE EFFECT OF ENTEROPATHOGENIC *Escherichia coli* INFECTION ON INTESTINAL EPITHELIAL CELL FUNCTION

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Enteropathogenic *Escherichia coli* (EPEC) infections are a leading cause of diarrhea in developing countries. Although it is known that EPEC induces biochemical changes in the host cell, the means by which those changes alter host cell function remain unknown. Our research focused primarily on the role of tight junctions as regulators of paracellular movement of fluids and ions. Previous studies have shown that EPEC causes an increase in intracellular calcium. This increase in calcium could indirectly cause the contraction of a ring of contractile proteins underlying the tight junctions. This would lead to the opening of the junction, thus disrupting barrier function. In order to verify the pathway by which EPEC causes the opening of tight junctions, we performed *in vitro* studies using cultured human intestinal epithelial T₈₄ cells. A disruption in barrier function was marked by a decrease in electrical resistance across the epithelial layer. *E. coli* strain E2348/69, a wild type strain of EPEC, as well as several genetically mutated EPEC, were employed in these experiments. Preliminary results suggest that the activation of myosin light chain kinase (MLCK), leading to the phosphorylation of myosin light chain (MLC), is involved in the disruption of barrier function.

ANESTHETIC EFFECTIVENESS OF SOLVENTS

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We are using single, isolated skeletal muscle fibers of frogs (*Rana pipiens* species complex) in order to study the anesthetic properties of aliphatic hydrocarbon solvents. We dissect free a single fiber from a whole semitendinosus muscle and then place a segment of the fiber on a chamber so that we can control the voltage across the membrane and record the currents through it. Sodium currents were obtained by applying cesium fluoride to the ends of the fiber, as this blocks all other currents. The solvents are applied to the fiber externally in order to determine how much they block the Na currents. We have reached an initial conclusion that nonpolar solvents with a small molar volume block more effectively than polar compounds with larger molar volumes do.

JEWEL PLUMMER COBB: A GEM OF A SCIENTIST

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Jewel Plummer Cobb first became interested in the "hard sciences" in a Chicago high school sophomore biology class when she was given a microscope in order to, in her own words, "view an entirely new world beyond [her] normal viewing capacity". Since then, Dr. Cobb has pursued her interest in biology in becoming a distinguished authority on cancer and a teacher and mentor to those who share her love of science. I will tell the story of Dr. Cobb's life in an original one-woman play designed to enable young people to understand the pull to science as a life's profession.

LEVELS OF DEGRADATIVE ENZYME mRNA AND PROTEASE INHIBITOR mRNA IN THE STROMAL AND EPITHELIAL LAYERS FROM PATIENTS WITH KERATOCONUS

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Keratoconus is a disease characterized by thinning of the central portion of the cornea. Experiments have demonstrated that the total protein level in keratoconus corneas is lower than in normal corneas. Also, specific histochemical staining has shown a higher level of the degradative enzyme lysosomal acid phosphatase (LAP) and a lower level of the protease inhibitor alpha-1-proteinase inhibitor (alpha-1-PI) in the stromal and epithelial layers of keratoconus corneas as compared to normals. We examined the mRNA levels of LAP and of alpha-1-PI in keratoconus corneas to see how they differ from those of normal corneas. We extracted, amplified, and electrophoresed the mRNA, using a competitive internal standard to determine the numerical levels of LAP and alpha-1-PI. From our results thus far, it appears that keratoconus corneas contain higher levels of LAP mRNA and lower levels of alpha-1-PI mRNA than normal corneas do. These are the results that would be expected, and it may be that the demonstrated correlations among total protein level in karatoconus; LAP, alpha 1-PI, and their mRNAs, may in time be shown to play some role in the etiology of karatoconus.

