

Final Report

Award ID: 0114400

Final Report for Period: 2001 - 2009

Institution: Georgia Institute of Technology

Title: Signals in the Sea

Research Accomplishments

Our IGERT program integrated ecology, chemistry, sensory biology and small scale physics of flow (hydrodynamics) to understand how marine and freshwater organisms communicated chemically and how these chemically-mediated interactions structured populations and organized communities. Below, I summarize a few of the recent, synthetic, and impactful investigations conducted by our interdisciplinary students. These represent only a few of the many studies conducted. The many more contributions that were made are listed in the publications for the program.

Chemically-mediated processes in oceanic plankton communities:

Toxic algal blooms in marine systems are frequent, kill millions of fishes and invertebrates, and produce losses in the tens of millions of dollars each year to coastal economies. Trainee Emily Prince combined ecology, chemistry, and small-scale hydrodynamics to study the interactions and fundamental mechanisms driving toxic algal blooms. She discovered (1) that some harmful species produce chemicals that suppress other competitors, (2) that the known toxic metabolites are not the chemicals producing this effect, and (3) that 2 of the 10 competitors tested chemically undermined the effects of the toxic species - thus lessening the damage to all co-occurring species. This work provides new insight into the processes regulating marine plankton and offers novel management options for lessening harmful algal blooms. These discoveries are described in (a) Prince et al. (2008) *Limnol. Oceanogr.* and (b) Prince et al. (2008). *Proc. Royal Soc. B.*

Dominant bloom-forming phytoplankton in the genus *Phaeocystis* comprise up to 85% of total production in some oceanic regions, produce the major carbon and thus food-web signal for these regions, and have been argued to be either supporting oceanic food-webs leading to fisheries or to damage and undermine these food webs and to send carbon to detrital chains and potentially affect global carbon storage. IGERT post-docs and students collaborated to show that this alga changed from a commonly eaten to commonly avoided food based on chemical signals coming from attacked neighbors. *Phaeocystis* used chemical cues to determine attack rates on neighbors, determine the species of consumer attacking, and altered its phenotype so as to decrease susceptibility to that consumer. This can alter oceanic food-webs, patterns of carbon sequestration, and nutrient flow and energy cycling (Long et al. 2007 *PNAS*)

Chemically-mediated interactions in benthic marine communities:

Coral reefs in the Caribbean have dramatically declined in the last 30 years, changing from 30-60% to about 5-20% live coral. The relative roles of overfishing, vs nitrification, vs global change in this decline are debated. Trainee Deron Burkepile used his ecology, chemical, behavioral biology, and statistical skills to (1) conduct meta-analyses to demonstrate that removing herbivorous fishes damage reefs much more than adding nutrients (Burkepile and Hay 2006 *Ecology*) and (2) to conduct large-scale fish diversity manipulation experiments to demonstrate that altering fish diversity could produce tremendous positive effects on reef communities, increase coral growth by >20%, and offer novel management options for restoring coral reefs (see Burkepile and Hay 2008 *PNAS*).

Marine worms are specious and numerically prominent members of marine communities where they play critical roles in trophic interactions and in affecting biogeochemical cycles. Despite the ecological importance of this group, little is known about their palatability to, and defenses against, consumers. In addition, most studies of prey defenses in marine organisms have focused on overt, sessile species; few studies have investigated more mobile and behaviorally complex species that could potentially be integrating predator deterrents with escape and refuging behavior. To increase the understanding of consequences of defensive traits among mobile marine prey, one of our IGERT students (Cynthia Kicklighter) surveyed the palatability of 81 species of worms from the Caribbean and warm-temperate Western Atlantic. Thirty-seven percent of the species were unpalatable, with the spatial and habitat-specific patterns associated with unpalatability suggesting fundamental insights into the processes structuring different community types and the variable selective pressures experienced by species in different habitats, and even by different parts of individual worms within a habitat. Worms with differentially exposed body portions commonly defended exposed feeding appendages with chemical or structural deterrents, while palatable and undefended bodies remained sheltered within structural refuges. Unpalatable worms tended to be brightly colored, sedentary, exposed to epibenthic predators, and to occupy hard substrates. Palatable worms tended to be drab, to live in structural refuges from consumers, to be mobile, and to inhabit unconsolidated sediments. Overall, taxonomy (Sabellidae and Terebellidae) and color were the traits most strongly associated with unpalatability. Unpalatable species appeared less constrained by predation and freer to forage for long periods on higher quality surface sediments or on other invertebrates at the sediment surface (thus, potentially influencing the distribution and abundance of other species). In contrast, palatable species appeared more constrained by predation risk. They fed on lower quality subsurface sediments and foraged at times or locations where consumers were less active. These ecological patterns may be generalized to other soft-bodied prey, such as

