

COVER SHEET  
TEXAS ACADEMY OF SCIENCE STUDENT RESEARCH PROPOSAL  
2008 COMPETITION

Name: Colin Kyle and James McDonough

Department: Biology

Institution: Southwestern University

Address: 1001 East University Avenue, Box 7252  
Georgetown, TX 78626

Telephone: (817)-914-5851 Fax: (512)-863-1696

E-mail: [kylec@southwestern.edu](mailto:kylec@southwestern.edu) and [mcdonouj@southwestern.edu](mailto:mcdonouj@southwestern.edu)

Degree sought: X B.S. \_\_\_\_\_ M.S. \_\_\_\_\_ Ph.D. \_\_\_\_\_

Research advisor: Dr. Romi L. Burks

Key words/Fields (up to three): exotic invasive species, *Colocasia*, *Pomacea*

Title of proposal: Snail fondue? Potential invasion meltdown with Texas applesnails, *Pomacea insularum*, and elephant ear, *Colocasia sp.*

Check off

X  Cover Sheet

X  Proposal with budget and CV

X  Agree to attend annual meeting

X  Preregistered for annual meeting

X  Academy membership current

## Snail fondue?

Potential invasion meltdown with Texas applesnails, *Pomacea insularum*, and elephant ear, *Colocasia sp.*



Left Photo: Clutch laid by *Pomacea insularum* on a stem of elephant ear. Right photo: example of a stand of elephant ear that has invaded Armand Bayou, Clear Lake, Texas.

### PROPOSED GOALS

This proposed research aims to investigate the relationship between two invasive species in Texas, applesnails and elephant ear. In particular, the proposed experiments test the questions:

1. What factors mediate the herbivore-plant interaction between applesnails and elephant ear?
2. Does preference for elephant ear for oviposition sites by *Pomacea insularum* facilitate invasion?

Collectively, addressing these questions will potentially help managers reach the goal of slowing the spread of invasive species in Texas. Our ultimate goal includes conducting enough research to contribute a paper to the peer reviewed literature.

### BACKGROUND

Indirect effects of globalization, such as changes in climate, species extinction, loss of habitat and introduction of exotic species, currently threaten the natural state of the earth's ecosystems (Roe and Van Eeten 2004, Keller and Lodge 2007). Next to habitat destruction, Wilcove et al. (1998) rank introduction and spread of non-native species as the greatest threat to biodiversity (1998). After becoming established, exotic species can endanger humans, change ecosystem function and damage the environment (Kolar and Lodge 2001, Pimentel et al. 2005). As of 2005, estimates indicated that over 50,000 non-indigenous species have invaded the United States, annually causing over \$120 billion in damages (Pimentel et al. 2005). To control and reduce the ever-increasing toll on the environment, ecologists require more research to understand exotic invasive species.

Historically, mollusks have been some of the most destructive and hard to manage exotic species (Ludyanskly and McDonald 1993; Rawlings et al. 2007). Invasions of exotic mollusks cause health risks to humans and wildlife and threaten native biodiversity (Keller et al. 2006). Prime examples of the destructive potential of molluscan invaders include zebra mussels (Ludyanskly and McDonald 1993), Asian clams (Vaughn and Spooner 2006) and applesnails of the family Ampullariidae

(Rawlings et al. 2007). Due to their large size and extraordinary rate of reproduction, the freshwater gastropod family Ampullariidae contains notoriously destructive invasive species (Rawlings et al 2007) that recently became an increasing problem in the continental U.S.

Discovered in Texas in 1989, the applesnail *Pomacea insularum* poses a potential threat to the diversity of life in Houston's waterways and the Gulf coast as a whole (Howells et al. 2006). Native to temperate South America, *P. insularum* snails typically reach fist size or larger when full grown and possess a round shell with a characteristic deep groove on the whorl (Howells et al. 2006). Unlike most snails, *P. insularum* voraciously consumes live plants rather than algae, which potentially allows them to be very damaging to plant populations and ecosystems (Carlsson and Brønmark 2006, Boland et al. 2008). Because ecologists only recently identified *P. insularum* as a distinct species (Rawlings et al. 2007), little evidence exists of its invasive abilities.

