


5-8-1998

1998 - The Third Annual Symposium of Student Scholars

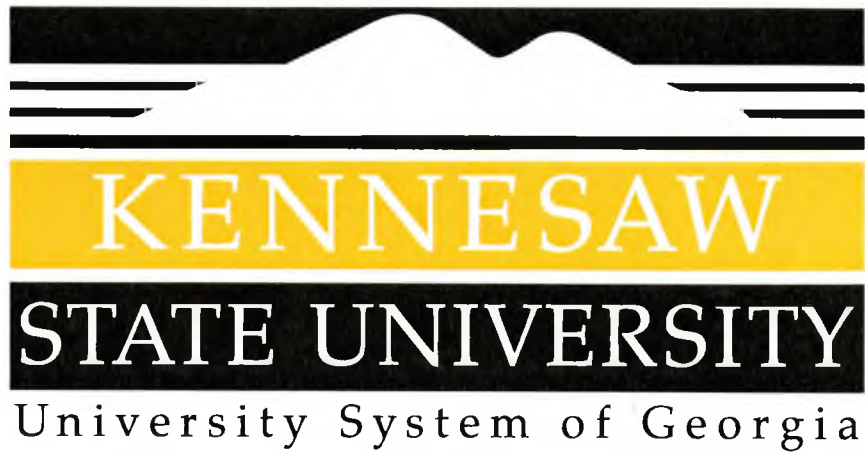
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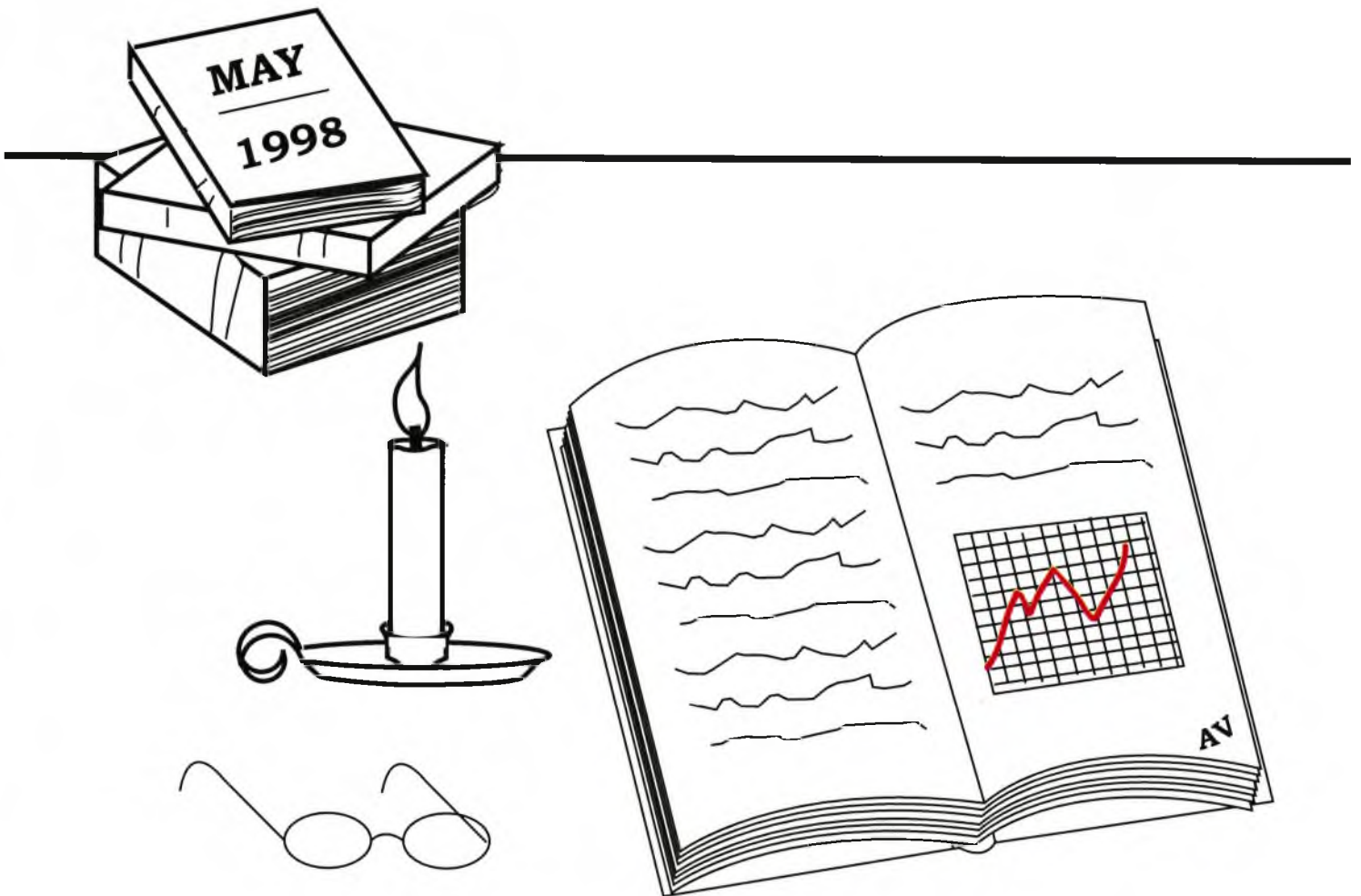
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Undergraduate Scholarship Symposium