caterpillars, which show similar trends regarding palatability and lifestyle (see Kicklighter and Hay 2006 Ecological Monographs; 2007 Oecologia)

Our IGERT summer field classes were charged with forming hypotheses about interdisciplinary aspects of chemical signaling and testing these in multi-disciplinary teams of IGERT students. The following paper resulted from one of these classes. Burkepille, DE, JD Parker, CB Woodson, HJ Mills, J Kubanek, PA Sobecky, and ME Hay. (2006) Chemically-mediated competition between microbes and animals: microbes as consumers in food webs. Ecology 87:2821-2831. This research unified areas of chemistry, microbiology, food-web theory, and ecosystem level processes and was broadly covered by the press - including Nature, NPR's 'Science outside the box' and various other radio, web, and print based media. It demonstrated that micro-organisms use chemical means to compete with macro-organisms, that this may significantly affect energy and nutrient flow, and that microbes need to be considered as competitors with large animals in marine food webs (and probably all food webs).

Our IGERT students demonstrated causal connections between flow, the transport of chemical signals, perceptual abilities of prey and the structure of marine soft-substrate communities such as mud flats, marshes, and sand flats. They found distinct strategies among groups of organisms characterized by different sizes and motility; turbulence disrupts perception in small and or rapidly moving animals whereas larger, slower animals are less affected. This led to these different groups being differentially affected by flow regimes in the field, with predators being advantaged by tracking chemical signals from prey, and prey being advantaged by perceiving chemicals from predators and altering their behavior so as to release less signal that could be tracked. These observations suggest that the strength of trait mediated interactions and density mediated interactions are context dependent and predictable from analysis of flow, chemical signals used, and sensory capability of both the consumer and prey. These interdisciplinary studies thus link specific mechanisms of chemical signaling and chemical cuing to the structure and function of populations and communities. Papers published on this topic include: Smee and Weissburg (2008 Marine Ecology Progress Series), (2006 Ecology); Smee et al. (2008 Oecologia); Ferner et al. (2005 Marine Ecology Progress Series); Ferner and Weissburg (2005 Journal of Experimental Biology).

Chemically-mediated interactions from marine systems inform investigations of terrestrial and other systems:

IGERT students used their marine training to ask general questions that could be tested in freshwater and terrestrial systems. They used both experimentation and meta-analyses to demonstrate that the processes affecting invasions by non-native plants are the opposite of what had been the ruling paradigm for the past 150 years. Non-native plants species did not prosper due to escaping their native herbivores, but in-fact were selectively attacked due to being evolutionarily naïve relative to the generalist herbivores they encountered in their new environments. Investigations in freshwater systems found that native North American crayfishes selectively attacked non-native relative to native plants, and this pattern from freshwater systems was repeated in different terrestrial systems. A larger meta-analysis of effects of native and non-native herbivores on native and non-native plants across many herbivores, plants, and habitat types found that invasive plant species were not escaping their native herbivores, they were following them. Introduced herbivores suppressed native plants, facilitated invasion by non-native plants with which they had an evolutionary history, and caused an 'invasion meltdown'. Basically European humans invaded the Americas, Australia, New Zealand, etc., killed the native herbivores (which suppressed invasions of non-native plants), introduced non-native herbivores (sheep, goats, cattle, etc.) which selectively attacked native plants and removed them as competitors of the non-native plants that followed these herbivores to the new habitats. (see Parker et al. 2006 Science, Parker and Hay 2005 Ecology Letters).