METHOTREXATE TREATMENT AFFECTS LYMPHOID TISSUE CELL ADHESION MOLECULE EXPRESSION IN RECIPIENTS OF RAT CARDIAC ALLOGRAFTS

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We and others have observed prolonged survival of rat cardiac allografts in combination low-dose cyclosporine A (CSA)/methotrexate (MTX)-treated recipients. There is controversy concerning the means by which MTX mediates immunosuppression. MTX has been shown to inhibit the adherence of neutrophils and fibroblasts to endothelial cells *in vitro*. We hypothesize that MTX treatment of cardiac transplant recipients may affect cellular adherence by downregulating cell adhesion molecule (CAM) expression. An initial step in allograft infiltration by host leukocytes consists of leukocyte adhesion to graft endothelium, an active process mediated by at least one ligand pair, ICAM-1/LFA-1. We have therefore investigated the degree to which low-dose CSA and low-dose MTX treatment alone and in combination impact CAM expression in rat accessory cervical heart transplants. Northern blot analysis was utilized to assess CAM steady-state mRNA levels post-transplant. According to mRNA analysis, ICAM-1 expression was upregulated in graft regional lymph nodes and spleen obtained from untreated cardiac allograft recipients. Despite VCAM-1 expression on cardiac allograft endothelium, ICAM-1 expression remained virtually undetectable in cardiac allograft tissue by both Northern blot and immunohistochemical analysis. These findings suggest a possible role for ICAM-1 in leukocyte trafficking from lymphoid tissue during rat cardiac allograft rejection. In spite of prolonged allograft survival, CSA alone and CSA/MTX combination treatment did not result in diminished steady-state ICAM-1 mRNA levels in regional lymph nodes or spleens in cardiac allograft recipients. MTX treatment alone, however, did result in diminished ICAM-1 expression in allograft recipient lymphoid tissues. We conclude that MTX treatment may downregulate CAM expression and that such effects may underlie at least in part MTX-mediated immunosuppression.

THE EFFECTS OF PHOSPHATES IN CLOSED-SYSTEM AQUARIA

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We are investigating the effects of phosphates in closed-system aquariology. Phosphates occur in nature as byproducts of the breakdown of food sources. Phosphates are also found in water supplies and in some dechlorinators and salt mixes used in aquariums. High nitrate levels are known to cause certain problems for aquarium fish, such as lateral line erosion, discoloration, and irregular fin growth. These symptoms have also been found, however, in aquariums with healthy nitrate levels, which has led us to search for another cause. We hypothesized that this might be high phosphate levels. We are using two 20-gallon aquariums, each with its own filtering system and containing one fish, a regal blue tang, *Paracanthurus hepatus*. The level of phosphates in one of the tanks was raised gradually and the level of phosphates in the other aquarium was kept at approximately .4 ppm, very similar to the level in the ocean. The aquarium with lower phosphate levels had less growth of undesirable algae and the fish was healthier. It is known that phosphates encourage the growth of certain algae which reproduce rapidly and cause health problems for other organisms in the tank. This two-aquarium experiment is intended as a preliminary feasibility study and, now that it has been completed, additional experimentation is to be carried out with more replications.

LONGITUDINAL STUDY OF IMSA GRADUATES: A FIVE-YEAR REPORT CARD

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Beginning with IMSA's charter class, each graduated class at the end of its freshman year in college has been administered a forty-item survey which assesses academic achievement, habits of mind, creativity, ethical-decision making, wellness, and levels of satisfaction with educational opportunities. Results of the survey are compared to responses of a group of similar high-achieving students from Illinois. IMSA graduates and comparison group students are again interviewed during the last semester of college, at which time comparisons are made between the responses of IMSA students and of the comparison group and the responses of the same groups four years earlier. Whenever possible and appropriate, responses of IMSA graduates are compared to national normative data. Chi-square and content analysis of the responses from the first five years of interviews indicate significant differences between IMSA graduates and comparison students in regard to satisfaction with high school and college, number and type of degrees earned, advanced placement at the college entrance level, honors and awards, public service and volunteer service, and intellectual development as measured by the Perry scheme. IMSA's longitudinal study is currently being redesigned in order to reflect changes in the curriculum and in residential life, differences in the student body over the past ten years, and IMSA's impact on education in the state of Illinois.

