



Pesticides and Behavior?

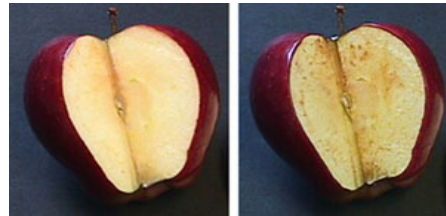


Fouling Communities?

# 39<sup>th</sup> Annual Framingham State College Biology Student Research Conference



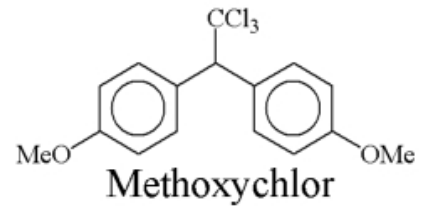
Parasites



Bad Apples?



Vaccines ...



Look Alikes?

## Abstracts



Vocalizing Your Feelings?

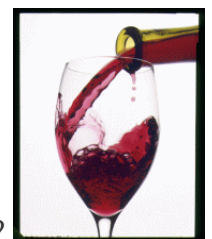


Dealing With Danger?

December 14, 2007  
Hemenway Hall, Room G32



They Make Me Itch!



The French Paradox?

# Welcome

Welcome to the 39<sup>th</sup> Annual Framingham State College Biology Student Research Conference. Each year our students present the results of their independent research at this conference. These presentations represent the culmination of a year of hard work. Through this first-hand research experience, our students come to understand the scientific process and appreciate the complexity and diversity of biological systems.

Recent graduates of the Biology Department have embarked on successful careers. Some have gone on to graduate and professional schools locally (Dartmouth, Tufts, UMass Medical, UNH), nationally (Columbia Dental School, Michigan State Vet School and Florida State University) and internationally (University of Edinburgh). They are pursuing advanced degrees in fields ranging from molecular biology and evolutionary biology to human and veterinary medicine. Others are at work in biotechnology companies, hospital and university research labs, Massachusetts' public health laboratories, and the Natick army labs. They are delineating wetlands, estimating wildlife habitats, and working as zookeepers and environmental educators. In the tradition of Framingham State, our graduates are also teaching biology in high schools across the Commonwealth.

Please join us in congratulating today's student presenters on their hard work and mastery of the professional skills needed for participation in this conference.

## The Thornton Award

The Thornton Award is given each year in memory of **Shaun Thornton**, a biology major who died in a motorcycle accident in 1993, several days after being awarded with the award for the best presentation at the FSC Biology Student Research Conference. The award is given to the presenter(s) of the best oral and/or poster of their research.

### **Previous Thornton Award Winners:**

- 1993 Jason Fitzpatrick
- 1994 Diane Caunt
- 1995 Amy Donoghue and Terry O'Connell
- 1996 Gianna Troiano
- 1997 Jim Uthoff (oral) and James Griffin (poster)
- 1998 Julie Ploof
- 1999 Scott Andrea
- 2000 Mark Cooperman (oral) and Deidre Osborne (poster)
- 2001 Virginia Rainville
- 2002 Azra Ahmed
- 2003 Scott Alconada

2004 Anita Lovely  
2005 Heather Paquin  
2006 Jeane Webster

**39<sup>th</sup> Annual Framingham State College  
Biology Student Research Conference  
Program Schedule – December 14, 2007 – Hemenway Hall G-32**

9:00	Efficacy of a <i>Staphylococcus intermedius</i> vaccine for the prevention of canine pyoderma in a mouse model. <b>Colin LaCroix.</b>
9:15	A Comparative Analysis of Fouling Community Structure, <b>Paul Richardson.</b>
9:30	Temperature and Age Effects on Pollen Germination in <i>Castanea dentata</i> . <b>Lafayne Martin.</b>
9:45	Trial and Error Problem Solving by <i>Acheta domesticus</i> . <b>Vanessa Raboin.</b>
10:00	Effects of Neonatal Injections of Methoxychlor on Adult Female Rat Mating Behavior. <b>Jennifer Bertolasio.</b>

