

The background of the cover is a photograph of a large, ornate building with a prominent dome and a small cupola on top. In the foreground, there is a modern fountain with several dark, angular, sculptural elements from which water is spraying upwards. A person is sitting on a low wall or ledge near the fountain. The overall color palette is dominated by warm, golden-brown and orange tones, suggesting a sunset or sunrise setting.

# McNair Research Journal

THE UNIVERSITY OF TEXAS AT ARLINGTON

Summer 2004 • Volume 8





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THE UNIVERSITY OF TEXAS AT ARLINGTON

The Ronald E. McNair Postbaccalaureate Achievement Program is a federally funded **TRiO** program.

The McNair Research Journal is the annual research publication of the Ronald E. McNair Postbaccalaureate Achievement Program (McNair Scholars Program), a TRIO Program funded by the U.S. Department of Education, at the University of Texas at Arlington. The journal consists of summaries of papers written by McNair Scholars who participated in the McNair Research Fellowship the preceding summer. Journal contents solely reflect the research and opinions of the individual authors. Presentation of this material was made possible by a limited license grant from the authors who have retained all copyrights in the contributions. All other elements of the journal such as its structure and organization are also protected by copyright. The University of Texas at Arlington holds copyright to the journal but permits reproduction of its contents (not to exceed 100 copies) for non-commercial or educational purposes.







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## Message from the Provost

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In 1986, the U.S. Department of Education established the McNair Scholars Program in honor of Ronald McNair who died in a space shuttle explosion that year. Dr. McNair's life was one that constantly cleared obstacles and was dedicated to fulfilling his

dreams. An African-American who grew up in a poor community in the South, Dr. McNair earned a Ph.D. in laser physics and became a NASA astronaut. The McNair Scholars Program was created to encourage students from similar backgrounds to pursue graduate studies, engage in research, and develop scholarly skills by working with a faculty mentor.

Students who participate in the McNair Scholars Program at The University of Texas at Arlington receive a stipend to fund a summer research project and are paired with a faculty member who supervises their research and serves as their mentor. Once the research is complete, the students present their findings at the annual McNair Research Presentations.

On behalf of The University of Texas at Arlington, I want to congratulate each of the McNair Scholars and their faculty mentors. The research published in this journal is a reflection of their hard work, dedication, and their willingness to dream. The skills they have acquired will serve them well as they pursue their graduate education and other endeavors throughout life. More importantly, their research exemplifies the core mission of institutions of higher education, and makes all of us at The University of Texas at Arlington proud.

A stylized, handwritten signature in black ink, consisting of a series of connected loops and a final horizontal stroke.

Dr. Dana Dunn

Provost and Vice President for Academic Affairs



## Notes from the Director



the level of effort these scholars devoted to researching, developing, writing and presenting their findings. They are to be commended for their dedication in pursuing and reporting new information in their respective fields.

It is with pride that I congratulate the research interns in the McNair Scholars Program at The University of Texas at Arlington on the successful completion of their eleven-week Summer 2004 research projects. The research summaries in this journal are evidence of

Equally deserving of recognition and appreciation are the outstanding faculty mentors who gave of their time, talent and expertise in guiding and directing the research process, and the numerous professional staff members throughout campus who conducted beneficial seminars and workshops. Additional appreciation is extended to President James D. Spaniolo, Provost & Vice President for Academic Affairs Dana Dunn, Vice President for Research Ronald L. Elsenbaumer, and Dean of the Graduate School Philip Cohen for their ongoing assistance and support.

Congratulations, McNair research interns, on your achievements this summer. Best wishes on your continued academic success!

A handwritten signature in cursive script that reads "Kathryn Head".

Kathryn Head  
Director of SOAR/McNair Scholars Program



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## The McNair Scholars Program



Dr. Ronald E. McNair/Scholar, Scientist, Astronaut, 1950-1986

The history of the McNair Scholars Program at UT Arlington commenced in 1990 when the U.S. Department of Education funded a grant proposal to bring it to campus. The goal of this program (and of the many McNair programs nationwide) was to assist disadvantaged undergraduates—either first-generation/low-income and/or

underrepresented (African American, Hispanic, Native American) students—to prepare for future graduate study culminating in the Ph.D. and a life of research and teaching. Since its inception on campus, the McNair program has encouraged and assisted over two hundred students in various majors with their preparation for graduate study.

Currently the McNair Scholars Program at UT Arlington works with a minimum of twenty-eight students (sophomores through seniors) each academic year, providing seminars and classes on a wide range of topics relating to graduate school, offering a spring institute to heighten Scholars' understanding of the culture of research, and, subsequently, affording them the opportunity to engage in one summer of research with a faculty mentor prior to graduation. The program also enables Scholars to present their research at McNair (and other) undergraduate or professional conferences, provides guidance with the graduate school application process, and funds graduate school visits.

The McNair Scholars Program at UT Arlington enjoys strong, campus-wide support and greatly benefits from the expertise and enthusiasm of its faculty and staff. An expression of this institution's commitment to McNair Scholars was the creation of the UT Arlington McNair Graduate Assistance Package (M-GAP) in spring 2002, offering a fellowship/assistantship combination in a wide range of disciplines.

# The Effects of Computer Applications on Landscape Architecture Education

PAUL KNIFONG

Mentor: Prof. Gary Robinette, FASLA, School of Architecture



## INTRODUCTION

The field of landscape architecture is currently undergoing major changes due to technological advances, specifically in the area of computer applications. As the private and public sectors of the profession adopt these new methods, it becomes essential that educational institutions stay current with these advancements. In order to track how accredited universities were adapting to these trends, a survey was developed to investigate the changes being made in computer requirements for students, specific software changes in the departments, and how computers were affecting the design studio sequence.

## LITERATURE REVIEW

Tai's recent article is the most current published work on the topic. She summarizes previous surveys conducted on computer use in landscape architecture practice. Her main focus is how the profession is using computers to affect the way design is approached. She acknowledges that this topic has not been thoroughly researched and believes "the contribution of computers to design creativity has yet to be fully explored" (114). She outlines five specific factors for educators to consider in regard to computer applications: integrating CAD into the curriculum, knowing how and when to teach computer use, developing training for faculty, obtaining appropriate resources to maintain com-

puters, and communicating with administrators about the long-term need to support the curriculum. Her article formed a cornerstone of my work in terms of both methodology and its focus on design applications.

I reviewed back issues of *Landscape Architecture* magazine from 1999 to 2004 in order to determine current trends being discussed in this professional forum. Hammatt, Sipes, and Speckhardt all had published articles on several aspects of the topic. Various topics, including portfolio design in school to computer software for the professional were covered. Reuter's work was a great general guide to digital methods. These sources provided the background material I needed to compose and format my survey questions.

## METHODOLOGY

Every accredited landscape architecture program in North America was contacted by telephone and offered an opportunity to respond to a 20-question survey. A list of accredited programs found on the American Society of Landscape Architects (ASLA) website was used to construct a roster. Once contacted, each program's representative identified the appropriate person or people to answer the survey. The survey consisted of three parts: computer ownership requirements, software application usage, and the role of computers in the design studio sequence. After all responses were received, the individual results were entered into an Excel worksheet to evaluate percentages on the yes/no questions. The answers to open-ended questions were recorded to be used as data in the completed report.



## RESULTS AND DISCUSSION

Results of the first section of the survey showed that 46% of schools contacted required computer ownership. Results also showed that 15% of the schools required students to own laptop computers. Regarding the specific software applications both taught and made available to students, results showed that the two dominant programs taught are Auto-CAD and Adobe Photoshop. These programs are introduced mainly in the sophomore year. Geographic Information Systems (GIS) and 3-D modeling are usually taught in the junior year.

The final topic area of the survey focused on how computers affect the design studio sequence. Fifty percent of the schools contacted still allowed students to hand-draw assignments in the studio. This varied, depending on the individual professor's requirement for class. Every department contacted allowed an integration of digital and hand-rendered projects in studio. On the issue of whether specific computer software should be taught at institutions of higher learning, 45% said yes, while 55% would rather it be outsourced to junior colleges or vocational schools.

## CONCLUSION AND FUTURE RESEARCH

In conclusion, this study found that educators are adapting to new technologies and that the debate continues about how to implement all the instruction required to enable graduates to enter the profession. Further research is needed to better address this topic. Time constraints limited the number of programs surveyed. A more in-depth survey including several copies of the instrument distributed among different faculty members would provide more definitive results.

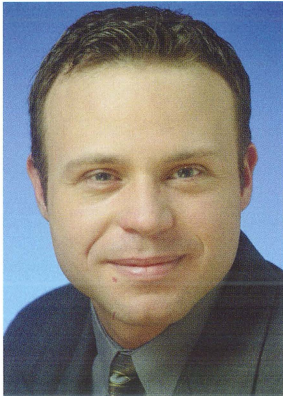
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# Case Studies in Architecture: The Casa Mañana Theatre Renovation

**MICHAEL SPENCER**

Mentor: Dean Donald Gatzke, School of Architecture



## INTRODUCTION

A case study is a teaching method which has gained recognition in business-related fields as an effective way to improve efficiency within organizations. In the field of architecture, for example, it can be applied to an examination of the design and construction of a building. Once a project has been completed, lessons are learned and efficiency is improved for future projects. Case studies review the process by which the firm operates, as well as the finished product. The Casa Mañana Theatre renovation project teaches how to handle a project to suit client and public needs. The firm-client interaction, design analysis, and public sentiment regarding changes to a historical building have implications for the future of the theatre itself (See Figure 1).

## BACKGROUND

In 1997, Denton Yockey was hired as Executive Producer of Casa Mañana, Inc., the production company that occupies the theatre. The need for expanding the theatre was apparent. GideonToal, a local architectural firm, was hired to design the renovations which included an enlarged lobby area, an increase in restroom facilities, and a replacement of the theatre-in-the round stage with a proscenium stage. The design of the renovation also carried the radial plan of the existing building through into the additions. The theatre was almost old enough to be regis-

tered by the National Trust as an historic building so it was important not to mimic the existing elements, but to add something that would complement them. In this case, the proscenium stage would give the viewer a better quality show, and hopefully increase attendance. (See Figure 2).

## METHODOLOGY

The American Institute of Architecture has specific guidelines for conducting a case study. The process includes a short literature review on topics related to the project and personal interviews with the client and architectural firm. In addition, the Casa Mañana Theatre renovation case study included articles from the *Fort Worth Star-Telegram* for information regarding public sentiment. This was included since the theatre is a landmark for the city of Fort Worth and the success of the renovation is measured by the attendance of its patrons.

## RESULTS AND DISCUSSION

In historic building renovation the cultural memory of the building is an aspect which sets it apart from a new building project. The architectural team worked well with the client in accommodating the needs of the theatre. Public opinion for the newly acquired accommodations is positive, though many feel the theatre has lost some of its heritage due to the new stage. The previous theatre-in-the round design offered a unique and historical aspect to the theatre that is not present in the new proscenium stage. Patron attendance has not been as high as predicted by Casa Mañana since the renovation, but this may be partly due to a change in programming.



## CONCLUSION

Foresight is necessary in order to maintain what once was a vibrant theatre and transform it into something contemporary yet familiar. Building projects employ expertise in many areas from design and construction to building codes and public sentiment. Often a design team is hired to make a smooth transition from the old to the new. In this case, the transition was smooth. What remained to be seen was the public response concerning the changes made to the theatre-in-the-round stage. Although it was a necessary change in order to maintain quality shows, the attendance speaks for itself. A renovation can be very successful pragmatically, but with a lack of patrons to support it, building usage becomes jeopardized.