Undergraduate Scholarship Symposium

May 8, 1998

Program

10:00 a.m.
2nd floor lobby,
Science Building

Welcome

Dr. Laurence I. Peterson
Dean, College of Science and Mathematics

Dr. Don Forrester
Dean, College of Arts, Humanities and Social Sciences

10:15 - 12:00
2nd floor lobby,
Science Building

Students present work

Special Thanks to:

Ms. Paula Skinner
Dr. Patricia Reggio
Dr. Howard Shealy
Ms. Anne Parker
Mr. Ryan Beckett

Ms. Luz Hamilton
Ms. Amanda Vespers
Ms. Jennifer Heck
Ms. Margot Zaney

**Kennesaw State University
1998 Undergraduate Scholarship Symposium
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CHARACTERIZATION OF BACTERIA RESPONSIBLE FOR BACKGROUND ANOMALIES IN THE QUANTITATION OF FECAL COLIFORM BACTERIA BY THE MEMBRANE FILTER TECHNIQUE.

Esther P Tennant-Clegg and Jerald D. Hendrix, Department of Biology, Kennesaw State University, Kennesaw, GA 30144 USA.

The concentration of fecal coliform bacteria is used as an index of water quality in aquatic systems. We have identified bacteria that cause background interference in the membrane filter technique of counting fecal coliforms. Fecal coliform bacteria produce blue-colored colonies on mFC agar, due to a drop in pH caused by the acid fermentation of lactose. We observed that about 10% of water samples from a stream contained bacteria that produced yellow colonies on mFC agar and that the presence of these bacteria inhibited the blue color of fecal coliform colonies. We characterized sixteen isolated from a water sample, including both typical and atypical colonies. Bacteria that exhibited atypical colonies were classed into two groups: lactose-nonfermenting *Escherichia* (*Escherichia fergusonii*) and nonfermentative gram-negative species, including species of *Pseudomonas*, *Acinetobacter*, and *Bordetella*. We established that the atypical color development was due to an increase in pH. During typical blue colony development, the pH dropped from 7.4 to less than 5.0. However, the presence of atypical colonies caused the pH to rise from 7.4 to above 8.0. We believe that the increase in pH is due to alkaline metabolic waste products excreted by bacteria growing with an oxidative metabolism.

**USES AND CLASSIFICATION OF PLANTS FOUND IN THE RAINFOREST
BY INDIGENOUS PEOPLES COMPARED WITH THE USES AND
CLASSIFICATIONS OF WESTERN CULTURE**

Sarah Cobb, Kennesaw State University, Kennesaw, GA 30144 USA.

Based on the knowledge that only a fraction of all plants on earth have been scientifically identified by Western culture, this project was intended to allow for the exploration of tropical plants through the knowledge of an indigenous culture. The data was collected in the Darien Forest, which is located in the country of Panama. Lead by a Choco Indian guide plants with agricultural, medicinal, or technical significance to the Choco people were identified. The plants were photographed and detailed records of their physical characteristics were kept. Library research is now being used to scientifically identify the plants studied and determine any uses in Western culture. After this data is collected a detailed comparison of the uses and classifications between the two cultures will be completed.