**10:15 – 10:40 Coffee**

10:45	The Effects of Food Preference on Vigilance Behavior of Common Grackles, <i>Quiscalus quiscula</i> . <b>Michelle Day.</b>
11:00	Effect of Neonatal Exposure to Methoxychlor on Reproductive Development in the Female Rat. <b>Susanne Glagowski.</b>
11:15	The Prevalence of Trematodes in Populations <i>Littorina littorea</i> along the New Hampshire Coasts. <b>Jaquay Smalls.</b>
11:30	The Analysis of Polysaccharide Purification Techniques for <i>Staphylococcus intermedius</i> . <b>Ryan Catania.</b>
11:45	Physiological Tolerance of the Invasive Tunicate <i>Botrylloides violaceus</i> to Salinity. <b>Caitlin Myers.</b>

**12:00 – 1:10 Lunch**

1:15	Extraction of Testosterone from Avian Egg Yolk for Measurement Using an Enzyme Immunoassay. <b>Louise Balduf.</b>
1:30	The Calls of the Common Loon ( <i>Gavia immer</i> ): Amplitude Degradation Over Water. <b>Luke Jandreski.</b>
1:45	Androgenic Effect of Methoxychlor in Male Castrated Rats. <b>Kelly Nord.</b>
2:00	Biofilm Production as an Indication of Capsular Polysaccharide Production by <i>Staphylococcus intermedius</i> . <b>Katelyn Murtagh.</b>
2:15	Effect of Methoxychlor on Anxiety in Ovariectomized Rats. <b>Kristina Denzel.</b>

**2:30 – 2:55 Coffee**

3:00	Effects of Patch Distance (Predation Risks) and Patch Preference on the Foraging Behavior of the Eastern Grey Squirrel ( <i>Sciurus carolinensis</i> ). <b>Nicole Ramos.</b>
3:15	Exploring Genotoxic Potential of Resveratrol Utilizing a Yeast Two-Hybrid Assay. <b>Michael Jones.</b>
3:30	The Allelopathic Potential of Japanese Knotweed ( <i>Polygonum cuspidatum</i> ). <b>Amira Azer.</b>
3:45	Comparing Total Phenolics, Polyphenol Oxidase and Peroxidase Activities of Apples and High Pressure and Thermal Processed Apple Sauces. <b>Isel Tavico</b>

**4:00 Photo Session - Class Pictures & Informal Reception**

## Abstracts

The Allelopathic Potential of Japanese Knotweed (*Polygonum cuspidatum*). **Amira Azer**, Biology Department, Framingham State College, Framingham, MA.

Since the beginning of the nineteenth century, Japanese knotweed (*Polygonum cuspidatum*) has been implicated as a major threat to ecosystems in the United States (1). Japanese knotweed is a non- native invasive plant species that spreads rapidly and aggressively. In this study, potential allelopathic effects of both green leaf extract and soil extracts from Japanese knotweed plants were tested on seed germination and root elongation of lettuce seeds (*Lactuca sativa*). There was an inhibitory effect on both seed germination and root elongation of lettuce seeds treated with either green leaf extract or soil extract of Japanese Knotweed compared to lettuce seeds treated with distilled water. The differences in seed germination and root elongation among treatments were significant. Germination and root elongation were lowest in seeds treated with green leaf extract. This supports the presence of allelopathic components in the green leaves. Soil from under Japanese knotweed and soil from areas lacking Japanese knotweed were also used to grow lettuce plants and were tested for effects on final dry weight of lettuce plants grown in both types of soil for 28 days. Final dry weight of lettuce plants grown in soil without Japanese knotweed was higher than their weight when grown in soil with Japanese knotweed. Japanese knotweed leaf extracts have allelopathic effects on lettuce seed germination and root elongation. Soil within patches of Japanese knotweed is also inhibitory to these growth parameters.

Extraction of Testosterone from Avian Egg Yolk for Measurement Using an Enzyme Immunoassay. **Louise Balduf**, Department of Biology, Framingham State College, Framingham MA.