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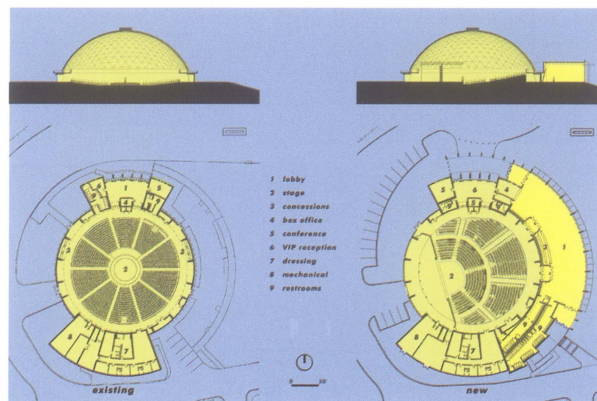


Figure 1 Plan and Elevation for Renovation of the Casa Mañana Theatre (before and after), 2003.



Figure 2 Completed Renovations of the Casa Mañana Theatre, 2003.

# The Bridging of the Great Municipal Economic Divide between the United States and Mexico

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## INTRODUCTION

While the idea that the US and Mexican economies are converging is far fetched, it does cause concern for US workers. Income, unemployment levels, prices, inflation, and income growth data for pairs of cities in northern Mexico and the southwest US

(selected according to geographic location and importance) were tested for a relationship between these municipal economies. We analyze the effect of the US border economy and the Mexican border economy, and also if the North American Free Trade Agreement (NAFTA) has had any impact on the development of these municipal economies.

## LITERATURE REVIEW

NAFTA created the largest free trade block in the world, eliminating tariffs, quotas, and non-tariff barriers within a 15-year period, and was said to be a major milestone in the development of trade in North America (Hashemzadeh 1997). We chose to study the northern region of Mexico and the southwest US because the proximity of the border economies should demonstrate the strongest evidence for economic integration. Mexico's northern region has a higher per capita income than the rest of Mexico, and even though the gap is wide, it is not as severe a drop as when you cross the US border to Mexico (BEA 2004). On the US side of the border, eight of the ten metropolitan areas with the lowest per capita incomes in the nation are in the states of California, Arizona, New Mexico, and

Texas. Both sides of the border have experienced a high level of population growth and recently they have begun to perform better than in the past.

## METHODOLOGY

We analyzed maquiladora per capita income<sup>1</sup>, inflation, prices, unemployment, and maquiladora income growth (some of the best indicators for the determination of economic conditions) for a number of city pairs along the US-Mexico border from 1990 to 2002. With the application of OLS regression, otherwise known as the multiple regression model, a statistically significant value will depict a correlation between the US and the Mexican city variables. We construct a panel for each of the variables and use a fixed effect model to analyze the relationship between the border economies. The relationship between the variables can be tested with the following formula:

$$(1) X_{MEX} = \alpha + \beta_1 X_{USA} + \beta_2 DUM_{NAFTA} + \beta_3 DUM_{PESO} + \varepsilon$$

Dummy variables were inserted to isolate the effects of NAFTA (1996-2002) and the peso crisis (1995).  $X$  represents the values of the variables tested by country; for example,  $X_{MEX}$  represents the Mexican value of income, prices, unemployment, inflation, or growth.

## RESULTS AND DISCUSSION

The results of the regression analysis are in Table 1. In columns denoted "a", we test the full model in equation (1); the results presented in column "b" restrict  $\beta_2=0$ . The Income and Prices variables both had statistically significant results, while the peso crisis had a strong effect on the economies of Mexican cities. NAFTA has shown to have had an impact as well. The results show that Mexican maquiladora wages are increasing 2.4% for every per-



cent increase in US income, and that rate increased by 1.3% because of NAFTA. Also, prices are becoming more standardized due to NAFTA.

### CONCLUSIONS AND FUTURE RESEARCH

This evolution of municipal economies should be viewed in a positive light since conditions are improving on both sides of the border. In the US cities, income is growing faster than the national average in these heavily impoverished areas; unemployment rates have seen a decline even while population is booming, and inflation and prices have kept steady. For the Mexican cities, income is growing faster than the national average, and unemployment rates are low even with a large influx of people who come to take advantage of higher wage rates closer to the US border. Additionally, inflation and prices have begun to stabilize, mirroring US levels after experiencing unpredictable

levels during the past decade, in large part due to the peso crisis of late 1994. In the future more precise studies can be conducted as more data are collected in these regions.

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### FOOTNOTES

- <sup>1</sup> We used maquiladora per capita income because per capita income was not available yearly by city for Mexico; however, maquiladora income is near the average normal income (or higher).

	Income		Prices		Unemployment		Income Growth		$\pi$	
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
US	2.443*** (15.922)	1.108*** (9.036)	0.131*** (16.615)	0.078*** (11.340)	0.680 (0.851)	0.612 (0.818)	0.093 (1.043)	0.138** (2.087)	76.621 (1.593)	76.638* (1.700)
NAFTA	-0.530*** (-9.947)	- -	-1.935*** (-8.108)	- -	0.002 (0.219)	- -	-0.264 (-0.750)	- -	0.001 (0.001)	- -
Peso Crisis	-0.472*** (-9.287)	0.264*** (3.453)	-2.839*** (-10.829)	-1.942*** (-5.233)	0.078*** (8.554)	0.077*** (9.355)	2.006*** (4.036)	2.134*** (4.588)	-21.782*** (-13.808)	-21.783*** (-14.921)
R <sup>2</sup>	0.869	0.643	0.902	0.760	0.826	0.830	0.606	0.609	0.787	0.791
F	53.844*	17.437*	67.803*	27.944*	2.778	3.294	13.311*	15.250*	28.310*	32.988*

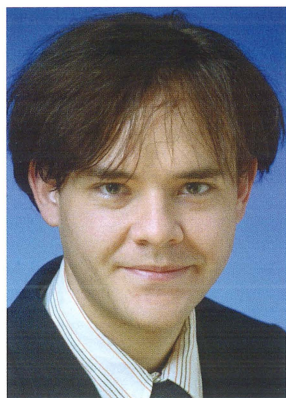
Table 1 Regression Analysis Results

Notes: t-statistics in parentheses; \*, \*\*, and \*\*\* represent significance at the 10%, 5% and 1% level respectively; \* represents significance for F-statistics.

# On Market Power in the Retail Gasoline Industry and its Effect on Prices

NICHOLAS OXEDINE

Mentor: Dr. Michael Ward, Department of Economics



## INTRODUCTION AND LITERATURE REVIEW

Starting in the 1990s, Western petroleum companies were involved in a wave of mergers, acquisitions, and joint ventures. Since many of these companies include very large corporations that had once competed with each other, these mergers lead many analysts to speculate that the market for petroleum and its products is now less competitive than it used to be. Economic research accumulated quickly following the mergers of some of the largest oil producers starting in 1998.<sup>1</sup> The reason behind the decisions for these mass reorganizations is debatable, and researchers have explored the effects with interests ranging from social well-being to corporate strategy. This paper investigates the price effects of these events in the decade since 1996 by analyzing market power in the gasoline retail industry for specific regions.

## METHODOLOGY

Determining whether or not market power is being exercised from market data is one of the most challenging problems facing economists. Several approaches exist for measuring market power, and their methods vary according to whether we use single-period (static) or multi-period models and the assumptions we adopt about the shape of the demand, marginal revenue, or marginal cost curves. One of the most straightforward means of measuring the degree of market power is to calculate the price-to-cost markup directly. For most industries, end-user price data are rela-

tively easy to come by, but unfortunately, marginal cost data are not. In gasoline retailing, however, we can use the wholesale price and taxes as the primary components of marginal cost.

Profit maximization leads to the so-called "Lerner Condition" which expresses price-cost margins in terms of the firm's elasticity of demand:

$$\frac{p - MC}{p} = -\frac{1}{\eta}$$

On average, wholesale costs and taxes represent more than 90% of retail prices (API, 2002) indicating that the demand is very elastic, in the range that most antitrust economists would consider competitive. However, the degree of competition, measured by this elasticity, may vary due to industry structure. In particular, mergers between competing retailers may reduce competition.

The Lerner condition can be decomposed into a multiple regression equation that can be used to examine the relationship between the variables in order to test for changes in the degree of competition:

$$P_R = \beta_0 + \beta_1 P_{W_i} + \beta_2 Tax_i - \beta_3 Con_i + \epsilon$$

where  $P_R$  is the retail price,  $P_{W_i}$  is the wholesale price,  $Tax_i$  is the Federal plus state tax,  $Con_i$  is some measure of the number of retailers in the local market and  $\epsilon$  is the error term incorporating all other factors affecting prices. The number of retailers and market concentration will vary due to mergers among competitors. When  $Con_i$  is the number of companies operating retail outlets within a particular region, then a negative estimate of  $\beta_3$  indicates that firms charge higher prices after merging.



## RESULTS AND DISCUSSION

The empirical results generally confirm the well-known theorem that increased market power leads to an increase in price. Our results also verify that wholesale price and taxes had the largest effect on the general price of retail gasoline. All cities analyzed experienced mergers within the past ten years. As oil companies intermittently merged over time, the number of branded firms decreased, which resulted in a significant increase in gasoline retail prices. In the specification using the number of firms to indicate market power, a \$1.00 increase in wholesale price caused a \$1.028 increase in retail price, and a \$0.10 rise in taxes increased the retail price by about \$0.122. One successful merger, acquisition, or joint venture results in a price increase by almost half a cent.

## CONCLUSION

Although this paper does not suggest any need for executive action, we can see the many factors, such as market structure, for example, that shift the price of gasoline either upward or downward, leading industries to choose prices based on the level of competition. We can also see how prices vary across cities due to difference in market power across regions and differences in regional wholesale prices and tax rates.

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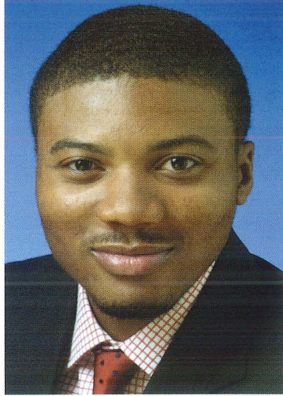
## FOOTNOTES

- <sup>1</sup> In recent years, there has been a significant number of mergers within the petroleum industry. To identify some of the largest, in 1998, Marathon and Ashland Oil merged their downstream assets, and British Petroleum (BP) merged with Amoco. In 1999, Exxon Corporation merged with Mobile Corporation. In 2000, BP/Amoco acquired ARCO. Within the past three years Shell acquired Texaco's downstream assets, Chevron acquired Texaco (other than downstream assets), and Conoco merged with Phillips.

# Video on Demand Using Distributed Video Streaming

ADETAYO AIYEDUN

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## INTRODUCTION

Video on Demand (VoD) is an enabling technology for many important multimedia applications, such as home entertainment, digital video libraries, distance learning, and electronic commerce [4]. In this research we propose a new VoD strategy

using DVS, called Video on Demand using Distributed Video Streaming (VoD<sub>Δ</sub>VS). This approach uses a framework for streaming video from multiple simultaneous servers to multiple receivers in an effort to achieve higher throughput and to increase tolerance to loss and delay due to network congestion. From the VoD perspective, we expand the single server architecture to multiple servers. From the DVS perspective, we allow simultaneous video streaming from multiple senders to multiple receivers, helping reduce the chances for congestion in the network. We also introduce a control server/sender, which serves as an intermediary between the clients and the streaming servers.