An important topic of research for invasive species involves their relationship with other species within their new habitat. Many invasive species often use beneficial relationships to help facilitate their establishment in an exotic environment (Grosholz 2005), a process often referred to as an "invasion meltdown." This new recognition on positive interactions emphasizes the need to examine both direct and indirect effects. A potential meltdown may subsequently result from interactions between *P. insularum* and an invasive plant, elephant ear or *Colocasia esculenta*. Discovered in the early 1900's in Texas, *C. esculenta* often dominates sites previously inhibited by native vegetation, thus changing the ecological dynamics of the habitat (Akridge and Fonteyn 1981).

A change in the dynamics of an ecosystem can facilitate the invasion of *P. insularum* within Texas waterways. In particular, elephant ear may serve as a key site for oviposition of egg clutches or also as a readily available food source for snails from the hatchling to adult stage. To further the understanding of *P. insularum* invasive potential, we purpose to study the relationship between *P. insularum* and *C. esculenta*. The goal of this study will be to determine the influence of *C. esculenta* on the invasive ability of *P. insularum*. The results of this research could lead to the potential control mechanisms for the spread of *P. insularum*.

## DESCRIPTION OF RESEARCH

Due to the potential of *C. esculenta* (i.e. elephant ear) for facilitating the successful establishment *P. insularum* in Houston, we will examine two ways in which the snails could primarily use the *C. esculenta*: as a food source and as an egg laying surface. For our proposal to the Texas Academy of Sciences, we focus on these two main interactions and will explore feeding trends with the 3 life stages of *P. insularum* (hatchling, juvenile, and adult):

Q1) What characteristics of *C. esculenta* make it a beneficial food source for *P. insularum*?

Q2) Does *C. esculenta* provide a more advantageous egg laying (oviposition) surface for *P. insularum* than native Texas plants? If this occurs, how does this preference affect the reproduction of exotic *P. insularum* in Houston?

## PROPOSED METHODS:

Q1) Feeding Preference Experiment: As observed in previous field studies and lab experiments, *P. insularum* actively feeds on *C. esculenta* when also presented with other native and exotic plants commonly found in Texas freshwater habitats (ex. *E. crassipes*, *Myriophyllum*, observations of *P. insularum* at Armand Bayou, Houston, Texas; unpublished data). To investigate how *C. esculenta* benefits *P. insularum* as a food source, we will conduct 3 feeding experiments (A, B, C) comparing *P. insularum*'s preference for the stems versus the leaves of three treatments of *C. esculenta*.

From these experiments, we will determine the part of the plant most beneficial to the growth of *P. insularum* populations and the biological reasons behind this benefit. The first experiment will determine *P. insularum*'s preference for unaltered stems or leaves. Secondly, we will determine how the physical structure of these components affects the feeding of *P. insularum*. Lastly, we will investigate the way in which the chemical defenses of *C. esculenta* (specifically calcium oxalate crystals) influence feeding by *P. insularum*.

We will conduct each of these 3 experiments on examples of 3 life stages of *P. insularum* [hatchling (1-4 mm operculum width), juvenile (15-25 mm), and adult (> 25 mm)]. We use operculum width as a measurement due to its higher reliability as a predictive measure for weight (Youens and Burks 2008). Examining the trends in feeding during the snail's whole lifecycle allows us to completely understand the consumption of *C. esculenta* by *P. insularum*.

1A) Plant Part Preference Experiment: We will offer snails unaltered, separated leaves and stems of *C. esculenta*.

1B) Influence of Plant Structure on Consumption Experiment: We will remove the natural structure of the plant and present the snails with only the chemical components of the plant. We will replicate part of the methods from Boland et al. (2008) which tested the influence of plant structure on *P. insularum* feeding with different species of plants. By repeated grinding and drying, we will convert elephant ear stems or leaves into a powder and then reconstitute using sodium alginate. We will press the reconstitute into strips and present the snails with reconstituted leaves and stems (see Photo to left).



1C) Influence of Chemical Defenses on Consumption Experiment: We will use another portion of the methods from Boland et al. (2008) to test the impact of the chemical compounds in the stems and leaves of *C. esculenta* on *P. insularum* consumption. Using the same method from 1B, we will convert stems or leaves into a powder. We will then extract chemicals from the powder using 95% acetone, leaving only the plant metabolites. We will mix the isolated metabolites with plant powder and sodium alginate to create a reconstitute containing less chemical defenses than the natural plant. As with Experiment 1B, we will press the reconstitute into strips and present the snails with high-metabolite reconstituted leaves and stems.