The testosterone deposited in avian egg yolk by the female parent has a crucial role in the development and survival of the offspring. Yolk testosterone levels vary in different species, among individuals, and along the laying order of a clutch. Extracting the testosterone from yolk for an accurate measurement requires avoiding either too many extractions or too few, both of which could result in losing testosterone and an incorrect measurement. Three different extraction methods were compared. One extraction method involved an ether wash, a hexane/ethanol wash, and running samples through diatomaceous earth microcolumns. In a second extraction method, samples were extracted using the ether wash, but the hexane wash and microcolumns were omitted. The third extraction method was nearly identical to the first but substituted the hexane wash for a second ether wash. The extracted testosterone was measured using an enzyme immunoassay (EIA), a safer and non-radioactive alternative to the more commonly used radioimmunoassay (RIA). However, EIAs are less sensitive and require a more efficient extraction method. The results supported the hypothesis and showed the second extraction method had the highest recovery of testosterone, a lower variability among the samples (measured by a coefficient of variation), and a more accurate serial dilution. This supported previous studies showing that the fewer extractions resulted in a higher recovery and a lower coefficient of variation.

Effects of Neonatal Injections of Methoxychlor on Adult Female Rat Mating Behavior. **Jennifer Bertolasio**, Department of Biology, Framingham State College, Framingham MA.

Methoxychlor (MXC), a commonly used pesticide, has been labeled as an endocrine disruptor. To evaluate the impact of MXC on brain differentiation, female Sprague-Dawley rats were given subcutaneous injections on postnatal days 1, 3, and 5. The injections contained 1.0mg MXC, 2.0mg MXC, 10 $\mu$ g 17 $\beta$ -estradiol benzoate (positive control), or sesame oil (vehicle.) After the allowing rats to grow to adulthood, they were ovariectomized. After recovering, they were hormonally primed by injections of 10 $\mu$ g 17 $\beta$ -estradiol benzoate at 48 and 24 hours prior to behavior testing, followed by 1mg of progesterone 4 hours prior to testing. Treated female rats were introduced to sexually experienced males in lordosis chambers. Each female was allowed ten mounts by a male and her response was scored. Responses were evaluated for frequency and amplitude of lordosis as well as incidents of proceptive and aggressive behavior. Treatment with MXC had no effect ability to exhibit a sexual response, although the high dose MXC (2.0) and the positive control (Estradiol) animals demonstrated a decrease in degree of receptivity, a decrease in proceptive behavior and an increase in aggressive behavior. These data suggest that higher doses of MXC given during the neonatal period can act as an estrogen *in vivo* and can alter aspects of sexual differentiation of the brain.

The Effects of Food Preference on Vigilance Behavior of Common Grackles, *Quiscalus quiscula*. **Michelle Day**, Department of Biology, Framingham State College, Framingham MA.

The vigilance behavior of birds can be influenced by many environmental factors, including the type of foods that they are feeding on. I examined the effects of food preference on vigilance behavior of common grackles (*Quiscalus quiscula*). My goal was to investigate what effect food preference has on antipredator vigilance. I hypothesized that when birds were feeding on preferred foods, feeding rates would increase, which would result in decreased vigilance. In my experiment, four different food types were offered to free range wild birds in order to determine which they preferred. All feeding trials were video taped and data was collected from focal birds. After preference was determined, vigilance behavior was analyzed in regards to food type. The four food types were plain white millet seeds, and white millet seeds mixed with increasing amounts of peanut butter and lard. The birds significantly preferred the middle food types over the plain seed and the seed mixed with the most lard and peanut butter. However, both scanning rate per minute and length of scan durations were unaffected by the food type that the birds were feeding from. My study failed to show that food preference impacts antipredator vigilance.

Effect of Methoxychlor on Anxiety in Ovariectomized Rats. **Kristina Denzel**, Department of Biology, Framingham State College, Framingham MA.

Methoxychlor (Mxc) is a pesticide that is widely used on agricultural crops, as a substitute for DDT. Previous studies have shown that Mxc mimics the actions of estrogen, the primary sex hormone in females, by binding to the estrogen receptor. When estrogen binds to the estrogen receptor, anxiety is decreased, as indicated by previous behavioral studies. Since Mxc mimics estrogen in the cell, it may decrease anxiety as well. Forty-eight adult female rats were ovariectomized to remove endogenous estrogen. Five treatment groups (N=9-10/group) were used: estradiol, (10µg/animal, positive control), ethanol:oil vehicle (1:9 dilution, negative control), high (133.3mg/kg body weight), medium (66.7mg/kg body weight), and low (33.3mg/kg body weight) levels of Mxc. Subcutaneous injections were administered daily for one week prior to and for the duration of behavior testing, to insure that target methoxychlor levels were maintained. Anxiety was observed in non-invasive, observational anxiety tests such as: open field, elevated plus maze and light-dark transition. Unfortunately, due to high variability there were no statistical differences among the treatment groups in any of the behavioral tests.