THERMOTACTIC RESPONSES OF *CAENORHABDITIS ELEGANS* TO EXPERIMENTAL TEMPERATURE VARIATIONS

Jody Frost, Debra Phillips, Jamie Williams
and Bowman O. Davis.
School of Biology, Kennesaw State University.
Kennesaw, GA. 30144, USA.

Caenorhabditis elegans is a nematode that inhabits a thin film of moisture surrounding organic and soil particles. With such a diminutive habitat this nematode cannot maintain an internal body temperature that deviates greatly from its' surrounding environment (Dusenbery, 1978). Basic knowledge of the behavior of *C. elegans* in the area of thermotaxis is virtually unknown. Previous studies indicate that in a thermal gradient, *C. elegans* tends to move toward its' cultured temperature (Hedgecock & Russell, 1975) and that the parasitic worm *Meloidogyne incognita* tends to move toward a temperature 3°- 4°C higher than its' cultured temperature (Diez & Dusenbery, 1998). Our hypothesis was that *C. elegans* would exhibit a preferred temperature threshold at which they would show a clear response and then decay away from that temperature. Both 16°C & 20°C cultured worms should exhibit similar behavior patterns, but on different temperature scales.

C. elegans raised at 16°C and 20°C were exposed to controlled thermal gradients in an attempt to cause a shift in response according to acclimation temperature. Movement responses were collected as images by video camera and linked to a computer capable of simultaneously tracking and recording the total number of nematodes and their movement patterns. The worms were exposed to a constant thermal gradient as room temperature air was channeled through an initial area containing a nichrome coil, and then across the worms located on the surface of a small agar plate. A thermal gradient was achieved by the design of the heating coil in which a switch on the power source would heat only half of the coil during each cycle of data collection. This caused the worms to move along an x-axis direction. Maximum temperature changes were calculated and increased exponentially as the voltage was increased.

The results were reported as a function of thermotaxis movement along the x-axis. Behavioral changes were noticed with the 16°C nematodes. As the temperature was increased, movement away from the thermal gradient occurred. A demonstrable deviation from normal behavior patterns was not observable with the 20°C nematodes, despite considerable increases in temperature. From these results it was determined that the 16°C nematodes moved towards the heat until the temperature rose to a maximum of 7.2°C above their cultured temperature, as predicted. The 20°C nematodes exhibited somewhat different behavior than expected. These worms migrated towards the source of heat until approximately 11°C above their cultured temperature, then the worms fled from the source of heat.

Behavioral Response Differences of Ethanol Naive and Ethanol Pre-exposed *Caenorhabditis elegans* to Ethanol

**Krista J. Gilbertson, Adam C. Pepper and Brian D. Tubiak
Department of Biological and Physical Sciences
Kennesaw State University
Kennesaw, GA 30144-5591**

Caenorhabditis elegans, a soil nematode (round worm), measures about 1 mm long. Testing for ethanol responsiveness to alcohol of naive and pre-exposed *C. elegans* was performed in order to determine if the behavior of *C. elegans* towards ethanol could be altered by prior exposure. *C. elegans* were cultured at 16 degrees Celsius for a period of five to seven days on a agar plate with a growth media of OP-50 *E. coli*. *E. coli* was then grown in a broth media of 5% ethanol. This was done in order to create ethanol tolerant *E. coli* for subsequent ethanol exposure of pretreated worms and video imaging .

Then using a computer we tracked the movement of naive *C. elegans* when exposed to varying concentration of ethanol (10^{-3} M and 10^{-2} M). Other worms were then grown in a concentration of 5% ethanol for a period of 24 hours. Afterwards these pre-exposed *C. elegans* were exposed to a concentration of 10^{-2} M ethanol and their responses were recorded.

Ethanol was attractive at all concentrations as evidenced with naive *C. elegans* by increased reversal behavior and slowed movement during the "stimulus off" phase of the ethanol expose cycle. However, as the ethanol concentration increased, their ability to orient towards the direction of stimulus flow was increasingly impaired at higher concentration. This could be due to either sensory adaptation or an anesthetic effect of high ethanol concentrations.

Pre-exposure to ethanol for 24 hours prior to testing reversed the behavior so that ethanol acted as a repellent.