Educational Accomplishments

IGERT allowed us to build a series of 8 novel and integrated classes that crossed the disciplines of biology, chemistry, and engineering, to simultaneously train biology, chemistry, and engineering students across each of these disciplines, and to then involve all of these students in team-focused multidisciplinary research on topics within aquatic sciences that span these disciplines. Because we were dropping engineering students into graduate biology and chemistry courses, biology students into graduate engineering and chemistry courses, etc., the students had to form groups to reciprocally teach each other and to play both mentor and mentee. This built an especially strong connection among each year-class of IGERT students and gave them an immediate intellectual and social cohort within which to interact. This approach 'infected' our students with an appreciation and enthusiasm for interdisciplinary science. A significant sub-set of these students then carried this approach into their own teaching in both university (as a teaching assistant, or even independently teaching university courses as a late-stage Ph.D. student) and high school teaching.

After their initial years of IGERT training several of our IGERT students participated in intensive year-long efforts where they taught part time for one year in a high school that was failing to meet state education standards. They took a summer course in teaching methods, then spent 10 hours per week conducting lectures and leading discussions in local high schools. They prepared and led labs for biology and environmental science classes and started an after school tutoring program that focused on preparing students from underperforming schools for the graduation test and for AP tests. They also commonly worked with high school teachers to better integrate hands-on approaches into class-room science experiences. Our students also organized enrichment activities for their students such as visits to the Georgia Tech campus and to the new Georgia Aquarium.

Several of our IGERT students have been able to participate in International education and research efforts that would not have been available without IGERT. This includes long-term field work in Fiji (4 students), New Zealand (8 students), Panama (8 students), Tasmania (1 student), Spain (1 student), and shorter term efforts in Germany and Greece (1 student each).

One of our critical educational activities was capstone field experimental course at the end of the first year's intensive series of courses. This class allowed students to form interdisciplinary teams that posed and tested novel IGERT-related in the field. This was initially conducted from the Skidaway Inst. of Oceanography over a period of 6 weeks in the summer. However after receiving funds for international experiences, the last two courses were conducted in field settings in New Zealand and in Panama. One of the papers coming from one of these summer courses was published in Ecology in 2006 and received considerable press, including interviews on National Public Radio, and many print and internet outlets.

Another successful effort has involved putting our students in charge of our IGERT seminar series. They are given a budget, invite speakers that they are especially excited to meet and hear, and in several cases these visiting speakers have been so impressed by the interdisciplinary views and abilities of our students that they have offered students post-doc positions before leaving campus. In some instances, these offers came as much as a year before graduation because the visiting speakers said that they wanted to "lock-in" the agreement early because they were so impressed with the students. While this is not an educational experience per se, it does seem to validate the skills and quality of the education the students are receiving.

Several aspects of our IGERT program have been institutionalized. When IGERT started, we initiated a course we called "tools of science" where we discussed general opportunities, challenges, obligations, and skills needed to be successful scientists and educators. Topics included aspects of ethics, minorities, and women in science, how to write proposals and papers, how to be a good reviewer, how to pick a productive professional path and the different challenges and opportunities offered by industry, government, university, college positions, etc. This class was offered year 1 to IGERT students only. The "buzz" from the class created request from the Biology Dept. to have it opened to all first year graduate student. This demand expanded and there are now Tools of Science courses being taught independently in the Biology Dept, Chemistry and Biochemistry Dept, and in Earth and Atmospheric Sciences Dept. The need for these courses to be interactive and small enough for significant discussion among all students mandated separate courses, but all of these courses are based on the initial IGERT model.

Major Trainee Accomplishments

Our IGERT program supported 48 total students. Of these 17 have graduated with a Ph.D., 2 received M.S. degrees, 6 left the program (some to industry, some to move with their major professor to other positions, etc.), and 23 are still progressing through the Ph.D. program here. To date, every graduate has received a job or post-doc offer (commonly several) before graduating. We consider this to be an indication of the generally high level of achievement of our trainees and an indication that universities, NGOs, government agencies, and industries highly value students with strong interdisciplinary training. Below, I provide several typical examples of trainee achievements and also discuss one group project by several of these trainees as an example of collaborative, interdisciplinary projects that IGERT produced that would not have been conducted by any of these students had they followed the more traditional discipline focused research alone.