Effect of Neonatal Exposure to Methoxychlor on Reproductive Development in the Female Rat. **Susanne Glagowski**, Biology Department, Framingham State College, Framingham, MA.

The effects of methoxychlor (MXC) at 2.0 mg and 1.0 mg were studied to determine whether methoxychlor would mimic estrogen in neonatal female rats. The female rats were placed into four treatment groups; 2.0 mg/rat MXC, 1.0 mg/rat MXC, 10 µg/rat estradiol (positive control), and sesame oil (negative control). The females were given injections a total of 3 times on days 1, 3, and 5 after birth. Its effects were determined by monitoring the onset of puberty, frequency of estrus by taking vaginal smears, and measuring anogenital distance. The frequency of estrus was significantly increased at the 2.0 mg dose but not at the 1.0 mg dose. MXC had no significant effect on the onset of puberty or anogenital distance at any dose. Exposure to MXC at high doses does have an estrogenic effect on some aspects of the reproductive system.

The Calls of the Common Loon (*Gavia immer*): Amplitude Degradation Over Water. **Luke Jandreski**, Department of Biology, Framingham State College, Framingham MA, 01702

Three calls of the Common Loon (*Gavia immer*), the wail, tremolo, and yodel, are used in distance communication. Of these, the wail and tremolo are very different, deviating in both acoustic wave form and use. However, the yodel seems to use acoustic properties of the wail and tremolo while having a unique function (territorial call). Because the acoustic structure of a call may be linked to its use, differences in the loon calls may help explain their purposes, especially the unique application of the yodel. In this experiment, I investigated the patterns of amplitude (loudness) degradation of each of the calls. The amplitude degradation of the calls determine how far they are able to transmit, and thus can play a role in their functions. To accomplish this assessment, I played previously recorded loon calls (wail, tremolo, and yodel) from a beach, and rerecorded the calls at several distances to determine degradation patterns. When I compared the degradation curves using a repeated measures ANOVA, I found that the degradation patterns were not significantly different among the curves ( $p=.278$ ). This indicates that the calls compared have no significant difference in their propagation distance over water.

Exploring Genotoxic Potential of Resveratrol Utilizing a Yeast Two-Hybrid Assay. **Michael Jones**, Department of Biology, Framingham State College, Framingham, MA.

Resveratrol (RES) is a natural phytoalexin found in the skin of red grapes and also in peanuts and mulberries. Research has been conducted to show that RES has antiproliferative and proapoptotic effects on several cancer cell lines. Studies have also shown that RES is genotoxic by several different mechanisms. Potential toxicity of RES to wild-type yeast is also investigated. The Yeast Two-Hybrid System (Y2H) will be used to study the affect of RES on protein-protein interactions important in transcription. The use of the Y2H system will also validate its use for studying potential genotoxic compounds. There are many definitions of the term genotoxicity. RES has been attributed to the chromosomal damage and the formation of micronuclei, disruption of transcription at multiple points, and exerting antiproliferative actions through its antioxidant effects. The yeast was plated in concentrations of 100cfu/mL, and was grown on dropout agar. RES, water, and positive controls containing copper sulfate, zinc sulfate, and arsenic trioxide at three different concentrations were the test compounds used in the assays. Growth of the yeast in the assays was expressed as percent of the negative control. The wild-type and Y2H yeast strains showed nonlinear effects and overall different sensitivities to the positive controls. The data show a significant reduction in number of yeast colonies in the RES assay in both wild-type and Y2H yeasts. These data could be a launching board for further study into the potential RES has on different cell lines.

Efficacy of a *Staphylococcus intermedius* vaccine for the prevention of canine pyoderma in a mouse model. **Colin LaCroix**, Department of Biology, Framingham State College, Framingham MA.