DEVELOPING PROCEDURES FOR THE IDENTIFICATION OF GEL INKS

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A quick and simple means of identifying an ink is an important tool to both forensic scientists and to document examiners. One of the newest types of writing inks is a water-based gel ink. Invented in Japan, this ink is now being distributed in the U.S. by five major ink companies. Using common laboratory methods, we are attempting to develop a simple method for classifying an unknown ink as a gel ink, and for then determining the ink's manufacturer. Ink samples were obtained by writing the known manufacturers and through the Internal Revenue Service's ink library. Initially, the inks were examined visually under UV light, the Visual Spectral Comparator (VSC) infrared image converter, and microscopically. Several solvents were then tested to determine the differences in solubility among the inks. The inks were then extracted using the best solvents, spotted on thin-layer chromatography plates, and developed. The plates were observed visually under UV light, with the Omniscan high-intensity light source, the VSC, and an argon ion laser to note characteristics of the inks. The fluorescent colored inks extracted fairly easily and were distinguishable when spotted and developed on a TLC plate. The black and blue inks did not dissolve in any of the original solvents. The inks did react with sulfuric acid but did not provide useful separations. However, the acid left the ink's pigment in solution. The isolation of the pigment would allow for the testing and for the possibility of pigment identification. If the pigment can be isolated and is found to be characteristic of the ink and the manufacturer, then the inks will be identifiable and distinguishable. From this point, an attempt will be made to devise a procedure to leave a clean and isolated pigment for microscopical and microinfrared spectroscopic analysis.

CLASSIFICATION OF GALAXIES BY COMPUTER ANALYSIS OF CCD IMAGING DATA

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Past sky surveys used photographic plates to record galaxies, and the morphologies of the galaxies were determined by observers directly studying the plates. Now, CCD cameras are making possible large-scale digital sky surveys. We are investigating an automatic method of computing the morphologies of galaxies directly from digital CCD data, as has been described by Abraham *et al.* This method involves finding a concentration index, which is a measure of how much light is concentrated in the center of the galaxy. The index is computed using the ratio of total flux inside two elliptical apertures of different sizes drawn around the galaxy. This method will be presented in more detail. At present, our evaluation of the method is incomplete but it should no longer be so at the time of our presentation.

A PORTRAYAL OF MAE JEMISON

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Mae Jemison was born on October 17, 1956 in Decatur, Alabama. She was relocated in Chicago when she was an infant. Dr. Jemison attended Morgan Park High School in Chicago; Stanford University, where she received degrees in Chemical Engineering and African-American Studies; and Cornell University Medical School. Mae Jemison applied for the NASA space training program in 1987, and was one of only fifteen of the 2000 applicants to be accepted into the program. While in space, she was a member of STS 47, Space Lab J, in which she performed biological experiments, including a highly publicized one on frog fertilization. In 1993, after she had resigned from NASA, Dr. Jemison formed the Jemison Group, which is dedicated to bringing space-age technology to developing countries, to promoting science education among the public, and to involving people in the space exploration programs. Dr. Jemison's accomplishments will be presented in a solo dramatic portrayal of the scientist.

THE EFFECTS OF DOMINANT NEGATIVE FGF ON PRE-IMPLANTATION MOUSE EMBRYOS

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Fibroblast growth factors (FGFs) are important in pregastrulation in frogs, chickens, and mice. There are nine related FGF ligands and four related receptors for FGFs. FGF-4 mRNA and protein 64-cell mouse blastocyst are the main receptors used in our experiments. We are performing immunocytochemical analyses on the embryonic stem cells and blastocyst cells in order to detect the presence of the antigenic dominant negative receptor. We then use a series of antibodies against the dominant negative FGF and develop them with alkaline phosphatase reagents. A nuclear stain is then placed on the cell and viewed under the electron microscope. FGF-4 protein is expressed only in the inner cell mass. FGF-4 increases the number of parietal endoderm cells growing out from cultured inner cell masses. We have found that if a dominant negative FGF receptor is expressed in stem cells resembling cells of the inner cell mass, these stem cells die or grow more slowly. We have also established that if a dominant negative (which imitates the receptor and gives a negative signal) inhibits FGF signalling and is expressed in the blastocysts, it is lethal.

WHAT DOES AN ORCHESTRA SOUND LIKE ON THE BOTTOM OF THE OCEAN?