DETERMINATION OF THE INFLUENCES OF HUMAN DISTURBANCES ON STREAMS BY EXAMINING VARIATION IN WATER QUALITY OVER 24 HOURS.

Timothy Nichols, Jade Vogel, Michele Kuter, Bisola Ashiru, Rhonda Garnett, Terri Hamby, Jason Holloway, Liana Martin, Amanda Roller, Susan Pipes, Brent Sanderson, Brian Tubiak and Joseph M. Dirnberger, Ph.D., Department of Biology, Kennesaw State University, Kennesaw, GA 30144 USA.

Differences in diel variations of water quality parameters were examined between disturbed and undisturbed streams in an attempt to determine sources of human impact. Automated monitoring and sampling equipment were used to measure stream height, conductivity, water temperature, pH, dissolved oxygen, and fecal coliform bacteria concentrated at intervals of 15 minutes to 1 h over 24 h periods. Invertebrate drift was sampled by hand from nets every hour over one 24 h period. Water quality parameters varied little and tended to show a single maximum and minimum over 24 h in the undisturbed stream, Jones Creek (Union County in the Blue Ridge Mountains). The disturbed stream, Noonday Creek (Cobb County near KSU campus), revealed short term fluctuations (several within 24 h) in numerous water quality parameters. Peaks in conductivity (a measure of dissolved ion concentration) lagged peaks in stream height by 7-9 hours at one location on Noonday Creek. Further upstream at a quarry, no lags were observed suggesting the quarry as a source of ions. Upstream of the quarry, fecal coliform bacteria concentrations fluctuated nearly 10-fold over 24 h and were correlated with changes in conductivity ($r^2=0.58$), suggesting human sewage systems as a source. These results suggest that an understanding of time lags between pollutant loads and stream hydrology might be used to develop a novel procedure in identifying and pinpointing pollutant.

CHEMOSENSITIVITY AND RECEPTOR SHARING IN THE NEMATODE
Caenorhabditis elegans

Lisa Todd, Peter Mutheki and Dr. Bowman Davis, Department of Biology, Kennesaw State University, Kennesaw, GA 30144 USA.

The behavior of the nematode Caenorhabditis elegans, in the presence of two chemical stimulants – the ester, isoamyl acetate and ketone, acetone, were explored using computer-tracking methods. The nematode has previously shown chemosensitivity to various stimulants. We proposed that Isoamyl acetate and acetone share receptors in the nematode. The nematodes were exposed to receptor saturation techniques with the two chemicals at different concentrations and a flow rate of 4ml/sec. Our results indicate that the nematode was remarkably attracted to isoamyl at 10^{-9} M concentrations. When 10^{-9} M isoamyl acetate was blown over worms whose receptors were flooded with 10^{-6} M isoamyl acetate, the results show that their behavioral response changed to repulsion. This study shows that the nematode is attracted to the two chemical stimulants. It also indicate evidence of receptor sharing for the two stimulants.

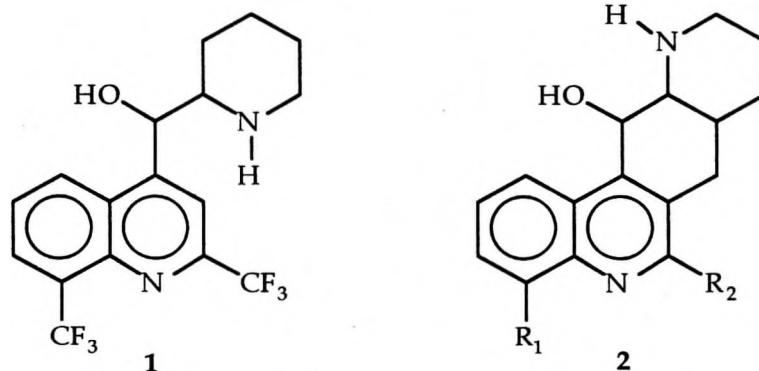
Key words – Acetone, isoamyl acetate, nematode, Caenorhabditis elegans, chemoreceptor threshold.

SYNTHESIS OF CONFORMATIONALLY RESTRICTED DERIVATIVES OF THE ANTIMALARIAL COMPOUND MEFLOQUINE.