*Staphylococcus intermedius* is a gram-positive coccus that has been shown to cause a skin disease on dogs known as pyotraumatic dermatitis, pyoderma or hot spots. The infection is created by an overgrowth of the bacteria on the dog's skin, creating epidermal collarettes, pustules and inflammation. Antibiotics are the main treatment for the disease; however, bacteria are quickly becoming resistant to many common antibiotics. A vaccine would protect dogs against any infection caused by the bacteria. An experimental vaccine using the capsular polysaccharide of *S. intermedius* has potential to be an effective vaccine against infection. The correct dosage required for immunization, however, needs refinement. Fifty eight mice (Balb/C) were randomly separated into 6 groups to receive varying intra peritoneal doses of the vaccine for a total of 3 vaccinations. Efficacy of the vaccine was challenged by a subcutaneous injection of  $2.2 \times 10^6$  cfu/ml of live *S. intermedius*. Five days later, the number of surviving bacteria in tissue removed from the injection site were determined. Groups of mice receiving the whole cell vaccine (72% protection) and the 31.25  $\mu$ g dose (85%) were significantly more protected ( $P < 0.03$ ) than the 500  $\mu$ g (-103%). The result suggests that the optimal vaccine dosage is lower than 31.25  $\mu$ g. The lack of protection from higher dosages is likely due to inadvertent suppression of the immune system from a lack of high-dose tolerance.

Temperature and Age Effects on Pollen Germination in *Castanea dentata*. **Lafayne Martin**, Department of Biology, Framingham State College, Framingham, MA.

The American chestnut, *Castanea dentata* is in danger of becoming extinct due to the chestnut blight. The chestnut blight is fungal disease which destroys the upper portion of the tree making it difficult for the tree to reproduce fruits. There is ongoing research to breed chestnut trees affected with the blight disease. Pollen longevity of the American chestnut was estimated through pollen germination. Pollen grains were collected from Granville, MA and stored at room temperature (22°C), 31°C, and 37°C and samples were removed at 3, 6, 9, 24, and 48 hours, placed in the sucrose solution and incubated overnight at 31°C. Pollen germination declined about 50% during the first three hours, with a larger decline in the pollen stored at 31°C (14%) and 37°C (20%), while room temperature was 40%. Removal of grains at six hours from 22°C was 21.5%, from 31°C was 27%, and from 37°C was 12.5%. At nine hours percent germination at 22°C was 25%, 31°C was 26.5%, and 37°C was 13%. At 24 hours percent germination at 22°C was 28.3%, 31°C was 25.5%, and 37°C was 6.5%. At 48 hours percent germination at 22°C was 30%, 31°C was 13%, and 37°C was 3.5%. The results indicate that warm temperature and time does have an effect on the longevity of pollen. This research may help the breeding effort by providing information about pollen longevity and how different temperatures affect the pollen.

Biofilm Production as an Indication of Capsular Polysaccharide Production by *Staphylococcus intermedius*. **Katelyn Murtagh**, Department of Biology, Framingham State College, Framingham MA.

Over-colonization on the skin of dogs by *Staphylococcus intermedius* results in reoccurring infections known as canine pyoderma. As of yet, there are no preventative measures that can be taken. The virulence of *Staphylococci*, among other bacteria is largely believed to be facilitated by the capsular polysaccharide (CP) layer of the bacteria and subsequent biofilm layer produced, cloaking it from the host's immune system. Because of resistance to antibiotic treatment in such bacteria, other options such as CP vaccines derived from pathogenic bacteria are being explored. These vaccines would allow the host body to recognize epitopes on the CP of the bacteria, resulting in increased phagocytosis. *S. intermedius* was examined for its ability to produce biofilm (and therefore CP) on 96 well polystyrene tissue culture plates. Forty seven pathogenic strains were grown onto plates, stained and had their optical densities determined. The majority of the strains were capable of weak adherence to the tissue culture plates. It can then be inferred that each of these strains produces a CP layer. However further research is required to determine why the adherence of these strains was less than that produced by other species of the same genus, who contain the same genetic mechanisms for adhesion and biofilm formation.