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Have you ever wondered what a musical instrument would sound like if the atmosphere was all helium? This year, we investigated how a violin and a flute would sound under these and other conditions. We constructed a simple model of an instrument, an environment, and a listener, that separated the problem into generation, propagation, and receiving of sound. This enabled us to model the effects of different atmospheres on each part of the system. Using signal processing techniques, we analyzed recordings of the flute and violin. Ultimately, we were able to reconstruct the sound as the listener would hear it in the altered atmosphere. You will hear a sample played. Although the physics governing this problem is well known, we discovered that it is impossible to construct any closed-form mathematical description of the sound generated. We spent most of our time on investigation—learning the physics and discovering the best way to analyze the problem. Finally, once we understood the tools available on PCs, it was a straightforward process to generate sound as it would be heard in a different atmosphere.

DEVELOPING MULTIFUNCTIONAL ROBOTIC GRIPPERS

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I have developed multifunctional robotic grippers intended to be capable of holding, specifically, a vacuum generator, a hair comb, and a syringe. These functions are important to work being conducted in the laboratories of Helene Curtis, Inc. I developed two different plans for activating the syringe. The first design requires one robotic finger to hold the syringe and the other finger to push down the plunger. The robot hand has a limited pushing force and products of different viscosity produce different resistances when pushed. However, after taking viscosity *vs.* force measurements for different products, it was apparent that the highest force required to operate the syringe is lower than the force produced by the robot. The second plan involves a pneumatic cylinder to push the plunger while the grippers hold the syringe in place. This plan is more practical than the first because the pneumatic device is able to produce a large force and is more easily controlled. Computer AutoCad drawings of the grippers illustrate the static aspect of the design, and these will be shown during the presentation. "True Space" path animation was used to evaluate the dynamic aspect of the design as it was used on a "virtual robot."

INVESTIGATION OF THE POSSIBILITY OF RELATIONSHIPS BETWEEN NUMBERS OF NEURONS IN THE HIPPOCAMPUS AND VARIOUS DISEASES

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We tested the hypothesis that the number of neurons in the hippocampus is less in alcoholics. We assigned various diseases to 10 different groups, *i.e.*, brain diseases, heart diseases, lung diseases, gastrointestinal tract diseases, liver diseases, infections, cancer, AIDS, endocrine disorders, and alcoholism, and counted the number of neurons and number of glial cells in slides of the hippocampus from individuals who had suffered from these diseases. We attempted to find relationships between the number of neurons and the number of glial cells in the hippocampus (correlated with the disease group), between the number of glial cells and the disease group, and between the number of neurons and the disease group, but we found no correlations. Thus our investigation appears to have falsified the hypothesis.

REACTIONS OF 2-SUBSTITUTED CYCLIC KETONES AND POTASSIUM SUPEROXIDE IN CROWN ETHER

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We are investigating the potential synthetic utilization of KO_2 in crown ether—specifically, the reactions of 2-substituted cyclic ketones with potassium superoxide in crown ether—to provide an easier method for the synthesis of delta and higher keto-acids. All of our experimental reactions involved 2-phenyl and 2-methyl cyclic ketones with benzene as the solvent. The product formation was monitored through TLC. Through NMR spectroscopy, we confirmed the identity of our product to indeed be methyl or phenyl delta and higher keto-acids. However, in the case of 2-methyl cyclic ketones, the reaction was complete in about 2.5 hours, whereas the reaction involving 2-phenyl-cyclohexanone took only 15 minutes. We concluded that KO_2 does act as an oxidizing agent in these reactions and then substituted KOH for KO_2 because KOH is safer and cheaper. To simulate the same atmosphere which KO_2 provides, we bubbled in oxygen gas. Although the reaction involving 2-phenyl-cyclohexanone, which took only 15 minutes when using KO_2 , took 45 minutes with KOH, the same product was produced. These results show that KO_2 and crown ether or KOH, O_2 , and crown ether can be used as oxidizing reagents in the formation of delta or higher keto-acids.

INVESTIGATION OF A MODIFIED NUCLEOSIDE AS A MARKER FOR BRAIN TUMOR RECURRENCE

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Elevated levels of urinary excretion of the modified nucleoside pseudouridine have been shown to be associated with various sorts of brain tumors. We hypothesize, therefore, that increasing levels of excreted pseudouridine can be correlated with brain tumor recurrence after tumor removal. In our procedure, clinical urine samples are run through a phenylboronate affinity gel column in order to isolate the modified nucleosides from the rest of the urine. We then inject the eluate into a high-performance liquid chromatography (HPLC) machine. We also analyze patient urine samples for their creatinine clearance in order to normalize the pseudouridine levels to each individual's metabolism. To date, we have found elevated pseudouridine levels in brain tumor patients prior to surgery. After tumor removal, these levels have dropped and remained constant for at least three months (that is, until the present). Because recurrence of brain tumors is not generally observed until four to six months post-surgery, our data are, thus far, not inconsistent with our hypothesis. In future, we may also look at other modified nucleosides as potential markers.