## BACKGROUND

A great deal of research has been conducted on VoD and DVS independently, falling into two categories: 1) True-VoD (TVoD) and 2) Near-VoD (NVoD). The most recent VoD research was a novel architecture called Unified VoD (UVoD) that tries to achieve cost-performance tradeoff anywhere between the two extremes (i.e., TVoD and NVoD) [4]. On the DVS front, there has been research on Distributed Video Streaming using Multicasting (DVSM) [1], that

extended the protocol suggested by DVS [3]. Many current video streaming protocols use multicast to efficiently utilize the available bandwidth of the network. DVSM operates in this vein by applying multicast functionality to DVS making it more efficient.

## METHODOLOGY

The solution to the problem of Video on Demand using Distributed Streaming involves devising algorithms for channel assignment and designing an appropriate control server. When a client makes a request for a particular video, this request goes to a control server, using primary and secondary channel algorithms (see Figures 1 and 2). The control server will then make initial assignments of the videos to individual servers following a mechanism of equally distributing the segments across the servers. The control server also sends a response back to the client to tell it which servers are responsible for the various video seg-

```
for i = 0 to (M - 1)
{
    Spci mod s -> Vi1 // 1st segment of video i is
                      //assigned to (i mod s) server on
                      //the //primary channel (pc).
    For j = 2 to K
        Spc,ji + (j-1) mod s -> Vij
}
```

Figure 1 Primary Channel Algorithm

```
for i = 0 to (M - 1)
{
    Spci mod s -> Vi1
    For j = 2 to K
        Ssc,j(i + j-1) mod s -> Vij //jth segment of ith
                                //video is assigned to
                                //(i+j-1) mod s server
                                //on the Secondary
                                //channel (sc).
}
```

Figure 2 Secondary Channel Algorithm

ments that make up the requested video. The client joins the multicast group corresponding to the channels at which these segments are being multicast. Each client will periodically send a control packet to the control server that contains feedback related to congestion in the network. The control server will detect congestion at particular servers using the control packet, and will compile all the control packets from each server at an interval (window) and decide if rate allocation is needed. If so, it will compare the initial assignment of the videos to individual servers with the new one, using the same methodology as in [1].

## RESULTS AND DISCUSSION

The algorithms for initial channel assignment do a good job of distributing the segments across the servers. The control server successfully reacts to congestion feedback received from the clients in the form of control packets. The use of a control server eliminated the need for a synchronization mechanism, because having multiple servers allows clients to receive video segments from more than one source. Using DVS helps overcome congestion on the internet, since it uses multiple senders/servers to achieve path diversity [1]. We propose special channels for each of the first segments of each video to ensure that new clients can be served with the shortest possible delay, as in true Video on Demand.

## CONCLUSION AND FUTURE RESEARCH

This paper extends existing research on Video on Demand (VoD) and Distributed Video Streaming (DVS) by combining the two into one, Video on Demand using Distributed Video Streaming (VoD $\leq$ VS). This approach uses a framework for streaming video from multiple simultaneous servers to multiple receivers to achieve higher throughput, and to increase tolerance to loss and delay due to network congestion. We proposed algorithms for assigning video segments to server in an equally distributing manner. Future work could include a simulation/implementation of the proposed solution. Also, various strategies need to be investigated for moving segment transmission responsibilities between streaming servers upon congestion.

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# Optimization Study of Enclosure Effects on Spot Cooling Devices

**BRANDIA JOHNSON**

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Dr. Dereje Agonafer, Department of Mechanical and Aerospace Engineering



## INTRODUCTION

The electronics industry has a strong demand for high-performance portable electronic devices. The laptop is one of these high-demand devices, mainly because of its portability and convenience. However, this type of convenience comes with a price. Since space is limited in a laptop, the heat flux increases dramatically when compared to a desktop. If the heat generated by the power dissipation of the CPU is not controlled, the laptop's life expectancy and performance are negatively affected. Therefore, since there is a strong desire to have the computing capabilities of a desktop in a laptop, a laptop's most significant problem is thermal management. The main intent of this project is to find a way to best control this heat with little or no disturbance to the overall system.

## BACKGROUND

There is vast amount of published literature that considers different cooling methods for laptop computers. Agonafer [1] showed that when simulating a fan heat sink in FlowTherm, the impinging air recirculates within the space and new air does not enter. Therefore, the air reaches steady state and the surface is not cooled. Duan and Muzychka [2] performed a study on an impinged plate fin heat sink in

order to compare the pressure drop of a theoretical model to an experimental model. The study showed that the predictions agreed with the experimental data within 20% at a Reynolds number less than 1200.

## METHODOLOGY

Obtaining the optimal fin height and spacing would allow maximum cooling to the heated surface. This will be accomplished by finding the pressure drop of the heat sink and the enclosure, which is known as the system curve. The system curve and the fan curve will be plotted on a graph by the pressure drop versus the volume flow rate. Where the two curves intersect will be the optimal volume flow rate at a given pressure drop. The system curve can be varied by the fin height and spacing. The appropriate heat transfer coefficient and volume flow rate can be established for a given heat sink, which will aid in the overall cooling of the heated surface.

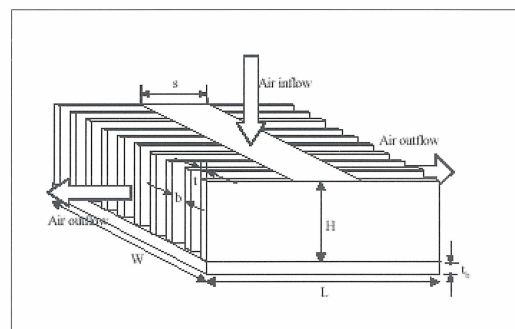


Figure 1 Impingement Flow in a Plate Fin Heat Sink [2]

## RESULTS AND DISCUSSION

The pressure drop of the enclosure was analyzed in Fluent with the purpose of visualizing the effects of the velocity vectors within the enclosure. The largest velocity was located at the inner corner of the enclosure. The area near the wall had the lowest velocity vector. The largest pressure was found at  $P_3$  (0 Pa) and lowest pressure was found at  $P_2$  (-0.385 Pa).

The pressure drop of the heat sink was found by analyzing the theoretical model in Excel. The results showed that as the shroud dimension got closer to the length of the heat sink, the pressure drop decreased and the channel velocity increased. The same analysis was conducted for the rest of the refined meshes. The results of the model were within 10% of the results found by Duan and Muzychka [2].

## CONCLUSION AND FUTURE RESEARCH

The results of the numerical analysis as well as the theoretical implications were presented here. Future studies may focus on finding the fan curve and plotting it with the system curve in order to find the optimal fin for a given heat sink.

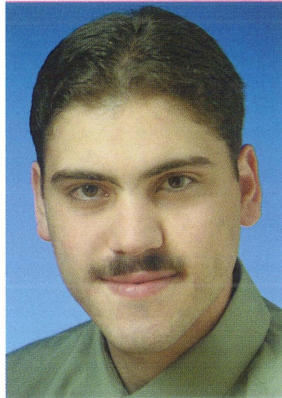
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# Controller Design and Implementation for Advanced Servo-hydraulic Robot Research

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## INTRODUCTION

There are two goals behind this research. The first is to provide an inexpensive and useful infrastructure for the control of a servo-hydraulic manipulator arm manufactured by Schilling Robotics known as the Titan 7F, using low-cost analog components. The second is to investigate whether any difference of practical significance exists between two amplification and summing junction techniques based on summing versus difference operational amplifier circuits. It is examined whether changing the feedback polarity by unity inversion can be avoided merely by using an alternate type of operational amplifier circuit with no effect in performance.

## BACKGROUND

Several efforts with objectives similar to this research have been identified in the literature. Namely, Lawrence Livermore National Laboratory developed a system called Tele-Robotic/Autonomous Control using ControlShell to manipulate a Titan 3 manipulator [1]. In addition, the ARM Project by TSC General Robotics group and Slingsby Engineering Limited (SEL) designed and built a control system with a graphical interface to carry out complex tasks for use with various Schilling Robotics Titan series of manipulator arms [2]. These systems focused on sophisticated digital control implementations involving computer hardware with dedicated ADC/DAC equipment for manipulation and control of the hydraulic manipulator arm. In the case of this research, however, the advantage of an analog control interface is that no software or computer hard-

ware is necessary for real time control. Unlike digital components in which trained technicians are required for diagnosing and repairing failed parts, analog controllers provide a standard instrument of control and a useful platform for learning and research.

## METHODOLOGY

Operational amplifiers are electronic components used as mathematical operators for addition, subtraction, multiplication, and integration. The operational amplifier used for the controller implemented in this research is known as a 741 op-amp, and it serves as the summing junction and amplification stage for the closed loop control system. Mathematically, the operation between summing and difference amplifiers is the same but each relies on different input and feedback polarities. When the feedback polarity is the reverse of the input polarity, a difference amplifier

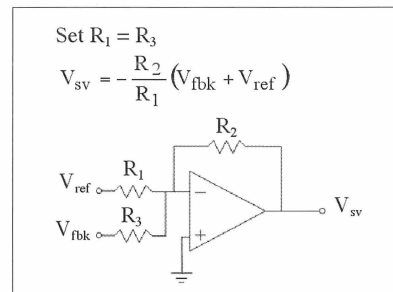


Figure 1 Circuit layout for summing amplifier

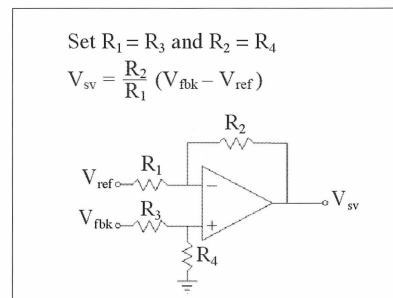


Figure 2 Circuit layout for difference amplifier



is required. However, when the feedback and input polarity are the same, a difference amplifier may be used without the need to invert one of the input signals. The op-amp acts as a comparator of the two signals, feedback and reference, to drive the hydraulic actuators to a desired stop position. Figures 1 and 2 depict the two types of amplifiers with their respective equations.

#### RESULTS AND DISCUSSION

The question addressed is which amplifier, summing or difference, exhibits better control. It should first be noted that with the proportional controller implemented, both summing and difference amplifiers accomplished smooth position control. A step input of one volt was applied to the wrist pitch motion under the same conditions such that only the amplifier type was changed. Both exhibited a first order transient response in which both of the amplifiers had the same system dynamics (i.e. the rise time and time constants were the same). Therefore, there was no difference of practical significance in performance of either of the two circuits.

#### CONCLUSION AND FUTURE RESEARCH

This research was successful in establishing a low-cost platform for the control of a servo-hydraulic manipulator arm. This control box was designed with the intent that further additions could be made, such as a joystick input device, additional operational amplifiers, or fine tuning the current layout for improved performance. The results show that a summing amplifier and difference amplifier have comparable performance. If both amplifier types deliver the same type of functionality, then which one should be

implemented as a summing junction for proportional control under a closed-loop control system? The recommendation from this research is to make that choice according to the relationship between polarities of the feedback signal and the input signal. If the polarities are opposite then a summing amplifier may be used; however, if they are the same, then a difference amplifier is equally appropriate. By making a controller with fewer components, there is less likelihood of error occurring, either through setup or mechanical failure.