Physiological Tolerance of the Invasive Tunicate *Botrylloides violaceus* to Salinity. **Caitlin Myers**, Department of Biology, Framingham State College, Framingham MA.

Invasive species are overwhelming estuarine and benthic communities in many areas of the world. They are a major threat to ecosystems by decreasing biodiversity of native communities. This study examined the effect of salinity by the colonial tunicate *Botrylloides violaceus*. The objective was to possibly predict potential habitats for future invasion. The ascidians were collected from Hawthorne Cove Marina, Salem, MA and kept in an incubator @13°C in containers of seawater with salinities that ranged from 6‰ to 32‰. Heart rate was used to assess the overall health of colonies. Heart rates were monitored daily for 2 weeks by recording the number of heartbeats in 15 seconds from three individual zooids in each colony (n=3); the results were analyzed using an ANOVA. The ANOVA resulted in a P-value of < 0.001 and an F-value of 47.06; these results suggest that there was a significant difference between the heart rates in each of the salinities. The heart rates of the colonies in 6‰ and 12‰ became very low after a day, two colonies in each salinity died within 24 hours and the third died the next day. The colonies stored in 32‰ and 24‰ maintained relatively good health and had a somewhat consistent heart rate until the end of the two week period. In conclusion, *Botrylloides violaceus* is not able to invade in habitats in estuaries with seawater at salinities below 20‰; they seem to experience stress very quickly when salinity much lower than 20‰. Assessing the tolerance of the species, allows one to possibly predict habitats that would be susceptible to successful future invasion.

Androgenic Effect of Methoxychlor in Male Castrated Rats. **Kelly Nord**, Department of Biology, Framingham State College, Framingham MA.

Unpublished studies from Framingham State College suggested that methoxychlor, a known endocrine disruptor and estrogenic compound, might also act as an androgen. Methoxychlor has shown in previous studies to disrupt the male hormone signaling pathway in intact male adult rats. To determine whether the exposure of methoxychlor to male castrated rats caused androgenic effects in male sex accessory organs, three doses of methoxychlor (100, 200 and 400 mg/kg) were administered to castrated, immature male rats. Testosterone propionate was used as a positive control and the vehicle (1:9 ethanol:sesame oil v/v) as a negative control as a means for comparison. All treatments were given as subcutaneous injections once daily over a 10 day period and the effects were examined on day 11. The results demonstrated that methoxychlor, in all dosing groups, did not increase the weight of either the ventral prostate or seminal vesicle sex accessory organs. Because methoxychlor did not increase the weights of the sex accessory organs, these results do not support the hypothesis that methoxychlor acts as an androgen.

Trial and Error Problem Solving by *Acheta domestica*. **Vanessa Raboin**, Department of Biology, Framingham State College, Framingham MA.

*Acheta domestica*, commonly known as the house cricket, was used to test trial and error problem solving in an artificial setting (escape confinement on an island in a water filled tray). The crickets had two escape choices (jumping or swimming) and were separated into two groups based on the choice each cricket made in a preliminary test, which was designated as the predetermined choice. In the experiment, if the cricket chose the predetermined choice it was helped to an atoll, which was closer to the edge of the tray (success), and if the cricket did not choose the predetermined choice it was sent back to the island (failure). The cricket was then allowed to make a third choice, hopefully one that was based on the outcome of the second choice that demonstrates trial and error problem solving. However, the results indicate that the third choice was not based on the outcome of the second choice for the crickets that were predetermined to swim, but was for the crickets predetermined to jump. This could be explained by the experimental design and normal cricket behavior.

Effects of Patch Distance (Predation Risks) and Patch Preference on the Foraging Behavior of the Eastern Grey Squirrel (*Sciurus carolinensis*). **Nicole Ramos**, Department of Biology, Framingham State College, Framingham, MA.