1) Amy Lane was an IGERT student that received her Ph.D. through the School of Chemistry and Biochemistry in 2008. Her research focused on the ecological consequences of algal chemical defenses. It led to the discovery of >20 new natural products from Fijian red alga. Several of these compounds were of previously unknown structural classes, had previously unknown ecological functions as anti-microbial defenses, and in a few cases possessed novel activities that suggest that they have potential as potent drugs to defend humans against malaria or some cancers. She did work showing that algal metabolites were defensive against pathogenic marine microbes and could also be used to harm nearby competitors. Compounds were also tested in biomedical assays and demonstrated potent antimalarial and anticancer activity. Amy's work resulted in her being recruited for multiple desirable post-doc. She accepted a prestigious post-doctoral position at the Scripps Inst. of Oceanography.

2) John Parker received his Ph.D. through the School of Biology. His work demonstrated that the prevailing notions about the chemical and other plant defensive mechanisms affecting successful plant invasions of other continents were not the major processes affecting the success of invasive species. Although it was commonly assumed, and commonly stated, that plants became invasive when they escaped their native herbivores, his work suggested the opposite (invasive plants are selectively attacked by native herbivore and are in-fact following their non-native herbivores to new continents and invading after then non-native herbivores selectively suppress native plants). His work was collaborative with another IGERT student, was published in Science, has become highly cited (>50 citations in less than 15 months), and identified a major new hypothesis to explain plant invasions. Although John worked in aquatic communities, he extended his work and data-based tests into terrestrial systems. Upon graduating, he was offered post-dos at both Yale and Cornell and accepted the Cornell position. He then rapidly moved on to become a Principal Investigator at the Smithsonian Institution's Environmental Research Center.

4) Brock Woodson graduated in Civil and Environmental Engineering. His interdisciplinary training at the borders of hydrodynamics, ecology, and chemical signaling allowed him to produce insightful and

technically challenging investigations about small-scale physical structures in the ocean and how these might affect chemical cuing and zooplankton-phytoplankton interactions at scales rarely investigated. His publications in this area resulted in his being recruited to a post-doc at the University of Hawaii from which he was advanced to an Assistant Research Scientist at both the Univ. of Hawaii and now at UC Santa Cruz where he works on oceanographic physical features that structured biotic processes and interactions.

5) Deron Burkepile received his Ph.D. through the School of Biology. He worked on coral reefs studying how herbivore diversity produced cascading effects on the effectiveness of seaweed chemical defenses against herbivores, the consequences of these chemically-mediated interactions on seaweed-coral interactions, and the longer term consequences of these interactions on reef community structure. By manipulating herbivore diversity (as opposed to biomass), he was able to enhance coral cover by 20% in only 10 months ? providing new options and approaches for coral reef conservation. This work was recently published in *Proceedings of the National Academy of Sciences* (2008). This approach was powerful enough that he was recruited to a prestigious post-doc at Yale University where he investigated similar interactions but using megaherbivores (zebra, Impala, buffalo, etc.) on the Serengeti plains in Africa and in the Great Plains of North America. From this post-doc, he was recently recruited to a faculty position at Florida International University.

6) As a demonstration of the utility of our IGERT summer capstone class, and of interdisciplinary productivity in general, the above 3 IGERT students plus one other IGERT student (Burkepile, Parker Woodson, and Mills) collaborated on a summer class project to investigate chemically-mediated competition between microbes and macro-organisms. Their project (Burkepile, DE, JD Parker, CB Woodson, HJ Mills, J Kubanek, PA Sobczyk, and ME Hay. 2006. Chemically-mediated competition between microbes and animals: microbes as consumers in food webs. *Ecology* 87:2821-2831) unified areas of chemistry, microbiology, food-web theory, and ecosystem level processes and was broadly covered by the press - including *Nature*, *National Public Radio*, and various radio, web, and print based media. It explained the ecological and evolutionary processes determining ?why meat rots? and found that meat rots in large part because that is the way that microbes use chemistry to compete with larger organisms. They demonstrated that marine micro-organisms use chemical means to compete with marine macro-organisms, that this may significantly affect energy and nutrient flow, and that microbes need to be considered as competitors with large animals in marine food webs. They also discussed numerous terrestrial patterns suggesting that the same processes occur there as well.