For further improvements of the controller developed in this research, the following two suggestions are made. First, because actuator loading is different during extension and retraction due to weight, frictional forces, and inertial forces, two individual gains will improve the control, precision, and accuracy of the hydraulic actuators [4]. Second, the addition of a derivative control and integral control, making the analog controller a PID-controller, will minimize any overshoot and reduce oscillation, and is therefore expected to provide improved tracking performance over the proportional-only controller [6].

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# The NATO Crisis of 1966: A Rare Victory for the Johnson Administration

**WILL CUTHBERTSON**

Mentor: Dr. Joyce Goldberg, Department of History



## INTRODUCTION

The spring of 1966 proved to be critical in the history of the North Atlantic Treaty Organization (NATO), the defense alliance created as one component of America's policy of containing Soviet expansionist tendencies. By 1966 serious problems arose concerning the organizational and military nature of the alliance, and no one had more problems with the structure of NATO than French President General Charles de Gaulle. On March 7 de Gaulle sent President Lyndon Johnson a hand-written letter announcing withdrawal of French forces from the NATO integrated military command structure and the eviction of all foreign forces from French soil. The ensuing NATO crisis caused considerable tension within the Johnson administration as differences quickly arose about what actions to take in response to de Gaulle's denunciation of NATO agreements. Through the careful management of public comments, deference to all NATO members on issues affecting the alliance, deliberate refusal to immediately denounce French actions, and a carefully-considered decision not to take a hard-line with de Gaulle, the administration weathered the NATO crisis far better than many observers or participants expected.

## LITERATURE REVIEW

The relationship between de Gaulle and the United States, as well as between de Gaulle and the NATO alliance, has been addressed before. Historians Frank Costigliola in *France and the United States, the Cold Alliance Since*

*World War II* and Lawrence Kaplan in *The Long Entanglement, NATO's First Fifty Years* have written on France, the United States, and NATO issues since World War II. Biographies of major officials during the Johnson administration are plentiful. Douglas Brinkley's *Dean Acheson: The Cold War Years, 1953-1971* and James A. Bill's *George Ball: Behind the Scenes in U.S. Foreign Policy*, have provided insightful accounts on how these important administration officials guided the Johnson administration's positions on major foreign policy issues. Despite numerous studies of NATO, however, the crisis of 1966 continues to be neglected. This study endeavors to provide a fuller account of the Johnson administration's handling of the crisis, examine the struggles within the administration, and assess the effectiveness of the administration's strategy.

## METHODOLOGY

The Lyndon Baines Johnson Library (LBJL) provided the bulk of material used in this project. Recently declassified documents shed new light on the reaction inside the Johnson administration to French denunciations. The LBJL also yielded various draft letters of responses to de Gaulle that highlighted the battle within the administration on whether to take a soft-line or hard-line approach with de Gaulle. *The Papers Relating to the Foreign Relations of the United States*, indispensable volumes of declassified documents published by the State Department, provided much useful information and supplied the final drafts of important letters sent between the United States and France. Additional periodicals, such as the *Washington Post*, *New York Times*, and *Newsweek*, helped in determining public reaction to both de Gaulle's March 7 letter and the Johnson administration's reply. Comparing the press articles with classified docu-

ments permitted insight into what the public perceived to have occurred and what really took place within the Johnson administration.

### RESULTS AND DISCUSSION

These previously neglected sources show the sensitive nerve Charles de Gaulle had struck with the Johnson administration's Europeanists in the State Department and National Security Agency. While a battle brewed in the U.S. government on the course of action to take, the public saw an uncommonly united administration. Apparently at the insistence of President Johnson, the administration refrained from attacking de Gaulle during the days immediately following receipt of the general's letter. By seeming to defer to the NATO organization, the issues raised in de Gaulle's personal letter to Johnson avoided de Gaulle's trap of bilaterally negotiating alliance issues with the United States. Johnson took a soft line with de Gaulle and thus avoided a public fight with the general that could have had disastrous results for the United States in Europe. The Johnson administration's handling of the crisis showcases a rare foreign policy success for President Johnson. The United States was becoming increasingly unpopular in Europe due to the Vietnam War, a conflict in which de Gaulle believed Johnson was ultimately hoping to procure NATO intervention. De Gaulle's fear that the United States would drag the Atlantic Alliance into an undesirable conflict still holds relevance today (the Bush administration requested NATO participation in the War on Iraq, a request NATO, led by France, denied). The Johnson administration's decision to bow gracefully to de Gaulle's demands and to promise that France might rejoin NATO when it was ready to participate, mitigated some of the angry sentiment in Europe

toward U.S. involvement in the Vietnam War. President Johnson, in a rare show of restraint, demonstrated that the United States did not wish to dominate NATO and thus reinforced public support for the alliance.

### CONCLUSION AND FUTURE RESEARCH

Lyndon Johnson's astute diplomacy during the NATO crisis shows that he had the ability to succeed in foreign affairs. The soft line taken by the administration and Johnson's refusal to issue a strong public rebuke of Charles de Gaulle raise several questions for further research. Was Johnson so distracted by the escalating Vietnam War and his Great Society program that he avoided taking a hard-line position with de Gaulle to bypass a drawn out public-relations battle with the general? Did the administration's soft-line approach ultimately strengthen NATO or did it undermine the importance of the alliance by allowing a single disgruntled member to withdraw with few repercussions? Further research into these questions would undoubtedly yield important results. Nonetheless, the immediate consequences of the Johnson administration's response to French denunciations benefited NATO and the United States, much to the dismay of General de Gaulle.

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# Lost in Translation: Historical Accuracy in the Modern Historical Film

CHRISTINA LAMOTTE

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## INTRODUCTION AND LITERATURE REVIEW

The stories that comprise history are often affected by the medium through which they are told. Oral history provides a “poetic relationship” to the past, while written history – especially as practiced by professional historians – has made the past more “linear and analytical.”<sup>1</sup> By contrast, visual history, especially history as portrayed on film, has emerged as a powerful medium that offers history an identity by giving it a face and a voice. Historical films like *Schindler’s List*, *JFK*, and *Pearl Harbor* remain with us in the form of images and characters.

Prominent historians, such as Robert A. Rosenstone and Robert B. Toplin, among others, have written several books and articles which examine the qualities of film as a potential new medium for historical representation. Historians and filmmakers share one major similarity when dealing with the past: they each have a personal set of values, ideas, and assumptions which reflect heavily upon the way they express and interpret the past in order to give it meaning and credibility.<sup>2</sup> This similarity, identified by Rosenstone, is a contributing factor to many of the controversies surrounding historical films and the manner in which those films present history. Although other historical mediums have endeavored to create an idealized image of the past, it is the historical film alone that has truly emotionalized history and captured not just the look, but also the “feel,” of the past. As creative reconstructions of history, historical films not only create an image, but also encourage us to think

about history and how it applies to us today. For such reasons, films dealing with historical subjects have become an important method for informing – and misinforming – the public about the past.

## METHODOLOGY

The purpose of this paper is to look at the ways in which historical films about a violent event in South American history have deviated from the written record. By examining these digressions through the comparison of two historical films, it is then possible to determine the extent to which disregarding the historical record affects the ability of a film to accurately reconstruct history. However, identifying these same digressions helps to reveal the ways in which both accurate and inaccurate historical films can help encourage new modes of thought and active interest in the past. Rosenstone and Toplin, as noted above, have considered the possibility of cinematic history becoming a reliable medium for portraying history. Yet, this supportive interest in developing film is hardly shared by all historians. Many historians remain skeptical, as they do not respect a form of historical representation that does not refer to the written record.

## RESULTS AND DISCUSSION

The foreign films *El Dorado* (1988) and *Aguirre: The Wrath of God* (1972) represent both the positive and negative aspects of history on film. Being the products of opposing approaches to historical reconstruction, each film provides a strong case for the differing viewpoints of historians when considering history on film as a credible medium. The careful consideration given to historical information in the case of *El Dorado*, a film by Spanish director Carlos Saura, becomes a glowing example of how the

historical record can be represented in both written and cinematic history. Saura's persistence in maintaining the major framework of the Ursúa expedition shows that films, like written history, are capable of being credible sources of historical knowledge. However, when looking at German director Werner Herzog's film, *Aguirre: The Wrath of God*, the lack of interaction with the historical record becomes glaringly obvious as he compresses thirty years of South American history into one expedition. It is this freedom with which filmmakers can alter the structure of the past that makes them so potentially dangerous to the way history is understood.



## CONCLUSION

In identifying the various deviations from the record found in the films *Aguirre: The Wrath of God* and *El Dorado*, my point is not to showcase how historical films misrepresent the past. Instead, my intention is to show how both accurate and inaccurate films can contribute to the way we

view history. Like Herzog's *Aguirre: The Wrath of God*, inaccurate films may prove ineffectual in delivering "facts" about the past. However, they can offer amazing insights into the more metaphorical aspects of historical events and human behavior and, by doing so, make us think about the past in new ways. If film is ever truly to become a credible source of historical information, it will take effort on the part of both the historian and the filmmaker to ensure accuracy as well as visual impact.

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## ENDNOTES

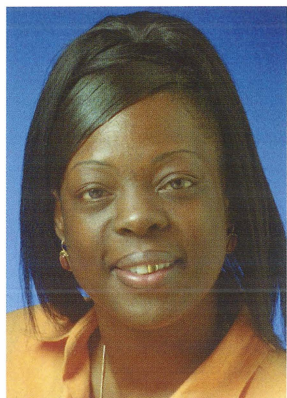
<sup>1</sup> Robert A. Rosenstone. *Revisioning History: Film and the Construction of a New Past*. (Princeton: Princeton University Press, 1995), 9-10. The first line is also credited by this endnote to Rosenstone.

<sup>2</sup> Rosenstone, *Revisioning History*, 6.

# Why Do Students Choose Criminology and Criminal Justice as a Major or a Minor?

**LESLIE WILLIS**

Mentor: Dr. Janice Ahmad, Department of Criminology and Criminal Justice



## INTRODUCTION

Criminology and Criminal Justice (CRCJ) is a recent field of study. Prior to the 1960s, CRCJ was taught mainly as law, political science, and sociology classes. It was not until President Johnson established the President's Commission on Law Enforcement

and Administration of Justice in 1965 that criminal justice was established as a separate field of study (this commission reported that police work was becoming increasingly complex and officers needed a college education). By 1976, the Law Enforcement Assistance Administration began to send funds only to those universities that offered CRCJ as a major. Since then, CRCJ has grown and many universities now offer this program. Therefore, the purpose of my research is to examine why students choose Criminology and Criminal Justice as a major or a minor. The research questions that this study will address are: Is there a difference between males and females? Is there a difference between whites and non-whites? Is there a difference between students who choose law enforcement and students who choose corrections as career goals?

## LITERATURE REVIEW

Current literature has little to say about Criminology and Criminal Justice being selected as a major or a minor. However, what has been done focuses on gender, race, and parental influence. One of the first studies was conducted by Krimmel and Tartaro (1999), who examined career choices and expectations of CRCJ majors. They found

that the students did not select this major because there were fewer science and math courses (as has been suggested), but because the students found the courses to be very interesting and relevant to the real world. Duplicating Krimmel and Tartaro's study, Gabbidon, Penn, and Richards (2003) surveyed African-American students at historically black universities. They discovered that students reported that the courses were extremely interesting and that they believed that CRCJ provided stable and gainful employment opportunities. Tartaro and Krimmel (2003) re-analyzed their original data by examining differences between whites and non-whites. They found non-whites chose law and corrections as career choices to help people and to protect others from oppression, while whites more often selected law enforcement.