We will use the same general methods for these 3 experiments. Prior to each test, we will not feed the snails for 24-hours to ensure maximum consumption. We will then offer the snails pre-weighed samples of one of the treatments of *C. esculenta* stems and leaves and observe their feeding. The experiments will take place in aerated containers over 24-hour periods with 12:12 Light: Dark phases. After this consumption period, the remaining plant matter will be dried and weighted. Using a wet-to-dry weight conversion for *C. esculenta* previously determined by a fellow research student (Hensley, unpublished), we will then calculate the mass of *C. esculenta* consumed per mass of snail. A Chi-squared ( $X^2$ ) statistical test of our results will compare consumption between stems and leaves in each treatment. A 2-way Analysis of Variance (ANOVA) will compare consumption between treatments and life stages. We will conduct at least 5 replications of the individual experiments for each snail life stage. We will collect the *C. esculenta* for the experiments from Town Lake, Austin, Texas.

Q2) Oviposition Preference Experiment: We will construct a new set-up that tests the oviposition preferences of *P. insularum* for either *C. esculenta* or *Sagittaria latifolia* (duck potato). *S. latifolia* is a commonly found, native, emergent aquatic plant that will represent an egg laying surface equivalent to *C. esculenta*. *S. latifolia* has many traits in common with *C. esculenta* such as producing tubers often consumed by humans and tolerating variable water levels. In 6 containers (0.75-m<sup>2</sup>), we propose to present sexually active *P. insularum* females with stem portions of *C. esculenta* and *S. latifolia* on which to lay eggs. We will design the set-up to force the females to deposit their eggs on one of the two plants. Field observations indicate that applesnails will lay on any hard, dry surface, but keeping a surface wet deters them from laying clutches. For this experiment, we will modify aquarium pumps to constantly stream water down the walls of the containers and effectively force *P. insularum* to lay eggs on the plants. We practiced and perfected this technique in the summer of 2007 (Photo to right). We will then record the total number of egg clutches per plant type and the egg clutch height above the water line. A Chi-squared ( $X^2$ ) statistical test of our results will allow us to view any trends in oviposition behavior. Constructing the setup will require three to four days and we will monitor the experiment for 14 days.



## RESULTS AND BASIS FOR EXPECTATIONS:

### Q1A) Plant Part Preference

Hypothesis: We expect *P. insularum* to consume more of the leaves of *C. esculenta* than the stalks. Based on previous feeding experiments, we expect younger snails to

consume more mass per weight than older snails (Carlsson and Brønmark 2006, Boland et al. 2008).

Basis: In previously conducted lab feeding experiments, we observed that *P. insularum* consumed the leaf portion of *C. esculenta* before the stem (Burks, unpublished data). This preference could exist because *P. insularum* can more easily consume the tender leaves of *C. esculenta* than its tough stems.

#### Q1B) Influence of Plant Structure on Consumption

Hypothesis: With the plant's physical structure removed, we anticipate *P. insularum* will consume stem tissue preferentially over leaf tissue. We expect to see the same trend of younger snails consuming more mass per weight than older snails.

Basis: Removing of the tough structure of the stems through reconstitution should make them as easy to consume physically as the reconstituted leaves leave only the chemical defenses of *C. esculenta* will deter herbivory. Due to the precedence of calcium oxalate in the leaves but not the stems (Savage and Dubois 2006), the chemical defenses of *C. esculenta* should motivate the snails to consume the reconstituted stems.

#### Q1C) Influence of Chemical Defenses on Consumption

Hypothesis: In the absence of chemical defenses, we predict *P. insularum* will consume more of the leaves than the stems of *C. esculenta*. Again, we expect to see the same trend of younger snails consuming more mass per weight than older snails.

Basis: *C. esculenta* employs calcium oxalate crystals that irritate the soft tissue of herbivores as a chemical defense (Savage and Dubois 2006). Reconstituting the plant tissue and extracting the chemical components will leave only the nutritional content of *C. esculenta* tissue. Because humans consume the leaves and not the stems of this plant (Savage and Dubois 2006), we assume that the leaves have more nutritional content than the stems. The higher nutritional content of the leaves compared to the stems should motivate the snails to consume the leaves over the stems.