ISOLATION AND IDENTIFICATION OF THE ANTIGEN/ANTIBODY REACTION IN HEPARIN-INDUCED THROMBOCYTOPENIA/THROMBOSIS

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Heparin, the most commercially available anticoagulant in medicine, has myriad applications, ranging from use during heart surgery to thrombosis treatment. Heparin-induced thrombocytopenia/thrombosis (HITP), however, is a relatively common, often serious, and potentially fatal complication of heparin therapy. Thought to be mediated by immunoglobulins, the molecular basis for HITP has not yet been fully established. It is known that HITP is caused by an antibody reacting with immobilized complexes of heparin and platelet factor 4 (PF4). Our research involved purifying and identifying the antibody responsible for reacting with heparin/PF4 complexes from antibody-enriched plasma. The plasma had been extracted using a protein A sepharose column, then dialysed against phosphate-buffered saline, and, finally, concentrated using an Amicon filter. Clotting times for complexes were measured using Helena Laboratory's Activated Partial Thromboplastin Time (APTT) Reagent. Aggregations of the platelets were also monitored using a Bio-DATA aggregometer, while quantitative measurements of heparin were taken using Heptest. Non-specific complexing agents such as Polybrene and Protamene were used to initiate the changes in the heparin molecule. Normal human plasma was used as a control. We have now purified the antibody-enriched plasma, conducted preliminary and, thus far, inconclusive aggregometer analyses of the test plasma, and ascertained clotting times of Polybrene. By the time of our presentation, we should have determined the concentration of Polybrene required for testing of the antibody-enriched plasma.

CREATING AN INTELLIGENT STREET INDICATOR SYSTEM

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We are developing an intelligent street indicator system—a computerized system for finding the fastest automobile route from one's location to the desired destination. Initially, we developed a concept map for finding a way to input data into an algorithm which we had developed and which can calculate values for such variables as time spent at traffic lights, time-of-day-related times between points, distances, etc. Instead of entering data from a spreadsheet into this algorithm, we decided to develop another algorithm which would not require acquiring data from a spreadsheet. We have not yet successfully developed a suitable algorithm, however, so we may still find the alternative of using a spreadsheet to be useful. We have now completed a program that can calculate route-relevant data but which must be inputted manually. Our next step will be to see if we can use a matrix to store and manipulate our data, perhaps using Mathematica or Maple. If the program can accept the values from Mathematica or a similar program, then the potential for our system would seem to be unlimited.

HEIDEGGER IN RUINS: A DOCUMENTARY FILM

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In 1987, Victor Farias's book, *Heidegger and Nazism*, established beyond question that Martin Heidegger, revered as one of the most profound thinkers of the twentieth century, was an enthusiastic Nazi. More scandalous than his energetic support for Hitler and his belief that the Nazi revolution represented the "saving power" of Western humanity, was Heidegger's disgraceful postwar silence concerning the Holocaust. My investigation of this topic draws from history, philosophy, political science, and psychology. I am attempting to put the issues in terms understandable to the general public, especially the often confusing, complex, and esoteric language of Heidegger's philosophy. The implications of his allegiance to the Nazi movement, of his attempt to be the philosopher of National Socialism, are alarming. We are forced to ask again: What is the role of the philosopher in society? Can Heidegger's thought be separated from his political actions? What is the responsibility of those intellectuals who have so much invested in Heidegger's thought that they choose to deny the truth and to refuse to re-evaluate Heidegger's writings in light of new and conclusive evidence of his Nazi past?