## METHODOLOGY

In this study, a replication of Krimmel and Tartaro's survey was administered to 81 students who identified themselves as CRCJ majors or minors and were enrolled in one of the 11 CRCJ summer classes offered at the University of Texas at Arlington. Surveys were obtained from 79 students, resulting in a 97.5% response rate. The first 10 questions measured selection of major and the next 14 questions measured career choice. The final survey items consisted of demographic questions.

## RESULTS AND DISCUSSION

The respondents ranged in age from 19 to 47 with a mean age of 25.8 years. The majority were white (59%), female (68%), and majoring in CRCJ (86%). Fifty-eight percent were seniors and another 34% were juniors. An equal number of students (20 each) were interested in law en-



forcement or becoming lawyers as their primary career goal. Only nine respondents (11%) desired to go into adult or juvenile corrections.

Almost all of the students (97.5%) found the CRCJ subject matter to be interesting, and 81% found it to be relevant to the real world. Fifty-seven percent did not choose the major or minor because of influence from family, friends, or other acquaintances. Respondents reported that they chose CRCJ as a potential career because the positions are exciting (92%), and secure (86%), and they had a desire to help people solve problems (86%).

The results indicate no difference between the ways males and females choose their major/minor. Similarly, there is no difference between whites and non-whites in their selection of a major or minor. However, previous research has shown differences between these groups. The current study found that differences exist between students who chose law enforcement and those who chose corrections as their primary career goal. Students interested in corrections reported that they enrolled in this major as they thought it would have less science courses. Students interested in law enforcement were more likely to agree with the statement that they wanted to arrest "bad guys."

## CONCLUSION

The findings of this study are similar to those of previous research, indicating that CRCJ majors and minors at UTA may be more similar, than dissimilar, to other CRCJ students. The results can be used to refine the CRCJ curriculum to reinforce the students' desire to help people solve problems and to offer more career guidance based on the belief that CRCJ is a secure career.

This study could be improved by examining the media's influence on students' choice of career, since 57% stated that no one influenced their decision to study CRCJ. However, the media does influence perception and may shape career choices. Therefore, an examination of media influence may be important.

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# Twice-told Tensions: The Influence of National Ideals on the Works of Nathaniel Hawthorne

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## INTRODUCTION

The flowering of American literature in the nineteenth century brought to the foreground two fundamental questions: What is an American? and What is the role of the artist in America? Traditionally, Americans on the whole were averse to artistic pursuits, viewing them as opposed to national values such as equality, liberty and practical reason. In the nineteenth century, however, many of these values were undergoing re-evaluation in the process of attempting to create a geographically and politically unified national consciousness. Nathaniel Hawthorne is one of the authors of this period whose work embodies the tensions of this transitional period. Particularly in his characterizations of artists, Hawthorne represents the dialectical nature of national and artistic values and the sense of guilt that develops as a result. In such tales as "The Artist of the Beautiful," "Rappacini's Daughter," and "Ethan Brand," guilt can be seen as deriving from being an artist in a nation demanding action; being intellectually superior in a nation glorifying equality.

## LITERATURE REVIEW

The themes of guilt, transition, and opposition are widely discussed in Hawthorne scholarship. Millicent Bell, for example, in *Hawthorne's View of the Artist*, discusses Hawthorne as a transitional figure caught in the dialectic

between the Romantic literary tradition and the Transcendental movement in America, noting that many of Hawthorne's artists contain elements of guilt. "We have seen that Hawthorne's art is obsessed with the theme of guilt," she writes. "One must ask why" (204). Frederick Crews also calls into question what he calls "the sin of art" (154) in his psychoanalytic study *The Sins of the Fathers*. Crews takes the position that Hawthorne faces an internal struggle between Puritanical "fathers" and the artistic "disinherited son" (37) in which both forces, in terms of Freudian analysis, are equally culpable. In a psychoanalytic fashion, Crews's ultimate determination as to why art is sinful is that it acts as a substitute for sexual acts. While in agreement with both of these scholars that Hawthorne's work embodies a dialectical struggle, this study views that struggle in terms of American national values as they evolved from the early settlement period to the nineteenth century. Thus, the guilt of the artists in Hawthorne's fiction is manifested in the view of the artist as a transgressor against the values of American society.

## METHODOLOGY

In order to clearly identify the values held by nineteenth-century Americans, I examined the evolution of national ideals as defined by Liah Greenfeld in her study, *Nationalism: Five Roads to Modernity* and Alexis de Tocqueville in selections from his *Democracy in America* as well as Puritanical beliefs and practices as discussed in Max Weber's *The Protestant Ethic and the Spirit of Capitalism* and Joshua Miller's "Direct Democracy and the Puritan Theory of Membership." In order to understand the phenomenon of guilt

and sin, I studied Paul Ricoeur's *Symbolism of Evil*. Finally, in analyzing the short stories themselves, I established the common images and symbols within each of the stories, examining them in an historical context.

### RESULTS AND DISCUSSION

The values of the American nation – equality, liberty, community, and industry – were often seen as contrary to the pursuit of knowledge for its own sake. Artists in America gained little popularity or recognition and were, in fact, often isolated from society in general because they did not conform to the traditional standard by which these values were measured. While themes of isolation and superiority are easily extracted from Hawthorne's works, particularly with regard to artists, the guilt associated with such isolation is manifested in his use of imagery and symbolism. The three stories examined indicate a progression from a merely superficial sense of guilt in Owen Warland to the reenactment of the Adamic fall in "Rappacini's Daughter" to the embodiment of sin in Ethan Brand. Burdened by their sense of guilt, the only means by which the artists can atone for it is to symbolically sacrifice their art for the sake of society. The discussion, as Hawthorne's ambivalence and irony indicate, is not one-sided, however. Hawthorne's view of American society embodies a critique of the emphasis on materiality and industry, which exclude the artist.

Ultimately, Hawthorne's work advocates a synthesis of such opposing forces as materiality and spirituality, activity and idleness, equality and superiority, and liberty and slavery.

### CONCLUSION AND FUTURE RESEARCH

Perhaps the best characterization of such a synthesis is that of Hester Prynne, whose art serves the purposes of society rather than alienating the artist from it. Indeed, *The Scarlet Letter* ultimately rescued Nathaniel Hawthorne from anonymity and assisted him in reaching the pinnacle of his career. With this study in mind, several aspects of Hawthorne's work provide a basis for further analysis, including the structure and events of the novels. The role of women in Hawthorne's stories would also prove to be an interesting study in light of the role of women in nineteenth-century America.

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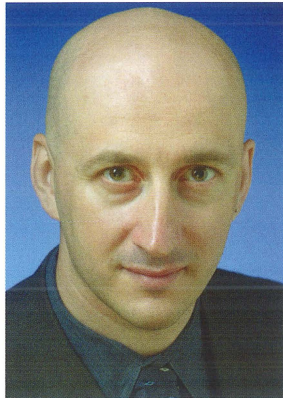
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# The Effects of Social Influence on Performance in Locating Food Sources (Local Enhancement), and on Neophobia Associated with Novel Environments in Green Sea Turtles (*Chelonia mydas*)

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## INTRODUCTION

In terms of safety and energy expenditure, there is a clear advantage gained in learning the location of a food source by observing, and imitating, the behavior of a knowledgeable conspecific. Therefore it was hypothesized that a naïve individual

would be facilitated in the task of food finding at a specific location, a process known as local enhancement, by the observation of a trained demonstrator, and that the presence of a trained individual would significantly reduce the neophobia associated with the novel food source for observing individuals.

## BACKGROUND

Foraging and the evasion of predators are probably among the most advantageous behavioral traits that can be shared and learned. The presence and behavior of a knowledgeable individual have been shown to have an enhancing effect on the behavior of others in the same group with regard to the location of a food source (Coleman & Mellgren 1994). This particular kind of social influence, in which an animal's attention is drawn to a particular place or object, is termed "local enhancement". According to Coleman & Mellgren (1994), this phenomenon is thought to aid in the location, the exploitation, and the overcoming of neophobia (fear of novel stimuli) associated with novel microhabitats that provide feeding opportunities.

## METHODOLOGY

Thirty-five green sea turtles (*Chelonia mydas*) approximately 8 to 9 months old were used as subjects. Five randomly selected turtles were trained to find food in a tray among three total trays at a specific location inside a round tank over ten trials. After training they served as trained demonstrators (TD) for another ten turtles (TDO) who individually observed one of the TD turtles. Twenty other turtles were randomly divided into ten groups of two turtles each, one to be used as naïve demonstrator (ND) and one as naïve observer (NDO). In the second part of the experiment, each of the observers was first allowed to observe the demonstrator feed and, subsequently, to feed itself. The latency to find the food source and the number of wrong attempts were recorded.

## RESULTS AND DISCUSSION

The NDO turtles found the food on average 2.65 times faster than the TDO turtles, a significant difference. A possible explanation could be that the average time spent demonstrating the behavior was significantly less for the TD than the ND turtles. In addition, TD behavior was more uniform than ND behavior, generally approaching the tray and hovering inside it for the entire duration of the feeding. Furthermore, the TDO latencies were not different from the ND. Therefore, the food finding was probably more related to the turtle's exploration efforts than to the acquisition of knowledge by observation. In contrast, the TDO vs. NDO and ND vs. NDO data can be interpreted as an indication that the NDO turtles learned where the food was by observing the demonstrators. Although the NDO group found the food almost twice as fast as the ND group, the

difference was not statistically significant ( $p = 0.08$ ). It is possible that the TD turtles, with their very low latency scores, their direct approach of the right trays as soon as placed in the tank, and their less exploratory and more focused behavior, either failed to capture the attention of the observers or they did not provide enough behavior to observe altogether. Therefore, a possible explanation could be that social facilitation, in the form of local enhancement of stimuli, does take place among sea turtles; however, the exposure time to the behavior plays a critical role in the learning of a specific task.

No significant difference was found between the data from the first training session of the TD and the combined data collected from the trials of the naïve observers (TDO and NDO). Comparison of the TD with ND latencies on their first trial was not significantly different either. Therefore, it appears that in *C. mydas*, the presence of a conspecific is not a factor in overcoming neophobic reactions.

#### CONCLUSION AND FUTURE RESEARCH

Social facilitation in the form of local enhancement of stimuli does seem to occur in sea turtles. However, the presence of a conspecific appears to be of no consequence in overcoming the stress associated with exposure to a new environment. Further research focusing on the effects of exposure time to a demonstrator's behavior and on herd-size behavioral responses to novel stimuli is needed to determine whether these findings can be broadly applied.

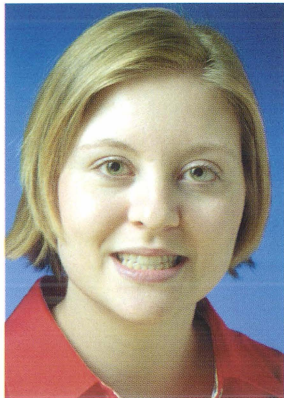
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# Magazine Training in Crayfish (*Procambarus clarkii*): Step One of Operant Conditioning

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## INTRODUCTION

Government and academic funding for research and teaching may be at risk due to public criticism of vertebrate animal testing and the escalating cost to maintain the animals in the laboratory. Without external funding, educational institutions may find themselves financially incapable of funding such endeavors. It is increasingly important to develop a reliable substitute for the vertebrate model. Invertebrates, specifically crayfish, may prove to be a viable alternative to vertebrate animals in certain fields of comparative research, notably animal behavior. Crayfish are more economical in acquisition, maintenance, and utilization than the currently employed rat and pigeon models in conditioning studies. *Procambarus clarkii* can be utilized in wet or dry experimental designs (Reese, 1983). They can locomote effectively on dry surfaces in various temperatures and have the capacity to manipulate their limbs in precise ways (Krasne, 1973; Reese, 1983). This species, selected for its vigorous ability to survive in squalid conditions (Huner, 1988; Holdich and Lowery, 1988), is less demanding to care for than other species, and is appropriate for use in classrooms (Holdich and Lowery, 1988). The present experiment examined the feasibility of using crayfish (*Procambarus clarkii*) to supplant the vertebrate model in applications of modifiable behavior, beginning with the establishment of magazine training.