Nokuthula N. Msimanga, Mark A. Senger, and Al M. Panu.
Department of Chemistry, Kennesaw State College
1000 Chastain Rd
Kennesaw, GA 30144

Mefloquine (1) is an effective methanol quinoline antimalarial compound currently used even in cases of chloroquine-resistant *plasmodium* strains. Little is known about the conformational requirements of this class of compounds at the binding site. Based on molecular modeling, we have planned a series of target compounds (2) (R1=H, R2=Ph) which incorporate conformational rigidity about the ethanol amine fragment of the molecule with little addition to the steric bulk of the overall molecule. There exist eight different stereoisomers for the target compound represented by structure (2). Once synthesized and tested, a ligand-ligand molecular modeling approach will be used to define conformational requirement for binding.

We have synthesized and spectroscopically characterized (infrared, nucleomagnetic resonance, mass spectrometry) the intermediate compound 2-(3-hydroxymethylpyridyl)-2-phenyl-4-quinoylketone starting with atophan and 2-chloronicotinic acid. The overall synthetic scheme is also described.



VOLTAMMETRIC DETERMINATION OF METAL IONS IN CENTRUM TABLETS.

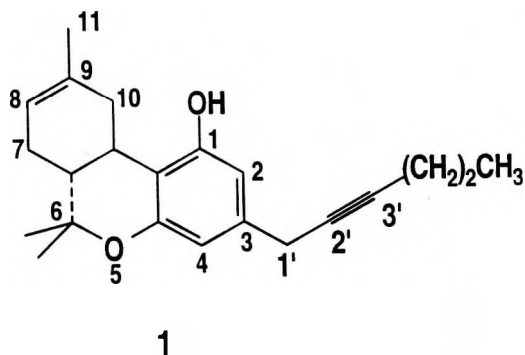
Elmang Nchako and Huggins Z. Msimanga, Department of Chemistry, Kennesaw State University, Kennesaw, GA 30144 USA.

Squarewave voltammetry (SWV), a sensitive and fast-scanning electroanalytical technique, was used to analyze some centrum tablets for Cu^{2+} , Fe^{3+} and Zn^{2+} . Centrum tablets contain a wide range of electroactive substances which interfere with the determination of the species of interest. The interferences are further compounded by the observation that the SWV signals are generally broad, thus easily lead to signal overlap. For acquiring the voltammograms, a DP82 polarograph, equipped with a dropping mercury working electrode, a Pt auxiliary electrode, and a Ag/AgCl reference electrode, was used. A pulse of -20 mV and -10 mV step was applied, providing a potential window of +100 mV to -1300 mV.

We attempted to minimize interferences by using different support electrolytes which would give us resolved voltammograms for each metal ion. Of the support electrolytes used ($\text{CH}_3\text{COONH}_4$, KNO_3 , and Na-EDTA), $\text{CH}_3\text{COONH}_4$ gave well-defined Cu peaks, but had Fe and Zn peaks overlapping. KNO_3 gave a defined Zn peak on an incline, and the Fe peak was poorly formed. Na-EDTA gave a well-defined peak for Fe, much resolved from Cu. Once we established the appropriate support electrolytes, a standard addition method was used to quantify all three metal ions. The amounts found were all within 10% of the expected, based on the manufacturer's claims.

CONFORMATIONAL ANALYSIS AND RECEPTOR MODEL DOCKING STUDIES OF AN
UNSATURATED SIDE CHAIN ANALOG OF DELTA-8-THC

DUC T. NGUYEN, DOW P. HURST AND PATRICIA H. REGGIO
Department of Chemistry, Kennesaw State University, Kennesaw, GA 30144



Compound **1** has been reported to possess high affinity for the cannabinoid CB1 receptor ($K_i = 11 \pm 1 \text{ nM}$), but to exhibit low activity in the mouse multiple-evaluation paradigm for cannabinoid activity.¹ In order to explore the reasons for the high affinity, but low activity of **1**, molecular modeling studies were undertaken. A complete conformational analysis of **1** was performed using the semi-empirical method, AM1. Conformational searches (6-fold rotations) were performed on all rotateable bonds in the C-3 side chain. 258 conformers were generated which were within 0.85 kcal/mol of the global minimum energy conformer. After elimination of duplicate structures, 174 conformers remained. The remaining conformers were superimposed at their aromatic rings using the Calculate Fit facility within the Chem-X suite of modeling programs (Chemical Design Ltd. Chipping Norton, UK). Superposition revealed that the structures clustered into three groups, each of which possessed a different orientation of the C3 side chain. Cluster 1 was characterized by a C4-C3-C1'-C2' torsion angle of 138° . Clusters 2 and 3 were characterized by C4-C3-C1'-C2' torsion angles of -151° and -106° respectively. Receptor docking studies of a representative structure from each cluster are currently in progress. [This work was supported by NIDA Grant DA 03934.]