EDITORIALS ON EDUCATION: A STUDY OF FOUR NEWSPAPERS

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I conducted a content analysis of 1,102 editorials in four major daily newspapers in order to determine the frequency and nature of editorial comment on education. The four are among the top ten daily newspapers in numbers of readers and represent a geographically diverse sample. My results indicate that education is not a high priority subject for editorial comment and that the limited comment that does appear is unfocused and fragmented. Education was the subject of approximately 5% (60) of the editorials. These editorials addressed 15 subtopics, altogether ignoring several which seem fundamental to the business of education ("teaching/learning", for example). The editorial subtopics also did not correspond to the subtopics previously identified by newspaper editors as high priorities for coverage in their papers. My findings suggest that the agenda-setting potential (ability to influence the public and/or policy-making agendas) of education editorials is low. Among my recommendations for practice by educational leaders and communication practitioners is that they be more proactive in cultivating relationships with newspaper editors, raise questions for them to consider, and expand their frame of reference on the topic of education.

THE INFLUENCE OF EXPECTATIONS ON THE SUBJECTIVE EFFECTS OF AMPHETAMINE IN HEALTHY NORMAL VOLUNTEERS

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The subjective effects of an instance of drug abuse are usually directly related to the dosage level. However, there is evidence that people's expectations concerning effects may interact with the effects themselves. We examined expectations concerning the subjective effects of a stimulant (d-amphetamine) in 40 human subjects who reported no prior use of any type of stimulant other than caffeine. A balanced placebo design was used to create 4 groups to which subjects were randomly assigned: Told Placebo/Given Placebo (P/P), Told Placebo/Given Stimulant (P/S), Told Stimulant/Given Stimulant (S/S), Told Stimulant/Given Placebo (S/P). On arriving at the laboratory, subjects completed a number of subjective effects questionnaires designed to measure their then current feelings and mood. Then they ingested a capsule and received information about contents. After taking the capsule, subjects left the laboratory and for the next 8 hours completed the subjective effects questionnaires every 2 hours. Of the 2 groups who received the stimulant, the P/S group reported less pronounced subjective effects than the S/S group. The S/P group reported more substantial effects than the P/P group. Thus, our data revealed that expectation of getting a stimulant increased the subjective effects reported.

1890-1900 ECONOMIC ACTIVITY IN DU PAGE COUNTY AND SURROUNDING AREAS

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The restoration of Kline Creek Farm has been undertaken in order to foster understanding of life in this area at the last turn of a century. This educational center is actively engaged in the gathering of information on the time period and place in question. We have now started gathering information on such things as stores, businesses, mail-order goods, rural free delivery, and other such economy-related matters, so as to acquire knowledge concerning the economic activities of the day. We have been gathering information from local libraries, old newspapers, local history museums, mail order catalogs, the libraries of the farm itself, and any and all other sources available. The collection of documents that we have amassed should prove serviceable to anyone interested in tracing the early history of growth of certain local communities and the history of various entrepreneurial endeavors in the area.

DEVELOPMENT OF A THREE-DIMENSIONAL QUANTITATIVE STRUCTURE-ACTIVITY RELATIONSHIP FOR AN ANALOG SERIES OF 3-QUINOLYLUREA DERIVATIVES

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We are trying to identify the key molecular properties responsible for the observed biological activity of a series of 3-quinolylurea derivatives. These derivatives are acyl-CoA:cholesterol acyltransferase (ACAT) inhibitors. ACAT plays a key role in cholesterol absorption from the intestine, in cholesterol secretion from the liver, and in cholesterol accumulation in the vascular wall. By controlling cholesterol at various levels, the risk of cardiovascular diseases could be considerably reduced. We designed a mathematical recipe of the sort called a three-dimensional quantitative structure-activity relationship, or 3D-QSAR, in order to predict the biological activity of a new molecule before it is synthesized and biologically tested. The 3D-QSAR should prove to be a powerful tool in future design of new, highly potent 3-quinolylurea derivatives. We computed, as potential activity descriptors, spatial properties (*e.g.*, overlap and nonoverlap volume, molecular surface area), electronic properties (*e.g.*, dipole moment, HOMO and LUMO energies), and thermodynamic properties (*e.g.*, heat of formation and log p). Advanced statistical techniques such as Partial Least Squares and Genetic Algorithms are now being used to optimize the correlation relationships between the estimated molecular property measures and the observed biological activities.