#### Q2) Oviposition Preference

Hypothesis: We predict *P. insularum* will choose to lay eggs on *C. esculenta* rather than other available emergent native Texas plants (*S. latifolia*).

Basis: Using methods similar to those proposed for this experiment, we found that *P. insularum* lay nearly exclusively on *C. esculenta* stems when presented with various types of surfaces in the summer of 2007 (unpublished data). In addition, we gathered field data in that summer that suggested a preference for elephant ear even when other emergent plants occurred. *P. insularum* could prefer to lay eggs on *C. esculenta* rather than *S. latifolia* because its tall, sturdy stems can better support the snail as it climbs the plant and the egg clutch once deposited. The large, broad leaves of *C. esculenta* could also shelter the eggs, reducing predation and water damage.

## TIMELINE

Each of the above-mentioned questions will require separate experiments. Although Dr. Burks currently maintains multiple research students and experiments, our experience working in the lab and the availability of resources will allow us to complete our objectives efficiently and thoroughly.

- January 2008: Proposal preparation; plant elephant ear in greenhouse
- February/March 2008: Construct setup for Q2, plant *S. latifolia* tubers.
- March 2008: Preliminary research from oviposition presented at TAS
- April 2008: Conduct oviposition experiment
- August 2008: Conduct new snails for feeding experiments
- Fall 2008: Conduct experiments for Q1-Q3
- January 2009: Analyze data, write abstracts
- March 2009: Present results at TAS 2009
- April 2009: Finish capstones and submit papers for publication

## OUTCOMES:

Results from these investigations will directly result in:

- 1 Contributions to the basic scientific knowledge regarding applesnails
- 2 Contribute to our senior theses at Southwestern University
- 3 An oral presentation at Southwestern University's Undergraduate Research Symposium
- 4 An oral presentation at the 2009 Texas Academy of Sciences Meeting
- 5 An eventual peer-reviewed publication regarding the interaction between applesnails and taro in Houston

## CONTRIBUTIONS TO KNOWLEDGE

The introduction of *P. insularum* to the U.S. could potentially endanger humans, change ecosystem function and damage the environment (Kolar and Lodge 2001, Pimentel et al. 2005). Because researchers know so little about the destructive potential of this species (Rawlings et al. 2007), we cannot yet fully understand the impact *P. insularum* will have on the waterways of southeast Texas and along the Gulf Coast. The naturalized invasive plant, *C. esculenta*, could prove to be a facilitator for the establishment of *P. insularum* populations within the Houston area and lead to the invasion of Central Texas where the plant already invaded. *C. esculenta* has taken the place of many native species thus changing the ecological dynamics of many Texas waterways (Akridge and Fonteyn 1981). This relationship between plant and snail could eventually lead to the destruction of local Texas ecosystems through a process called 'invasional meltdown'.

With the results of these proposed experiments, we hope to further our knowledge of *P. insularum* destructive potential but more specifically, we hope to determine the type of relationship shared between *P. insularum* and *C. esculenta*. Analysis of our results will lead to a greater understanding of the threat posed by *P. insularum*, and the role *C. esculenta* may play in its spread and growth throughout Texas. With these contributions to our knowledge of *P. insularum*, we may be able to exploit the relationship between *P. insularum* and *C. esculenta* and slow future applesnail invasions, which will minimize the damage to aquatic Texas habitats.

## WORKS CITED

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2. Boland\*, B. B., M. Meerhoff, C. Fosalba, N. Mazzeo, M. A. Barnes\* and R. L. Burks. 2008. Juvenile snails, adult appetites: Contrasting resource consumption between two species of applesnails. *Journal of Molluscan Studies* doi:10.1093/mollus/eym045.
3. Carlsson, N. O. L., and C. Brönmark. 2006. Size-dependent effects of an invasive herbivorous snail (*Pomacea canaliculata*) on macrophyte and periphyton in Asian wetlands. *Freshwater Biology* 51: 695-704.
4. Grosholz, E. D. 2005. Recent biological invasion may hasten invasional meltdown by accelerating historical introductions. *Proceedings of the National Academy of Sciences* 102(4): 1088-1091.
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## BUDGET