1. W. Ryan, M. Singer, R.K. Razdan, D.R. Compton and B.R. Martin, "A Novel Class of Potent THC's: 2'-Yne- Δ^8 - and Δ^9 -THCs" Life Sc. 56: 2013-2020, 1995.

AN EXPLORATION INTO DESIGN PATTERNS: REAL WORLD APPLICATIONS

Chris Watson and Tom Gooch, Department of
Computer Science and Information Systems,
Kennesaw State University, Kennesaw, GA 30144
USA

As object-oriented analysis, design, and implementation becomes more prevalent within KSU's Computer Science curriculum, design patterns also begin to emerge as an essential component of this shift toward object-oriented technology. The purpose of design patterns are to give a developer/student a toolbox of formalized solutions to common data structure problems, such as iterating through list structures.

A study was done into how useful these design patterns are and how commonly they are used in development. Examples of implementations studied include JavaBeans in Java, the STL library in C++, and the MVC architecture in SmallTalk.

A MATHEMATICAL MODEL OF MALARIA TRANSMISSION AND POTENTIAL VACCINES

Kara S. Nunley, Jonathan M. Shaw, and Meghan A. Burke, Department of Mathematics, Kennesaw State University, Kennesaw, GA 30144 USA

Malaria affects over 100 million people every year, and over 1 million people die of the disease, mostly children. We are working on a mathematical model of the transmission of malaria to see which link in the spread of the disease can most easily be broken. The differential equation model used in our project reflects two important concepts of the disease: the life cycle of the parasite, alternating between the vertebrate host and mosquito vector; and immunologic intervention for the control and prevention of the disease.

The mathematical method we employ entails using a compartmental model to represent the various populations of humans and mosquitos and their dynamics. These are converted to differential equations governed by the law of mass action, with the populations becoming functions of time. We restrict the human population to children with parameters that apply to children under 5 years of age. Numerical analysis of the data from specific regions of Africa reveal important behavioral factors of the disease.

Previous models have not made the distinction between low and high levels of parasitemia. By employing a more realistic model, the project refelcts a more accurate account of the data. We evaluate various hypotherical vaccines to determine which stage-specific effect is most useful in reducing the disease burden.

Supersonic Rectangular Twin Jets and Kelvin-Helmholtz Instability Waves

**Kara S. Nunley
Mathematics Department
Kennesaw State University
1000 Chastain Road, Kennesaw, GA 30144**

Abstract

Three physics laws (the Conservation of Mass, the Conservation of Momentum and the Conservation of Energy) in the differentiation form are employed to formulate the Kelvin-Helmholtz instability problem. A dispersion relation of the instability wave is derived.

The Application of Kelvin-Helmholtz instability to supersonic rectangular twin jets is mathematically modeled by using partial differential equations, kinematic and dynamic boundary conditions. The instability of rectangular twin jets will be discussed.

ATHLETES AND COMMERCIALS

Jason Matthew Brown and Dr. Katherine Kinnick, Department of Communications, Kennesaw State University, Kennesaw, GA 30144 USA.

The purpose of this thesis was to study the effects famous athletes have in television commercials. The intent was to see if people remember the commercial and product better if an athlete endorses it and if people remember a specific athlete better than another.

The method of analysis was through quantitative survey samples. 86 people were shown 16 different television commercials with six of them featuring an athlete endorsing a product. The volunteers sampled showed no significantly higher recall of the sport-related commercials, but Michael Jordan was found to be the most memorable.

AUTOCRATIC VS. DEMOCRATIC LEADERSHIP

Greg Gaddis and Dr. Katherine Kinnick, Department of Communications, Kennesaw State University, Kennesaw, Ga. 30144, USA.