7) One of our IGERT trainees (Alan Wilson ? now an Assistant Professor at Auburn University) wanted to organize a "local" meeting where graduate and undergraduate students could present and exchange ideas with post-docs and some faculty. He recruited other IGERT students to this task and ended-up creating and holding the first meeting of the Southeastern Ecology Evolution Conference (SEEC). This was held at Ga Tech with IGERT students leadership and attracted 500+ participants, from 22 states and 8 countries. The meeting was such a success that it became institutionalized among universities in the Southeastern U.S. and has now been held annually for the past 6 years (04 Ga Tech; 05 U. GA; 06 U. Alabama; 07 U. Central FL; 08 Fl. State U.; and in 09 will be a U. FL). The meeting generated tremendous positive press and feeling toward our IGERT program, resulted in numerous invitations for IGERT students and faculty to speak at other universities, and many student requests for IGERT information from undergraduate students attending the meetings. This IGERT student, not only reached out to others across disciplines and geography, but did so in such a positive way that it affected hundreds of students and faculty ? and continues to do so. Alan?s research was as impressive as his organizational skills. Following graduation from Ga Tech, he was awarded prestigious post-docs at both Michigan State and at NSF?s Center for Ecosystem Synthesis and Analysis at the Univ. of California Santa Barbara. He went to Michigan State and then on to a faculty position at Auburn University.

8) We are proud of all of all of our IGERT students, but some of our minority students have shown special achievements despite the high demands of our courses, and have been singled out by national and international groups for special awards and opportunities. As one example, Ph.D. student Elizabeth Padilla received the following recognitions or awards recently: (i) Hispanic Business Inc. recognized her with its Entrepreneur of the Year (EOY) Winner's Circle Scholarship (<http://www.ce.gatech.edu/news/237/74/Hispanic-Business-Inc-Recognizes-PhD-Student-Elizabeth-Padilla/>). This carries a monetary award that will be presented to her personally at Hispanic Business' annual Entrepreneur of the Year event at the Millennium Biltmore Hotel in Los Angeles in November 2008. (ii) In July she was selected to participate in the NSF funded workshop of Ocean Carbon and Biogeochemistry Science at WHOI. An article on this meeting is in the OCB News letter Vol. 1, No. 2 October, 2008 (http://www.us-ocb.org/publications/OCB_NEWS_OCT08.pdf). It has pictures of her and other participants in the R/V Tioga and she also wrote part of the article. (iii) She was selected by the American Society of Limnology and Oceanography Multicultural Program to attend their upcoming meeting in Nice, France and present a poster on the IGERT funded project that she initiated (ASLO pays all costs). And finally, (iv) She was awarded travel assistance from the Consortium for Ocean Leadership, through the US Science Support Program associated with the Integrated Ocean Drilling Project; to attend the 7th International Symposium for Subsurface Microbiology, in Japan in November 2008 where she will present her research.

Elizabeth?s comments after providing the above list included, ?I feel that all this couldn't have been possible if it wasn't for your guidance, and teaching when I first came here, and the IGERT initiative/training. I lived by the ocean all my life, but I feel like you and Julia really opened the realm of ocean sciences, marine interactions and microbial oceanography to me.?

Accomplishments from the International Component

Several of our IGERT students have been able to participate in International education and research efforts that would not have been available without IGERT help. This includes long-term field work (1-4 months) in Fiji (4 students), New Zealand (8 students), Panama (9 students), Spain (1 student), Australia (3 students), and shorter term efforts in Tasmania (1 student), Spain (3 students), Germany (3 students), and Greece (1 student). Descriptions of some typical examples of these activities are outlined below.

A group of 8 IGERT students conducted interdisciplinary studies on the ecological consequences of chemical signaling at the University of Auckland's Leigh Marine Lab. They collaborated among themselves (chemists, biologists, and engineers) and interacted with faculty and students there to learn a new system, design and conduct research there, and from this work are producing 2 manuscripts for publication. These manuscripts focus on susceptibility to predators and how prey can use chemically defended host organisms to hide their signals and lessen losses to consumers. General patterns for New Zealand can be compared to similar investigations done in the northern hemisphere. The students learned to innovate in new habitats, to respond to new challenges under trying field conditions, to rely on each other's disciplinary strengths to build better interdisciplinary understanding, and to work as teams both internally and with the faculty and students from Auckland. All skills that they say are strengthening their ongoing work back in the U.S.