DEVELOPMENT OF APROTININ FORMULATIONS: AN EXAMINATION OF VARIOUS FORMULATION FACTORS AFFECTING APROTININ ACTIVITY

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I investigated the effects of various additives on the formulation of protease inhibitors. I used aprotinin (of molecular weight 6500) as a model protease inhibitor because of its relative abundance. Aprotinin is used clinically to offset the effects of acute pancreatitis, of various stages of shock syndrome, and of hyperfibrinolytic hemorrhaging. I examined pH, ionic strength, and salt concentration as well as the effects of surfactants and of permeation enhancers. In order to measure the activity of aprotinin, I considered its inhibition of trypsin. I assayed trypsin by means of a method reported in the USP, XXIIIrd edition, except that the method was modified to incorporate aprotinin into the assay. Spectrophotometric analysis revealed that some formulation additives and factors influenced the activity of aprotinin on trypsin. At pH 2, there was slightly decreased aprotinin activity, while pH 10 had no effect on aprotinin activity. KCl brought about a concentration-dependent reaction in which aprotinin activity was hindered (.1M-10M). In the presence of Tween 80, aprotinin did not inhibit trypsin. EDTA slightly decreased aprotinin activity. Although we predicted that β -hydroxypropylcyclodextrin would bind with the aprotinin molecules and protect them from degradation and thereby increase their ability to inhibit trypsin, this cyclodextrin had no effect on aprotinin activity. The methods used and the results obtained will be applied to the study of the effect of formulation factors on other protease inhibitors. The results will provide a template upon which the foundations of other stable protease inhibitor formulations may be based.

DESIGN OF INHIBITORS FOR GLYCOGEN PHOSPHORYLASE

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Studies have shown that glucose is a weak inhibitor for glycogen phosphorylase, the enzyme which converts glycogen into glucose 1-phosphate. Repressing the enzyme in type II diabetic patients should help regulate blood glucose levels. However, in order to create a glucose inhibitor that will meet pharmaceutical demands, it must be properly designed to bind with the enzyme, with a minimal K_i value. Currently, the best inhibitor, N-methyl-B-glucose-C-carboxamide, binds with a K_i value of 0.16 mM, and thus does not meet pharmaceutical standards. We will use molecular graphics in an attempt to design an inhibitor which will efficiently and sufficiently hinder the glycogen to glucose 1-phosphate conversion. From an analysis of the interactions between inhibitors and their enzyme, we can develop insights into those interactions that most influence binding, and new inhibitors can be designed which may bind with lower K_i values. Using a molecular dynamics computer program called Molsim, we can more efficiently determine the K_i values of glucose inhibitors, instead of spending time engaged in tedious processes in wet labs. Our primary objective is to analyze interactions in glucose inhibition and to design effective glucose inhibitors. We have reached the point where, using the program Quanta, we have prepared the glycogen phosphorylase protein data bank file for molecular dynamics calculations, and have also built known glucose inhibitors on a program called Chemlab. Molsim will simulate the interactions between the inhibitors and the enzyme and calculate the binding energies involved.

O, L'AMOUR!

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While creating his/her art, an artist constantly asks: is the form doing justice to the concept? Attempting to portray "love" is, in many ways, attempting to express the inexpressible. The limits of form in literature, film, music, and dance are constrictive of the idea of love itself. Beginning with Plato's notion of spiritual love, and then on through modern-day conceptions of abandoning the quest for the ideal, we have traced the origins of Western love myths and the forces which have shaped our societal conception of love. For Plato, the highest form of love transcended the domain of the physical and involved a mutual search for higher truth. Spiritual conceptions of love integrated religion and the need for security, giving rise to the courtly love tradition. To overcome this constrictive tradition, people turned away from fidelity and to the power of the mind and imagination and to the use of art to immortalize thoughts and emotions. In many artistic pieces, we discovered a dichotomy between relationships and the context without which they would not exist. Such circumstances have led to forbidden love, isolation, and death. Our study will culminate with the examination of modern thought in this regard, including the importance of the individual, the rejection of giving oneself up to love, and the abandonment of the quest for the ideal. We have thus far concluded that the nature of love, although dependent on societal forces, cannot be confined to a definition. To discover what love is, one must experience it for her/himself.