## BACKGROUND

The study of crustaceans in the past has provided invaluable insight into the physiological mechanisms of the functions of learning (Corning and Lahue, 1972). Comparative psychology's interest in animal behavior includes the investigation of one species as a model of other higher-order species (Denny, 1970). Invertebrates have been found to possess the ability to alter their behavior to environmental variations, and previous studies are suggestive of crustacean learning; however, limited relevant data exists supporting operant conditioning in these animals.

## METHODOLOGY

Six male freshwater crayfish (*Procambarus clarkii*) under appetitive deprivation were observed during five magazine training sessions in an operant conditioning box (see Figure 1). The "click" sound of the feeding apparatus performed as the central discriminative stimulus correlated with

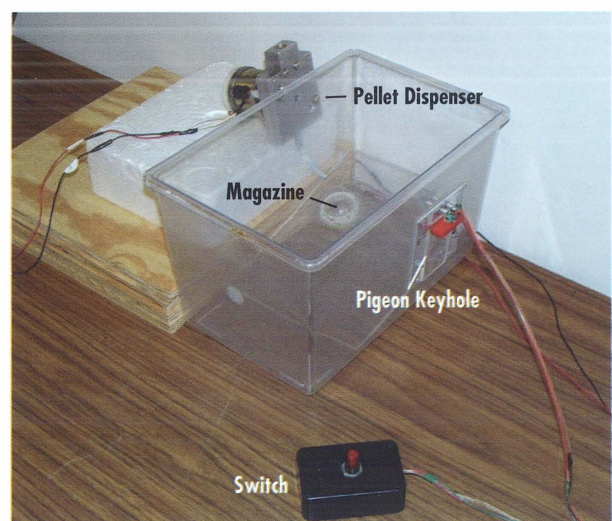


Figure 1 Operant conditioning box for crayfish



the availability of food (Denny, 1970). Individuals were contingently reinforced to emit a food-taking response. The target response was to travel out of water up an inclined plane to the magazine when a pellet was dispensed. Each session occurred once daily for 30 minutes for five consecutive days.

#### RESULTS AND DISCUSSION

Crayfish (*Procambarus clarkii*) performance observed during five sessions of magazine training varied greatly among subjects. One subject demonstrated exceptionally solid food-taking behavior under reinforcement control. Moderately steady accomplishment was observed in two subjects, which displayed decreasing efficacy per session, and zero successful responses were observed in one subject. The results indicated that the rate of response increased with experience suggesting establishment of behavior under reinforcement control. This is partially consistent with our hypothesis that crayfish possess the aptitude to effectively participate in and replace the vertebrate model in operant conditioning studies.

#### CONCLUSION

Demonstration of improved skill with experience suggests that crayfish (*Procambarus clarkii*) are capable of responding at an increased rate and with decreased response latency under more complex reinforcement contingencies and schedules. The present experiment is the first examining magazine training in crayfish, and increased research efforts, featuring positive reinforcement techniques, are necessary.

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# The C: N: P Stoichiometry of a Mixotrophic Protozoan Grown at Various Rates

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## INTRODUCTION AND BACKGROUND

In aquatic systems, the movement of minerals from the dissolved state to the particulate state is mediated by bacteria and algae. Further movements of these mineral nutrients into higher trophic levels are mediated by consumers of bacteria and algae. The primary consumers of bacteria are the heterotrophic nanoflagellates (Eccleston-Parry and Leadbeater 1995). *Ochromonas danica* is a single-celled motile nanoflagellate grouped with golden-brown algae. *Ochromonas* is incapable of phototrophic growth but grows and reproduces at the expense of bacterial prey (Sanders et al. 2001). Under laboratory conditions, it may grow heterotrophically on very rich organic media (Sanders et al. 2001).

The macromolecular and elemental composition of bacteria and algae has been shown to be a function of growth rate and temperature (Henrici 1928, Schaechter et al. 1958, Neidhardt et al, 1990). Bremer and Dennis (1987) demonstrated that the ratios of macromolecules in bacteria change with growth rate and that fast growing bacteria contain more DNA, RNA, and protein than slow growing bacteria. Similar results were reported by Rhee and Gotham (1981) for two genera of algae.

Thus, it appears that the movement of mineral nutrients available to higher trophic levels via microbial predator-prey relationships should reflect the growth rate of the prey as well as the macromolecular composition of the preda-

tor. This study reports on the ratios of element composition (carbon, nitrogen, and phosphorus) of *O. danica* as a function of growth rate.

## METHODOLOGY

Four growth rates were established by growing *O. danica* at temperatures of 30, 25, 20, and 15 C. Eight 50 mL batch-cultures of *O. danica* were prepared for each temperature and shaken in the dark. When the cultures were in exponential growth, 6 cultures were sampled to determine cell abundance, volume, carbon (C), nitrogen (N), and phosphorus (P).

Cell abundance (500X) and volume (1250X) were determined using epifluorescent microscopy (Caron 1983). Single sub-samples from each of the 6 cultures were collected for the determination of C, N, and P. C and N were determined using a CHN analyzer (Perkin-Elmer) and P was determined colorimetrically according to Menzel and Corwin (1965).

## RESULTS AND DISCUSSION

Growth rate of *O. danica* was found to correspond to temperature (Table 1). Cell size decreased as temperature increased (Table 1). Cellular concentration of C, N, and P ( $\mu\text{moles mL}^{-1}$ ) for each culture was normalized to cell abundance ( $\text{cells mL}^{-1}$ ) and cell volume ( $\mu\text{m}^3 \text{ cell}^{-1}$ ). C:N ratios ranged from 6.4 in cultures grown at 15 C to 8.4 in cultures grown at 30 C. C:P ratios increased from 140.2 at 15 C to 283.2 at 25 C. N:P ratios increased from 23.5 at 15 C to 36.8 at 25 C (Table 2). Each of the element ratios increased as linear functions of temperature ( $R^2$  for C:N = 0.87, C:P = 0.95 and N:P = 0.97).

## CONCLUSION AND FUTURE RESEARCH

Rhee and Gotham (1981), working with chemostat cultures, determined that the N:P ratios of *Asterionella* and *Scenedesmus* increased with decreasing temperature. They attributed the change in cell element content to an increased demand for nutrients at lower temperatures. Similarly, Woods et al. (2003) established that organisms respond to lower temperatures by either increasing the content of synthetic and catalytic components or by increasing cell size. These findings appear to contradict our results with *O. danica*; however, our work was done in batch cultures where growth rate was established by regulating temperature. Chemostat cultures allow both temperature and growth rate to be manipulated independently; thus, while *O. danica* clearly regulates its element composition as growth conditions change, it remains to be determined if the cells are responding to changing temperature or changing growth rate.

Temperature (C)	Growth rate (h <sup>-1</sup> )	Volume (μm <sup>3</sup> ) (SE)
15	0.04	1.81 (0.07)
20	0.06	2.15 (0.16)
25	0.08	2.17 (0.08)
30	0.10	2.24 (0.05)

**Table 1** Growth rate and volume of *Ochromonas danica* at various temperatures. Volume; N=60

Temperature (C)	Growth rate (h <sup>-1</sup> )	C:N	C:P	N:P
15	0.04	6.4 (0.6)	140.2 (15.4)	23.5 (3.7)
20	0.06	6.5 (0.2)	189.9 (13.4)	28.4 (2.1)
25	0.08	8.2 (0.8)	283.2 (15.6)	36.8 (5.0)
30	0.10	8.4 (1.2)	ND	ND

**Table 2** Element ratios of *Ochromonas danica* grown at various temperatures and growth rates. All ratios are atomic. Values shown are the averages of 6 determinations (SE). ND = not determined.

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# CG2222-like, An Expressed Retrogene of *Drosophila willistoni* under Purifying Selection

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## INTRODUCTION

Newly acquired duplicates are opportunities for exploration into how genomes obtain new functions. Retroposition is a duplication mechanism whereby a transcribed gene is converted from mRNA into DNA and reinserted in the genome.

During a comparative genomic study of five *Drosophila* species, a new coding region (CG2222-like) was observed to have been gained through retroposition in the even-skipped (*eve*) region of *D. willistoni*. CG2222-like is a close intronless homolog of CG2222 of *D. melanogaster* (Bergman *et al*, 2002). CG2222 is an intron-containing

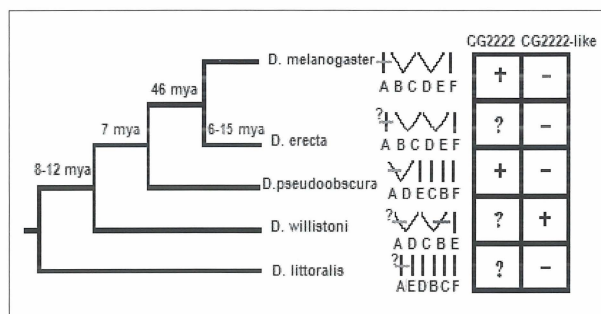
gene in *D. melanogaster* (Adams *et al*, 2000) and *D. pseudoobscura* (<http://pipeline.lbl.gov/pseudo/>) with a protein identity of 79.5% with CG2222-like. The characterization of CG2222-like as a new functional retrogene of CG2222 is the focus of the investigation.

## LITERATURE REVIEW

Retrogenes are duplications that possess distinct characteristics: high identity with the transcribed region of the parental, a lack of introns, and a different chromosomal location from the parental gene (Li, 1997). Since a retrogene originally lacks regulatory elements, these elements must be recruited for expression (Makalowski, 2000). Once the retrogene is inserted into the genome, there are two possible alternatives. One is that the gene accrues deleterious mutations and degenerates or, alternatively, it gains regulatory elements and acquires a function (Betrán, 2002a).

## METHODOLOGY

To recover CG2222 in *D. willistoni*, DNA was extracted from 25 adult flies and used in PCR reactions. The primers were designed in conserved regions between CG2222 of *D. melanogaster* and CG2222-like of *D. willistoni*. Expression analyses were conducted with total RNA extracted from 15 adult flies. An RT-PCR protocol was conducted. The primers used were designed in areas of low identity to increase the likelihood of the retrogene being amplified instead of the parental. Genbank sequences of CG2222 in *D. melanogaster* and CG2222-like were compared to evaluate if selective constraint existed for their



**Figure 1** The phylogenetic distribution of CG2222 and CG2222-like in the *Drosophila* species compared by Bergman *et. al.* (2002) is depicted. The haploid chromosome set and divergence time for each species is shown accordingly (Powell, 1997). For *D. erecta* and *D. littoralis* the elements are derived from close relatives. The presence of CG2222 is displayed on the Muller element A and on *D. willistoni*'s B Muller element the presence of CG2222-like is shown. A question mark indicates that we assume the gene is present based on chromosomal arm homology and/or phylogenetic distribution. (<http://pipeline.lbl.gov/pseudo/>)

proteins.  $K_A$  and  $K_S$  were calculated using the Li-Wu-Luo method (Li, Wu, and Luo, 1985) and compared with a Z-test. Clustal X (Thompson *et al*, 1997) and MEGA2 software (Kumar *et al*, 2001) were used.