Type of Supply	Item Description	Quantity	Cost Per Item	Total	Estimate
LAB	Fluval 305 Multi-Stage Filter	2	\$160	\$320	Aquatic Ecosystems
LAB	Rubber Tubing (10 ft)	6	\$6	\$36	Home Depot
LAB	Aquarium Heaters	6	\$35	\$210	Petsmart
LAB	<i>S. latifolia</i> tubers	box of 100 tubers	\$80	\$80	On-line
LAB	Romaine Lettuce	14	\$1.78	\$25	HEB grocery
LAB	Construction materials		miscellaneous	\$100	Experience
FIELD	Round-Trip mileage to Town Lake	5 x 60-mile	\$0.505 per mile	\$152	Standard SU Rate
LAB	Disposable materials to make plant reconstitute		miscellaneous	\$150	Experience
FIELD	Round-Trip mileage to Armand Bayou	450 miles	\$0.505 per mile	\$227	Standard SU Rate
FIELD	Overnight lodging	2	\$70	\$140	Per night + tax
FIELD	Food expenses	3	\$20	\$60	Per Diem Rate
			Total Request	\$1500	

## Justification

Our budget includes two types of requests:

- 1.) Supplies to construct lab experiments
- 2.) Travel money for fieldwork

The research lab of Dr. Burks already contains many of the supplies used in our proposed experiments, but we will have to purchase materials specific to our projects. The lab has the tanks and containers in which the experiments will take place. We also have 4 of the 6 Fluval 305 Multi-Stage Filters needed for Q2. We request money to purchase the 2 additional filters required for our proposed amount of replication. In addition to the filters, we will purchase tubing used to prevent egg laying on the walls of the containers and aquarium heaters to simulate the warm waters of summer in which *P. insularum* spawns. We plan to grow the *S. latifolia* from tubers, which are available for purchase on-line ([www.kestersnursery.com](http://www.kestersnursery.com)). While monitoring the experiment for Q2, we will feed the snails romaine lettuce to reduce their consumption of the *C. esculenta* and *S. latifolia*. For the amount of adult snails in the experiment, we anticipate the snails will consume one head of lettuce each day. We also request money for routine building supplies (i.e. clamps, zip ties, drill bits, etc.).

Because Southwestern does not have a field vehicle, we request gas money for trips to collect fresh *C. esculenta* from Town Lake (5 trips, one for each feeding experiment and two for the reproduction experiment). For the feeding experiments, we will need \$150 to re-stock the lab's reconstitution supplies (window screening, sodium alginate, wax paper, acetone, and clips). The second portion of the budget will fund a trip to Armand Bayou in August 2008 to collect more snails for the lab population. Snail collection requires a 2 days in Houston and we request money for gas, lodging and food. Dr. Burks already possess all field equipment required for this trip.



January 14, 2008

To: Dr. Don Harper, Texas Academy of Sciences  
From: Dr. Romi L. Burks  
Re: Undergraduate Research Grant Competition

This letter serves as my acknowledgement that the research proposal submitted by undergraduate Colin Kyle, with the cooperation and assistance of James McDonough, represents independent work and thought. In fact, I usually more closely supervise grant writing efforts of my students, but the deadline for this grant comes happen to come when I was needed out of town and the students successfully completed the writing on their own. I am pleased with the final product.

Colin, James and I have been working for a little over a year on understanding the oviposition behavior of Texas applesnails, *Pomacea insularum*. Since coming to Southwestern in 2003, I have devoted my lab to examining the life history of this new invasive species. My first studies focused on overall feeding behaviors and estimates of fecundity. Colin and James chose to move the next direction of the lab into the area of oviposition. Together, they participated in research last summer as SURGE (Southwestern's Undergraduate Research Group Experience) students where they constructed a set-up to test substrate choice for oviposition by female applesnails. Now, with this experience, they want to refine their questions to examine interactions between applesnails and another common invasive species.

I can attest that Colin developed the methods, expected outcomes and budget for this proposal largely independently. The background represents a joint writing effort, taking this form after many revisions. Both Colin and James have worked with these snails in the field and understand the feasibility and worked involved with their proposed research. In addition, both students submitted abstracts for oral presentations at the 2008 meeting in Corpus Christi and acknowledge the other requirements for proposal consideration.

Please let me know if I can clarify any other questions with the independent nature of this proposal.