A similar group of 8 IGERT student conducted studies on chemically-mediated competitive and consumer-prey interactions on coral reefs in Panama. The students worked in self-organized teams to address (1) how seaweeds used allelopathic metabolites to harm corals, how these interactions varied across different seaweed-coral combinations, which herbivorous fishes most readily consumed the most damaging seaweeds, and in general the role of seaweed secondary metabolites in mediating all of these interactions; (2) the role of fish chemical defenses in the evolution of color pattern and behavior of cleaner fishes in the Caribbean, (3) the roles of seaweed chemical defenses in deterring reef herbivores and how the effectiveness of these defenses varied against a wide taxonomic range of Caribbean herbivores (fishes, urchins, crabs).

Four of our present and past IGERT students have spent significant periods of time in Fiji studying aspects of chemical ecology and how insights from this field may enhance both local conservation efforts by Fijian villagers and the search for useful pharmaceuticals from marine species. These students lived in a native Fijian village, commonly met with the chief and his advisors to inform them of research plans and findings, and included villagers in their day-to-day research activities. This last activity served to both more directly involve and educate villagers and an especially effective "coconut telegraph" to keep the entire village connected with and interested in the research efforts. Activities of our IGERT students helped this village to become one of the first to stop damaging environmental practices and restore their marine environment via replanting of mangroves, cessation of "live rock" harvest from the reef and switching to culturing live rock in the lagoon (where it does not damage the reef) as an alternative income producing activity that does not involve natural resource extraction from the reef. Their first crop of "green" live rock was purchased by the new Atlanta aquarium as a demonstration of how aquariums should be moving in this direction of being "green." This was not a small purchase; it was 5 metric tonnes of cultured live rock, which is to our knowledge the largest single purchase in history. This has helped set the stage for others and to found a solid new environmentally wise industry in Fiji. Faculty and students at Georgia Tech are continuing (via non-IGERT funding) to work with the Fijian Fishers Dept., local village leaders, and the major live rock exporters in Fiji to move from wild-harvest to cultured "green" live rock. Present plans look like all harvest of native live rock will stop within the next 3-5 years and that the villager's income from wild harvest can be more than replaced by cultured live rock. Thus, preserving the reefs, the livelihood of the villagers, and the cultural values and activities of the villages.

IGERT student Doug Rasher has lived in Votua village in Fiji for several months this year. Has focused his research on determining the effects of seaweed-coral competition on coral health, on the role of allelopathic metabolites in controlling these interactions, on which reef herbivores can best control the abundance of the most aggressive seaweeds, and on informing the villagers of these critically important herbivores in hopes that they will choose to modify their fishing practices so as to minimize harvest of crucial species and thus use the reef in a sustainable manner. To date, this seems to be working well. Villagers have an established Marine Protected Area where herbivory is higher, detrimental seaweeds are rare, and corals are in high abundance relative to nearby areas that are fished. The villagers are also enthusiastic about learning more regarding critical fish species and are especially excited by the films Doug shows them of the species-specific feeding patterns of different reef fishes. This has been a significant scientific, cultural, and social experience for both Doug and the villagers and appears to be producing valuable outcomes for all participants. The data collected by Doug in Fiji will be compared to similar data he collected in Panama (see above) ? thus allowing contrasts between ocean basins with different histories, levels of species diversity, etc.

Working and living in the Fijian village of Tagaqe for two months, IGERT students Amy Lane and Sara Edge discovered new compounds, new allelopathic activities of seaweed metabolites, and new methods for assessing molecular responses to biotic stresses in corals. Their manuscripts are published and being prepared for publication, and both received prestigious post-doc offers before completing their degrees (Amy is at Scripps Inst. of Oceanography; Sara is at Harbor Branch Inst. of Oceanography).

Kim Catton traveled to Tasmania to conduct comparative research on krill schooling and the physical properties affecting this phenomena. Kim's research on the fluid mechanics of schooling in krill is producing two publications and has opened a new collaboration between the lab she worked with in Tasmania and her

major professor's lab at Ga Tech.