For many mammals, foraging, or the gathering of food, is essential for survival. Foraging behavior is well observed in the eastern grey squirrel (*Sciurus carolinensis*). There are many factors that can influence foraging behavior such as food preference and predation risk. I noted that in areas close to cover (trees), the squirrels would look for a preferred food item. However, when the preferred food item was no longer available near cover, the squirrels would disregard the non-preferred food item close to cover and look for other food choices. I hypothesized that there must be some type of trade-off between staying close to cover (lower predation risk) and eating a preferred food item. I also hypothesized that the squirrels would rather stay close to cover than travel away to consume a preferred food item. To test my predictions, I set up one patch site with a preferred food item (peanuts with their shells) close to cover and a non-preferred food item (sunflower seeds with their shells) farther from cover. Another patch site was set up with the peanuts farthest from cover and the sunflower seeds closest to cover. This would help determine whether food preference or predation risk would have the greatest influence on the foraging behavior of the grey squirrels. The results supported my hypothesis that the eastern grey squirrel would choose to forage close to cover for a lower predation risk, despite the preference for the food items available.

A Comparative Analysis of Fouling Community Structure, **Paul Richardson**, Department of Biology, Framingham State College, Framingham MA.

A fouling community is a community of benthic marine organisms that inhabit man-made structures. Many factors can change fouling community composition, such as recruitment of invasive species. The object of this experiment was to compare present fouling community composition with communities from the early 1980's. Plexiglas panels were deployed from the commercial fishing pier in Portsmouth, NH for six months and species recruitment to the panels was monitored monthly. Percent cover was calculated and compared to community composition from photographs of panels from 1984. *Halichondria panacea* and *Anomia simplex* recruited to the panels in 2007, but were not present in 1984. Abundances of *Botrylloides violaceus*, *Botryllus schosseri*, *Obelis commissuralis*, and *Semibalanus balanoides* are significantly different than they were 23 years ago. The results of this study show that *B. violaceus* has changed local fouling community composition since 1984. Also the presence of organisms not seen in 1984 signifies a change in community structure. This study demonstrates the periodic changes and impacts of invasive species on fouling communities and opens up new discussion as to the long term impact these alterations may have on future communities..

The Prevalence of Trematodes in Populations *Littorina littorea* along the New Hampshire Coasts. **Jaquay Smalls**, Department of Biology, Framingham State College, Framingham, MA.

Populations of the periwinkle snail (*Littorina littorea*) along the New Hampshire coast were sampled to assess the prevalence of trematodes. 100 snails were collected from seven sites and dissected to identify cercaria infection. 744 snails processed and 9.4% were infected. All populations were positive for infection by *Cryptocotyle lingua*, however at Pebbles Cove, some snails were also infected by *Cercaria parvicaudata*. Past research found a correlation between the gulls present at the sample sites and percentage of infection, however, result from the research found that there was no correlation between the number of birds present at the site and number of snails infected. Medium length (between 11-20 mm) females were the largest percent of infected snails. Common infection rate in females of this size may be attributed to larger snails consumed as a primary food source by predators, slower mobility, or faster fatality rate in males who are infected.

Comparing Total Phenolics, Polyphenol Oxidase and Peroxidase Activities of Apples and High Pressure and Thermal Processed Apple Sauces. **Isel Tavico**, Department of Biology, Framingham State College, Framingham, MA.

High pressure processing (HPP) retains the nutritional characteristics of foods by eliminating the thermally induced, cooked off flavors and inactivating spoilage associated with the shelf life of foods. Unlike thermally processed foods, which are heated to inactivate spoilage, HPP uses extremely high pressures to preserve the food's quality, taste, texture and appearance. Apples when bruised or cut undergo oxidization by polyphenol oxidase (PPO) and peroxidase (POD) enzymes. This enzymatic browning degrades the freshness and shelf life of apples. The activity of these enzymes was measured in fresh apples, HPP applesauce, and heat processed applesauce. Complete inactivation of both enzymes was demonstrated in both HPP and heat-treated applesauce. The total phenolic content was determined using Folin-Ciocalteu's method. High total phenolic content were found in HPP applesauce (>170 mgGAE/100g), especially in the HPP apple cherry, apple grape and apple cran-ras sauce. Fresh apple extracts also showed high total phenolics (>90 mgGAE/100g), especially Golden Delicious (437.5 mgGAE/100g) containing the most of phenol contents. Heat-treated applesauce's contained low total phenol content (<60 mgGAE/100g), indicating loss in antioxidants. These results support previous studies that HPP retains freshness and nutritional value.