Sincerely,

Dr. Romi L. Burks  
Assistant Professor of Biology, Southwestern University  
1001 University Avenue  
Georgetown, TX 78626  
[burksr@southwestern.edu](mailto:burksr@southwestern.edu)  
512-863-1280

## COLIN KYLE

### CURRICULUM VITA

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Box 7252, Southwestern University, 1001 E. University Ave., Georgetown, TX 78626  
tel: 817-914-5851 || [kylec@southwestern.edu](mailto:kylec@southwestern.edu)

## EDUCATION

- |  |   |
|--|---|
| <p><b>Southwestern University</b><br/>Georgetown, TX</p> | <p>Pursuing <i>B.S. in Biology and a Minor in Mathematics</i>;<br/>Anticipated Graduation: 5/2009<br/>Cumulative GPA: 3.59/4; Biology GPA: 3.41/4</p> |
| <p><b>Lamar High School</b><br/>Arlington, TX</p>        | <p>Graduated with Honors (#14 of 554)<br/>May 2005</p>  |

## PROFESSIONAL EXPERIENCE

- Jan. 2007 - current      Undergraduate Researcher in Aquatic Ecology lab  
Advisor: Dr. Romi L. Burks  
Topic: Oviposition preferences of *P. insularum*
- May 2007 – July 2007      Southwestern Undergraduate Research Experience (SURGE) Program Participant  
Advisor: Dr. Romi L. Burks
- Aug. 2006 – Dec. 2006      Lab Manager of Aquatic Ecology Lab  
Advisor: Dr. Romi L. Burks
- Jan. 2006 – May 2006      Lab Assistant in Aquatic Ecology Lab  
Advisor: Dr. Romi L. Burks

## ABSTRACTS SUBMITTED

- **Kyle, C.**, McDonough, J., and Burks, R. Anticipated March 2008. Location, Location, Location: Laboratory experiment shows invasive *P. insularum* choose elephant ear as oviposition sites. Oral presentation, Texas Academy of Science, Corpus Christi, TX.

## RELEVANT COURSEWORK

- Introductory Biology (Genes and Molecules, Genetics and Evolution, Biodiversity and Interactions, Cell Biology)
- Upper-Level Biology: Methods in Ecology and Evolutionary Biology, Methods in Cellular and Molecular Biology, Ecology, and Independent Research
- Physical Sciences: Physics 1 and 2, Statistics, Calculus 1, 2 and 3, Geometry and, Topology
- Chemistry: General Chemistry, Organic Chemistry 1 and 2, and Biochemistry

## PROFESSIONAL MEMBERSHIPS AND AWARDS

- 2008-Present
  - Texas Academy of Science Undergraduate member
- 2007-Present
  - *Beta Beta Beta* active member
- Dean's List (3 semesters)

## GRANT WRITING EXPERIENCE

- CURRENTLY SUBMITTED:
  - Joe S. Mundy Fellowship for Faculty-Student Collaborative Research (~\$9000)

## RESEARCH SKILLS

- Proficiency in Microsoft Excel, Word, PowerPoint and SPSS
- Experience constructing and maintaining large flow-through aquarium setups
- Experience collecting data and specimens in the field (Armand Bayou and Town Lake)
- 

## REFERENCES

- DR. ROMI L. BURKS ([burksr@southwestern.edu](mailto:burksr@southwestern.edu); Phone: 512-863-1280)
  - Assistant Professor, Department of Biology, Southwestern University
- DR. MARIA C. TODD ([toddm@southwestern.edu](mailto:toddm@southwestern.edu); Phone: 512-863-1983)
  - Assistant Professor, Department of Biology, Southwestern University

# JAMES McDONOUGH

## CURRICULUM VITA

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Box 6998, Southwestern University, 1001 E. University Ave., Georgetown, TX 78626  
tel: 210-854-4905 || [mcdonouj@southwestern.edu](mailto:mcdonouj@southwestern.edu)

## EDUCATION

<p><b>Southwestern University</b> Georgetown, TX</p>	<p>Pursuing <i>B.S. in Biology</i>, Anticipated Graduation: 5/2009 Cumulative GPA: 3.32/4; Biology GPA: 3.13/4</p>
<p><b>Texas Military Institute</b> San Antonio, TX</p>	<p>Graduated with Honors May 2005</p>

## PROFESSIONAL EXPERIENCE

- May-July. 2007 Undergraduate Research Student, SURGE (Southwestern Undergraduate Research Group Experience) Southwestern University
- Aug. 2007 - current Undergraduate Researcher in Aquatic Ecology lab  
Advisor: Dr. Romi L. Burks

## ABSTRACTS SUBMITTED

- **Pink Eggs and Snails: Oviposition Behavior in *Pomacea insularum*.**  
James P. McDonough, Colin H. Kyle and Dr. Romi L. Burks, Department of Biology, Southwestern University, Georgetown, TX. Oral presentation, Texas Academy of Science, Corpus Christi, TX.