### RESULTS AND DISCUSSION

Despite various primers and PCR conditions, *CG2222* in *D. willistoni* was not recovered. mRNA of *CG2222-like* in adults was detected and confirmed with a restriction reaction. Further supporting the existence of functionality, sequence analysis revealed significant purifying selection ( $K_A/K_S = 0.064$ ;  $p = 0.003$ ). Other approaches should be employed to recover the putative parental gene since recovering *CG2222* in *D. willistoni* would clarify where selection is being exerted.

### CONCLUSION AND FUTURE RESEARCH

Using modern molecular techniques, duplications can be examined for method of acquisition, expression, and possession of function. Despite originally lacking regulatory regions, *CG2222-like* in *D. willistoni* is an expressed retrogene (produces mRNA) likely under purifying selection. Further research will be conducted to study the *CG2222* pattern of expression and to provide stronger evidence of purifying selection for the retrogene. This will primarily occur through the recovery of *CG2222* in *D. willistoni* to provide better comparisons for the retrogene's

mode of evolution and through additional expression analysis for *CG2222-like* in males and females. The latter will test the proposed hypotheses that many autosomal retrogenes acquire male-specific expression (Betrán *et al*, 2002b).

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# Characteristics of Adamantane as a Pressure-Transmitting Medium in Diamond Anvil Cells

CARLOS PARADA

Mentor: Dr. Michael Pravica, Department of Physics, University of Las Vegas Nevada



## INTRODUCTION

The characteristics of adamantane suggest that it may be an adequate pressure-transmitting medium at pressures up to 20 GPa (giga-pascals) and possibly higher. At ambient conditions adamantane is a white solid which would simplify the loading process since liquid pressure transmitting mediums can be difficult to load <sup>5</sup>. X-ray diffraction and Raman spectroscopy studies of the adamantane molecule demonstrated its cubic phase. This structure consists of four interlocking, six carbon rings with C-C-C bond angles of approximately 109.45 degrees and zero structural strain. This implies that the molecule is only moderately compressible and may be suitable as a pressure transmitting medium.

## BACKGROUND

One of the greatest difficulties in dealing with diamond anvil cells (DACs) is the minute dimensions of the sample. The material to be measured must be painstakingly loaded under a microscope using a needle to position ruby chips where needed. Unfortunately most materials of interest are not good pressure transmitters. This means that when placed under load the pressure distribution will not be uniform and therefore not hydrostatic. Hydrostaticity is desirable because it ensures that the entire sample experiences the same conditions during experimentation. Unfortunately the most common pressure transmitting mediums are liquids at room temperature, and tend to ruin the positioning of sample and ruby once they are added.

## METHODOLOGY

Adamantane of 99% purity was loaded into a Mao-Bell-type DAC. A 280 micron thick rhenium gasket was pre-indented to 70 microns and was then drilled utilizing an electric discharge machine (EDM) to produce a 130 micron diameter hole. Adamantane was loaded and ruby chips of 5 to 10 micron diameter were strategically placed within the hole. The DAC was then reassembled, the diamonds were compressed, and the ruby fluorescence spectra were recorded. This measurement was done with a SpectraPro 750 monochromator. The separation of the ruby R1 and R2 peaks were measured as a function of pressure, along with their positions and full widths at half maximum.

## RESULTS AND DISCUSSION

Pressure measurements were recorded in 5 GPa increments up to 43 GPa and were taken for various ruby crystals. The pressures were then related to the ruby R1 peak width and the distance between the ruby R1 and R2 peaks. For adamantane, broadening on the R1 peak indicates the presence of pressure gradients and sheer stresses <sup>7</sup>. Figure 1 is a distribution of pressure versus the R1 peak width. A moderate increase in full width half maximum was expected before 5 GPa because of the transformation of the adamantane molecule to the tetrahedral structure <sup>3</sup>. Although the broadening is gradual throughout the range of pressure, an increase in the rate of broadening was observed at 8 and 16 GPa. This is significant since these pressures have been verified as phase transition points for the molecule <sup>3,4</sup>. Figure 2 shows the pressure versus R1-R2 separation. No significant increase in the separation was noted until approximately 10 GPa. This suggests that there is no sheer stress in the sample at this point. A gradual increase occurs until approximately 18 GPa. At this pres-



sure the distance of H...H atoms falls below the critical separation of 1.9 Å (angstroms) where formation of free hydrogen molecules occurs, decomposing the molecule<sup>3</sup>. The largest increase in the R1-R2 distance occurs at approximately 40 GPa, which accompanied a reduction in the R1 peak width. A possible explanation for this data is that shear stress has overcome pressure gradients as the main form of pressure relief. This may indicate that a phase transition has occurred, which will be further explored in a future study.

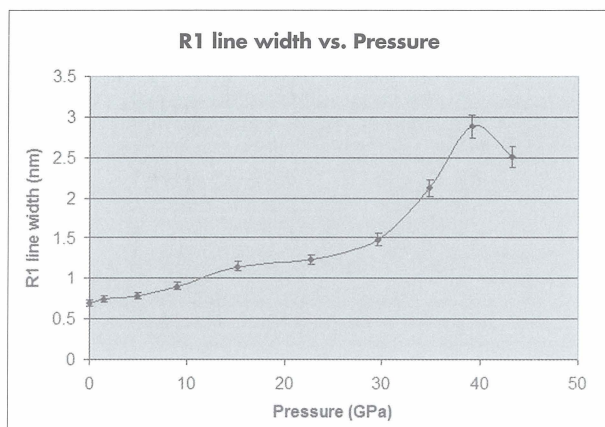


Figure 1

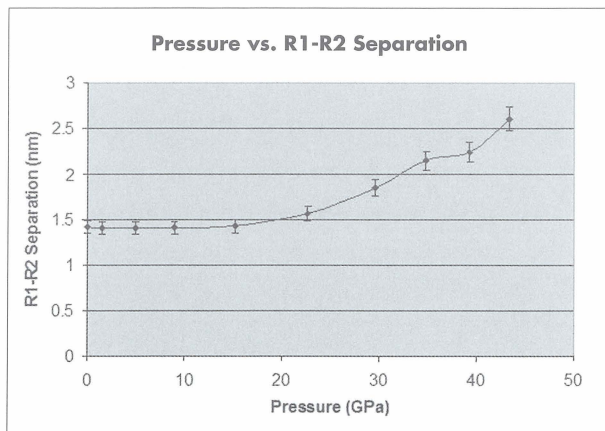


Figure 2

## CONCLUSIONS

The continuous broadening of the ruby R1 peak after 5 GPa and the increase in R1-R2 peak to peak separation after 10 GPa indicate that the samples experienced a high degree of pressure gradients and shear stresses. This non-hydrostatic behavior makes adamantane unsuitable as a pressure transmitting medium for pressures greater than 5 GPa.

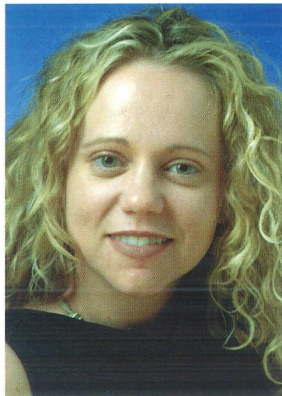
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# Do Green Sea Turtles (*Chelonia mydas*) Exhibit Play Behavior? A Closer Look Using Play Object Analyses

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## INTRODUCTION AND BACKGROUND

If you take a walk in the park you may see children playing on a tire swing and dogs jumping and chasing after their owners. These playful activities are enjoyable to watch but do we really know why they occur? In science the topic of play

has many definitions because it takes different forms in different species. A leading scientist in the study of reptilian play has suggested non-mutually exclusive criteria for play (Burghardt 2004): play is repetitive, spontaneous and/or pleasurable; it is a response to stimuli and part of development; and it is initiated when the "animal is in a relaxed or low stress setting" (p. 234). Reptilian play has received little scientific attention in the past, perhaps because the subject seemed trivial or just having fun (Spinka *et al.* 2001). However, the current view of play research is that it has profound value for a species (Burghardt 2004). The purpose of this exploratory study was to observe green sea turtles (*Chelonia mydas*) with play objects and determine if they were indeed playing. We hypothesized that the turtles would initially experience neophobia towards play objects, but through more exposure they would be inquisitive of, and interact with, the objects.

## METHODS

In this experiment, eighteen 8-month-old green sea turtles were selected at random from the population at Parque Xcaret, Mexico. Three different experiments were designed to get a thorough description of the turtles' activity with the

absence and presence of play objects. Three different play objects were used (an elongated yellow ball, a medium-sized blue ball and an orange disc). Fisher's Exact Probabilities Tests were used to determine whether turtles spent more time in the target quadrant in the presence of play objects than expected based on time spent in the target quadrants in the absence of play objects.

## RESULTS

We found that after overcoming initial neophobic responses (avoiding the area around the objects) in trial 1 of the first experiment, the turtles began approaching, touching and biting the objects. The amount of time the turtles spent with a particular object, when they were allowed to float freely in the tank, was analyzed for the second experiment. In this experiment, 60% of the turtles' time interacting with the objects was with the orange play disc. This play object "preference" was also analyzed for experiment 3 and the data shows that the turtles spent 53% of the time with the orange disc. Results from experiment 3 also show that 75% of the individuals spent significantly more time in the target quadrant in the presence of play objects than in their absence (Figure 1).

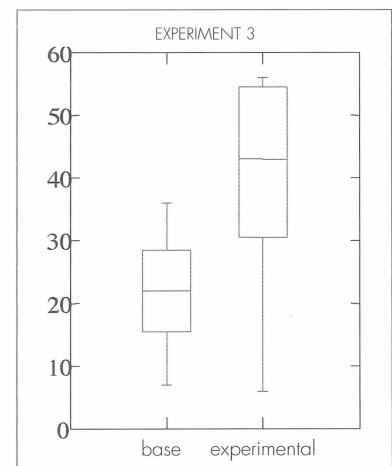


Figure 1 Presence of play objects for trial 1 and trial 2

## DISCUSSION AND CONCLUSION

In this study, we found that green sea turtles were very curious and seemed interested in the play objects. When the play objects were present the turtles were observed biting, rubbing and investigating the objects. It is apparent that the turtles were interested in the objects, but it is difficult to conclude that they were exhibiting play behavior because little or nothing is known about the topography of reptilian play. There were many caveats to be noted in this study. Based on the definition of play described at the introduction of this paper, the turtles that were studied fit some of the criteria. It is my belief that some of the subjects in the test were "playing"; however, much of the interactions with the objects involved biting or "mouthing" the object, which might be interpreted as futile feeding attempts given that the turtles had several hours of experience with the objects. It seems unlikely that the biting behavior was truly inappropriate feeding. Play in other species, such as dogs, often involves biting or mouthing behaviors, and so for turtles it might be the same. Regardless, the results of

this study suggest that turtles are inquisitive and interactive with unfamiliar objects. If certain species of reptiles, particularly turtles, do exhibit play behavior, then more conclusions can be made about the history and evolutionary benefits of play. Making conclusions about a species' natural behavior using data from animals studied in captivity has its limitations; however, under the right conditions object play may prove to be beneficial to reptiles in captivity.