This research analyzes the differences in the communication styles between autocratic and democratic leaders. I attempted to determine which style is more prevalent, how each leadership style is used during organizational communication, the reasoning behind each leadership style, and the effectiveness of each. This research was conducted by interviewing five people in leadership positions. From their responses I determine whether each uses an autocratic or democratic leadership approach. I used a scale from one to ten, one being democratic and ten being autocratic, to scale my participants. Three of my participants were autocratic with scores of nine, seven, and six. The other two were in between with scores of five.

THE EMBODIMENT PROCESS IN A THEATRICAL ROLE

Gail Paller and Dr. Katherine Kinnick, Department of Communication, Kennesaw State University, Kennesaw, Ga. 30144, USA.

Much of the scholarship that exists on the embodiment process in a theatrical setting is derived from Stanislowski's methods. These methods are discussed in books and articles written by a variety of theatrical professionals, but they have not been looked at as a whole process that culminates in embodiment. The following thesis seeks to identify the process an actor goes through when embodying a role in a play. This study follows the embodiment process of five actors as they prepare their roles for a play. It is a qualitative study based on questionnaire responses, daily observations of the actors, and analysis of pertinent literature. The study addresses the role imagination plays in the embodiment process; how an actor's previous experiences help him or her create a character; the collective nature of role development; the importance of script analysis; the necessity of an actor's tuning his or her physical instrument; and the work ethic of a successful actor. The study suggests, at its conclusion, that the imagination is the key to successful embodiment and that discipline, experience, script analysis, physical tuning, and collective role development are simply focusing tools that, when properly utilized, feed an actor's imagination, cause visualization, and lead to embodiment.

A TRAINING MANUAL FOR RETAIL MANAGEMENT STYLES: TEAM LEADER VS. DICTATOR

Ginger Pepper and Dr. Katherine Kinnick, Department of Communications, Kennesaw State University, Kennesaw, GA 30144 USA.

There have been many articles and books written on team leadership and positive reinforcement. The articles suggest that in order to be a successful business, managers need to learn the art of being a team leader with using positive reinforcement. There is no evidence though, that people have attempted to emulate this way of running a business. This project provides an actual training manual that conducts a three hour session for retail managers on what team leadership and positive reinforcement are. The sessions are in three one hour sessions that define and discuss team leaders and positive reinforcement. This is an interactive training manual so the attendants play a part in every session. The research done supports the skills necessary to conduct this seminar. The overall purpose of this project is to give the people attending the session the choice of changing their managing style if need be in order to be an affective manager.

**THE PERFORMANCE OF THE FIRST MARINE DIVISION AT THE CHOSIN
RESERVOIR DURING THE KOREAN WAR**

William Ghilarduchi, Department of History, Kennesaw State University, Kennesaw,
GA 30144, USA

This will be a presentation in SC212 at 10:30.

USING MIDI TECHNOLOGY FOR COMPOSING AND PUBLISHING MUSIC

Jamie Duerksen, David Chapman, and Laurence Sherr, Department of Music,
Kennesaw State University, Kennesaw, GA 30144, USA

A MIDI (Musical Instrument Digital Interface) synthesizer and Finale software were used to create three original compositions. The technology provides playback of the work as well as the ability to prepare a publication-quality score.

ARTWORK PRESENTED

Redhaired Model

Oil on Canvas
30 x 40 Inches
Bert Hels

Pirate (unframed)

Oil on Canvas
30 x 24 Inches
Nkirote Mugambi

Alla Prima Still Life (unframed)

Oil on Canvas
18 x 24
Tina Meschko

Pumpkin

Oil on Panel
11 x 14
Sandra Scohier

Trompe l'oeil Map

Oil on Panel
12 x 16
Teri Hunter

East and West (unframed)

Oil on Panel
11 x 14
Arata Tumura

Red Pears

Oil on Panel
11 x 14
Chris Lambert

Oranges & Knife

Pastel
22 x 18
Jan DiPietro

Hidebound – Aluminum

Life Masks – Bronze

Four Faces – Bronze

Woman – Aluminum

All by Jack Birnkammer

Supplication – Aluminum

By Anne Hull

Two Figures – Bronze

By Melissa Floyd

Figure - Aluminum

By Jason McCoy

Figure – Aluminum

By Pipar West

Two Figures - Aluminum

By Tara Tanner

Figure – Aluminum

By Fernando Dastoli