## RELEVANT COURSEWORK

- Introductory Biology (Biodiversity, Cell Biology, Genetics and Evolution, Genes and Molecules)
- Upper-Level Biology: Methods in Ecology and Evolution, Methods in Cellular and Microbiology, Ecology, Cell Physiology
- Physical Sciences: Calculus, Statistics and Physics
- Chemistry: General Chemistry, Organic Chemistry, and Biochemistry

## PROFESSIONAL MEMBERSHIPS

- 2008-Present
  - Texas Academy of Science Undergraduate member
- 2006-Present
  - *Beta Beta Beta* active member
  - *Kappa Upsilon Chi* Fraternity

## GRANT WRITING EXPERIENCE


- CURRENTLY SUBMITTED:
  - Texas Academy of Science Student Research Award (this grant; \$1500)
  - Joe S. Mundy Fellowship for Faculty-Student Collaborative Research (~\$9000)

## RESEARCH SKILLS

- Proficiency in Microsoft Excel, Word and PowerPoint
- Moderate degree of experience with SPSS

## REFERENCES

- DR. ROMI L. BURKS ([burksr@southwestern.edu](mailto:burksr@southwestern.edu); Phone: 512-863-1280)
  - Assistant Professor, Department of Biology, Southwestern University
- DR. MARIA C. TODD ([toddm@southwestern.edu](mailto:toddm@southwestern.edu); Phone: 512-863-1983)
  - Assistant Professor, Department of Biology, Southwestern University




## 111<sup>th</sup> Annual Meeting

### Texas Academy of Science

Texas A&M University-Corpus Christi

March 6, 7 & 8, 2008



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First Name: Colin Last Name: Kyle  
 Billing Address: SU Box 7252, 1001 E. University Ave. Preferred Name on Badge: Colin Kyle  
 City: Georgetown State: Texas Zip: 78626  
 Institutional Affiliation: Southwestern University Department: Biology  
 Telephone: 817-914-5851 Extension: \_\_\_\_\_ Email Address: kylec@southwestern.edu

Members	Before 2/15/2008	After 2/16/2008	Membership Renewal	Amount
Senior Academy Member	\$ 105.00	\$ 155.00	+ \$30.00	\$
Graduate & Undergraduates	\$ 35.00	\$ 40.00	+ \$15.00	\$ <span style="border: 1px solid red; padding: 2px;">\$35</span>
Guests	\$ 50.00	\$ 75.00		\$

Guest Name: \_\_\_\_\_

Invited Speakers & International Guests	\$ -	\$ -		\$
Field Trip (Circle Choice) Must sign up for before Feb. 15th	Package A: \$37.70	Package B: \$21.95		\$
Commemorative T-Shirts	\$ 15.00 Each	Circle Size(s): <input type="checkbox"/> Sm <input type="checkbox"/> Med <input type="checkbox"/> Lg <input type="checkbox"/> XL <input type="checkbox"/> XXL		\$

If you are paying for membership, you must fill out a membership application form.  
 If you are not a member, you must pay the membership fee above. The above registration includes socials, Friday lunch and Friday banquet.

Total: \$ \$35

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**Seating is limited to some events, please indicate the number attending, guests included, to applicable events:**

Welcome Social (3/6/08) <input style="width: 20px; text-align: center;" type="text" value="1"/> <input style="width: 20px; text-align: center;" type="text" value="1"/> <input style="width: 20px; text-align: center;" type="text" value="1"/> <input style="width: 20px; text-align: center;" type="text" value="1"/> <input style="width: 20px; text-align: center;" type="text" value="1"/>	Please Circle: Will you fly to Corpus Christi? <input style="width: 40px;" type="text" value="Yes"/> / <input style="width: 40px;" type="text" value="No"/> Will you rent a vehicle? <input style="width: 40px;" type="text" value="Yes"/> / <input style="width: 40px;" type="text" value="No"/> Will you require transportation from the hotel to A&M-CC? <input style="width: 40px;" type="text" value="Yes"/> / <input style="width: 40px;" type="text" value="No"/> Will you require a vegetarian meal plan? <input style="width: 40px;" type="text" value="Yes"/> / <input style="width: 40px;" type="text" value="No"/> A&M-CC is ADA compliant. Will you require special room/parking accommodations, i.e. wheelchair access, handicapped parking? <input style="width: 40px;" type="text" value="Yes"/> / <input style="width: 40px;" type="text" value="No"/>
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For the Friday Evening Banquet, provide your entrée selection:  Beef  Chicken  Vegetarian