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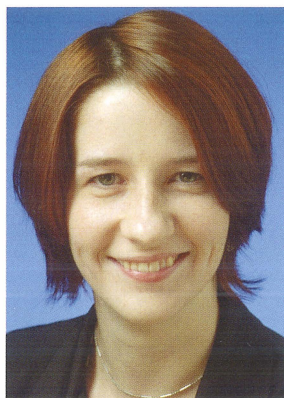
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# Effects of Herbivory and Nutrient Addition on the Arctic Alaskan Plant Species

ELIZABETH RAMSEY

Mentor: Dr. Laura Gough, Department of Biology



## INTRODUCTION

Global climate change is expected to affect northern latitudes dramatically, giving rise to probable alteration of plant community structure (Maxwell 1992). Increased nutrient availability caused by elevated summer temperatures will likely lead to higher primary productivity and taller plant communities (Nadelhoffer et al. 1992; Oechel and Billings 1992). Such changes may also alter herbivore population densities and their interactions with plant communities (Jefferies et al. 1992). At the Arctic Long-term Ecological Research site in northern Alaska, I examined the growth responses of five plant species in dry heath (DH) and moist acidic tussock tundra (MAT) communities when they were exposed to natural conditions (NFCT), fertilization with nitrogen and phosphorus (NFNP), fencing to keep out herbivores (SFCT), or fencing combined with fertilization (SFNP) in the ninth year of treatment.

## BACKGROUND

Several studies have been conducted to elucidate the effects of plant nutrient content and availability on mammalian herbivores, but fewer have investigated herbivore effects on plant populations and communities in the Alaskan Arctic (Batzli and Lesieutre 1991; Mulder 1999). Many nutrient addition experiments simulating the effects of climate change have been conducted (Shaver et al. 2001; Gough et al. 2002), but combined nutrient addition and herbivore effects on growth have not been studied in DH and MAT community types in this area of northern Alaska.

## METHODOLOGY

The plant species chosen were: *Hierochloa alpina* (tussock-forming graminoid), *Carex microchaeta* (rhizomatous graminoid), and *Betula nana* (deciduous shrub) at DH, and *Eriophorum vaginatum* (tussock-forming graminoid), *Carex bigelowii* (rhizomatous graminoid), and *Betula nana* at MAT. Depending on the growth form, leaf lengths and number of leaves per ramet, number of inflorescences, average inflorescence height, and new and total stem growth were measured weekly from 14 June to 14 July 2004.

## RESULTS AND DISCUSSION

At the more nutrient-limited DH site, fertilization increased growth of most species, more obviously in fenced plots, while fencing alone had little effect; these responses oc-

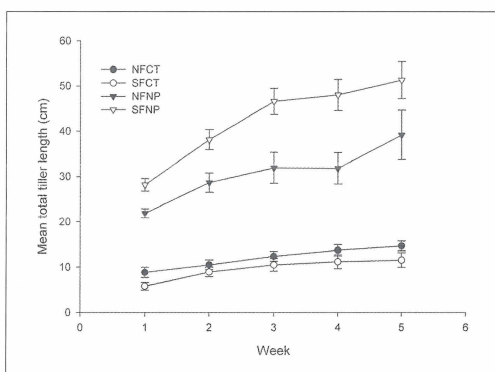


Figure 1 Growth of *H. alpina* tillers from 14 June to 14 July, 2004 (n=9 tussocks). Error bars represent 1 S.E.

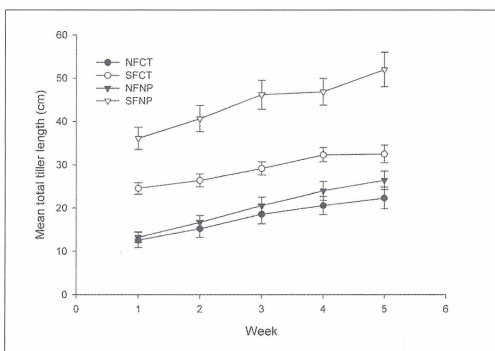


Figure 2 Growth of *E. vaginatum* tillers from 14 June to 14 July, 2004 (n=9 tussocks). Error bars represent 1 S.E.

curred especially for *H. alpina* (Figure 1). At MAT, plants were affected more by fencing than by fertilization, although herbivore effects were more evident in fertilized plots than control plots, mostly for *E. vaginatum* (Figure 2) and *B. nana*.

## CONCLUSION

If predicted trends in climate change continue, all species studied will probably respond to higher nutrient availabilities by growing more due to the nutrient limitations in both community types. However, herbivore activities may negatively affect growth for most species studied, and effects will be most pronounced for *H. alpina* and *E. vaginatum*, both tussock-forming graminoids. Selective consumption of these preferred species may affect plant communities by favoring the growth of other, less favored species.

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# Influence of Victimization on Adjustment: Psychic or Somatic?

PADMINI VEERAPEN

Mentor: Dr. Lauri Jensen-Campbell, Department of Psychology



## INTRODUCTION AND BACKGROUND

The aim of this study was to examine how both prior victimization in adolescence and specific personality traits predict reactions to rejection in adulthood.

Victimization - a form of social pain - has been extensively researched. Specifically, the association between poor peer relations earlier in life and subsequent maladjustment in adulthood has been documented (e.g., Cowen, Pederson, Babigian, Izzo, & Trost, 1973; Kupersmidt, Coie, & Dodge, 1990; Parker & Asher, 1987; Olweus, 1978). Eisenberger's and Lieberman's study (2003) added a physiological dimension to this research by documenting a link between both the physical and social pain neural network in humans. Earlier work by Beck further augmented this finding. He found one of the most recurring thoughts in neurotic individuals was the specter of social pain such as rejection (Beck, Laude, & Bohnert, 1974). The present study ties in with the cited studies by attempting to further define how prior victimization and neuroticism lead to subsequent maladjustment.

## METHODOLOGY

A total of 115 women completed self-report measures on current and prior victimization (CSEQ; Crick & Grotpeter, 1995), belongingness, self-esteem, the Big Five (the 5 dimensions that represent an individual's personality), and rejection sensitivity.

## RESULTS AND DISCUSSION

Prior overt victimization uniquely predicted rejection sensitivity,  $\beta = 2.34$ ,  $p < .05$  and lower feelings of belongingness,  $\beta = -2.52$ ,  $p < .05$  (see Table 1). Further, although prior overt victimization was negatively associated with global self-esteem,  $r = -0.22$ ,  $p < .05$ , it did not uniquely predict feelings of self-esteem when other variables were controlled. Being the current recipient of prosocial help consistently predicted intimacy, social support, self-esteem, social acceptance, and close relationships. Prior relational victimization, on the other hand, was not significantly related to rejection sensitivity. Neuroticism was associated with rejection sensitivity (see Table 2) but did not uniquely predict it when other measures were controlled. The limitations of this study involve concerns associated with retrospective reporting, the exclusive use of self-report measures, and possible fatigue effects.

## CONCLUSION AND FUTURE RESEARCH

These findings are significant because they lay the foundation for future research on prior victimization. In particular, they flesh out the role of environmental influences on the neural mechanisms that play a critical role in subsequent adjustment. Future research should consider using measures other than self-report to lend credence to the findings. Moreover, the role of individual differences in adjustment needs to be investigated further.



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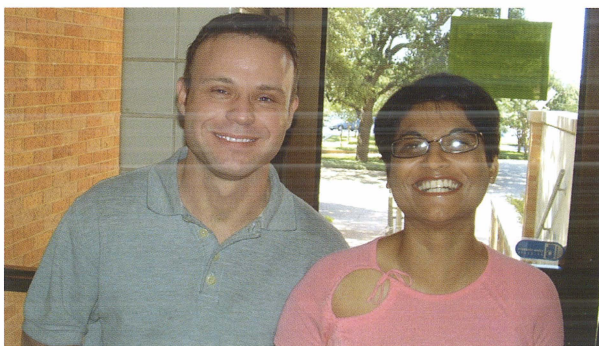
	Adolescent Overt Victimization		Current Recipient of Prosocial Behavior	
	$\beta$	t-value	$\beta$	t-value
Rejection Sensitivity	0.24	2.34*	-0.20	-2.13*
<b>FORSYTH BELONGINGNESS MEASURES</b>				
Belongingness	-0.26	-2.52*	0.24	2.54*
Intimacy	-0.16	-1.60	0.31	3.30**
Social Support	-0.14	-1.30	0.32	3.40**
<b>HARTER'S SELF PERCEPTION PROFILE</b>				
Global Self-Esteem	-0.15	-1.54	0.27	3.03**
Scholastic Competence	0.16	1.59	0.19	2.04*
Social Acceptance	-0.02	-0.16	0.27	2.78**
Close Relationships	-0.04	-0.41	0.36	3.91**
Romantic Relationships	-0.18	-1.71+	0.20	2.10*

**Table 1** Adolescent Overt Victimization Predicting Current Rejection Sensitivity and Feelings of Belongingness, Intimacy, and Social Support.

	Rejection Sensitivity	Belongingness	Intimacy	Generativity	Social Support	Influence	Exploration
<b>BFI</b>							
Extraversion	-0.11	0.11	0.15	-0.11	0.10	0.20*	0.04
Agreeableness	-0.04	0.03	0.06	0.19*	0.09	0.01	0.12
Conscientiousness	-0.23*	0.15	0.09	0.33**	-0.03	0.23*	0.09
Neuroticism	0.20*	-0.01	-0.08	-0.01	0.04	-0.10	-0.20*
Openness to Experience	-0.03	0.20*	0.21*	-0.06	0.19*	0.11	0.07

**Table 2** The Association of Personality to Rejection Sensitivity and Adjustment

## Research Interns in the lab and presenting their work

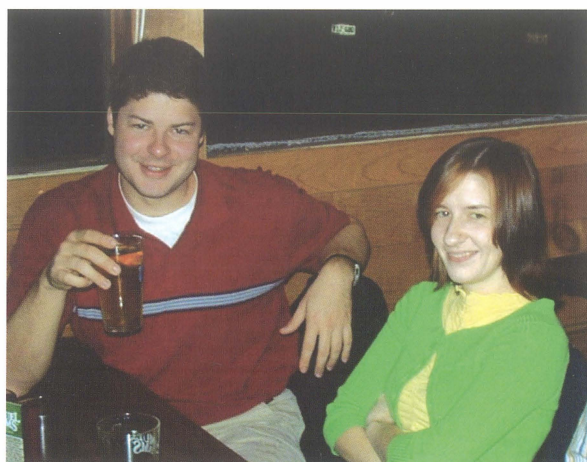
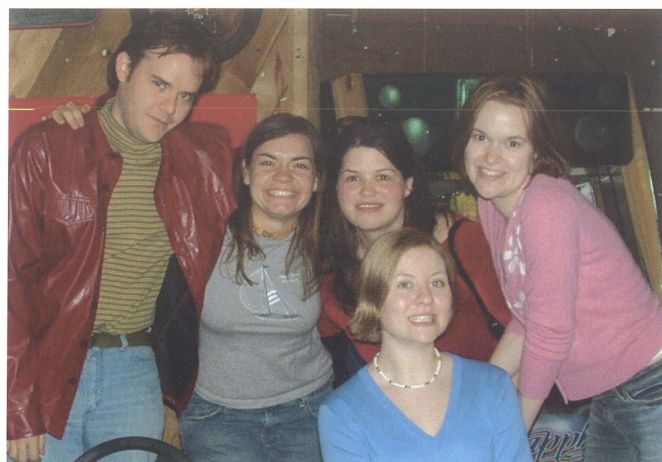




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