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**Payment Options:**

CHECK PAYABLE TO: TEXAS A&M UNIVERSITY - CORPUS CHRISTI

CREDIT CARD (Circle): American Express    Discover    Visa    Master Card

Cardholder Name \_\_\_\_\_ PLEASE PRINT

Credit Card Number \_\_\_\_\_

Expiration Date \_\_\_\_\_


Zip Code \_\_\_\_\_

Signature \_\_\_\_\_

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Payment by check or credit card only. Mail or fax registration forms to:  
**2008 Texas Academy of Science  
 Community Outreach Programs  
 Texas A&M University - Corpus Christi  
 6300 Ocean Drive, Unit 5854  
 Corpus Christi, Texas 78412**

Telephone: 361.825.2778
Fax: 361.825.2384




## 111<sup>th</sup> Annual Meeting

### Texas Academy of Science

Texas A&M University-Corpus Christi

March 6, 7 & 8, 2008



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First Name: **James** Last Name: **McDonough**  
 Billing Address: **SU Box 6998, 1001 E. University Ave.** Preferred Name on Badge: **James McDonough**  
 City: **Georgetown** State: **Texas** Zip: **78626**  
 Institutional Affiliation: **Southwestern University** Department: **Biology**  
 Telephone: **210-854-4905** Extension: Email Address: **mcdonouj@southwestern.edu**

Members	Before 2/15/2008	After 2/16/2008	Membership Renewal	Amount
Senior Academy Member	\$ 105.00	\$ 155.00	+ \$30.00	\$
Graduate & Undergraduates	\$ 35.00	\$ 40.00	+ \$15.00	\$ <b>\$35</b>
Guests	\$ 50.00	\$ 75.00		\$

Guest Name:

Invited Speakers & International Guests	-	-		\$
Field Trip (Circle Choice) Must sign up for before Feb. 15th	Package A: \$37.70	Package B: \$21.95		\$
Commemorative T-Shirts	\$ 15.00 Each	Circle Size(s): <input type="checkbox"/> Sm <input type="checkbox"/> Med <input type="checkbox"/> Lg <input type="checkbox"/> XL <input type="checkbox"/> XXL		\$

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Total: \$ **\$35**

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**Seating is limited to some events, please indicate the number attending, guests included, to applicable events:**

Welcome Social (3/6/08) <input style="width: 20px;" type="text" value="1"/>	Will you fly to Corpus Christi? <input type="checkbox"/> Yes / <input type="checkbox"/> No
Friday Lunch (3/7/08) <input style="width: 20px;" type="text" value="1"/>	Will you rent a vehicle? <input type="checkbox"/> Yes / <input type="checkbox"/> No
Distinguished Texas Scientist Event (3/7/08) <input style="width: 20px;" type="text" value="1"/>	Will you require transportation from the hotel to A&M-CC? <input type="checkbox"/> Yes / <input type="checkbox"/> No
Outstanding Texas Educator Event (3/7/08) <input style="width: 20px;" type="text" value="0"/>	Will you require a vegetarian meal plan? <input type="checkbox"/> Yes / <input type="checkbox"/> No
Friday Evening Social and Banquet (3/7/08) <input style="width: 20px;" type="text" value="1"/>	A&M-CC is ADA compliant. Will you require special room/parking accommodations, i.e. wheelchair access, handicapped parking? <input type="checkbox"/> Yes / <input type="checkbox"/> No

For the Friday Evening Banquet, provide your entrée selection:  Beef  Chicken  Vegetarian

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CREDIT CARD (Circle): American Express    Discover    Visa    Master Card

Cardholder Name \_\_\_\_\_ PLEASE PRINT

Credit Card Number \_\_\_\_\_

Expiration Date \_\_\_\_\_

Zip Code \_\_\_\_\_

Signature \_\_\_\_\_

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