IGERT Project Personnel and Trainees

Principal Investigator(s)

Name: Mark Hay

Project Years Active: 2001-2002, 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009

Co-Principal Investigator(s) or Trainee/Associate Advisor(s)

Name: Charles Derby

Project Years Active: 2002-2003, 2003-2004, 2004-2005

Role in Project: Trainee/Associate Advisor

Name: Donald Doyle

Project Years Active: 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007

Role in Project: Trainee/Associate Advisor

Name: Ching-Hua Huang

Project Years Active: 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007

Role in Project: Trainee/Associate Advisor

Name: Jiri Janata

Project Years Active: 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009

Role in Project: Trainee/Associate Advisor

Name: Adam Jones

Project Years Active: 2002-2003

Role in Project: Trainee/Associate Advisor

Name: John Kirby

Project Years Active: 2002-2003, 2003-2004, 2004-2005, 2005-2006

Role in Project: Trainee/Associate Advisor

Name: Chris Klausmeier

Project Years Active: 2004-2005

Role in Project: Trainee/Associate Advisor

Name: Julia Kubanek

Project Years Active: 2001-2002, 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009

Role in Project: Co-PI and Trainee/Associate Advisor

Name: Frank Loeffler

Project Years Active: 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009

Role in Project: Trainee/Associate Advisor

Name: Nael McCarty

Project Years Active: 2004-2005, 2005-2006, 2007-2008

Role in Project: Trainee/Associate Advisor

Name: Boris Mizaikoff

Project Years Active: 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007

Role in Project: Trainee/Associate Advisor

Name: Joseph Montoya

Project Years Active: 2001-2002, 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009

Role in Project: Trainee/Associate Advisor

Name: Terry Snell

Project Years Active: 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009

Role in Project: Trainee/Associate Advisor

Name: Patricia A. Sobecky

Project Years Active: 2001-2002, 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009

Role in Project: Co-PI and Trainee/Associate Advisor

Name: Peter G. Verity
Project Years Active: 2001-2002, 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009
Role in Project: Co-PI

Name: Donald R. Webster
Project Years Active: 2001-2002, 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2008-2009
Role in Project: Co-PI and Trainee/Associate Advisor

Name: Marc Weissburg
Project Years Active: 2001-2002, 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2008-2009
Role in Project: Trainee/Associate Advisor

Name: Jeannette Yen
Project Years Active: 2001-2002, 2002-2003, 2003-2004, 2005-2006, 2006-2007, 2008-2009
Role in Project: Trainee/Associate Advisor

Trainees

Name: Ruth Armour
Total number of months funded: 21*
Project Years Active:
2005-2006 Project Year - Trainee supported for 12 months
2006-2007 Project Year - Trainee supported for 12 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Name: William A. Berry
Total number of months funded: 15
Project Years Active:
2007-2008 Project Year - Trainee supported for 12 months
2008-2009 Project Year - Trainee supported for 3 months

Name: Deron Burkepile
Total number of months funded: 10
Project Years Active:
2001-2002 Project Year - Trainee supported for 0 months
2002-2003 Project Year - Trainee supported for 0 months
2003-2004 Project Year - Trainee supported for 0 months
2004-2005 Project Year - Trainee supported for 0 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 10 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months
Date Ph.D. Received: 05/2006

Name: Ryan S. Cantor
Total number of months funded: 21
Project Years Active:
2002-2003 Project Year - Trainee supported for 6 months
2003-2004 Project Year - Trainee supported for 10 months
2004-2005 Project Year - Trainee supported for 5 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Name: Kimberly B. Catton
Total number of months funded: 38
Project Years Active:
2004-2005 Project Year - Trainee supported for 12 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 12 months
2007-2008 Project Year - Trainee supported for 12 months
2008-2009 Project Year - Trainee supported for 2 months

Name: Sarah K. Delavan
Total number of months funded: 25*
Project Years Active:
2005-2006 Project Year - Trainee supported for 12 months
2006-2007 Project Year - Trainee supported for 12 months

2007-2008 Project Year - Trainee supported for 2 months
2008-2009 Project Year - Trainee supported for 2 months

Name: Gary T. Dobbs

Total number of months funded: 32

Project Years Active:

2002-2003 Project Year - Trainee supported for 10 months
2003-2004 Project Year - Trainee supported for 10 months
2004-2005 Project Year - Trainee supported for 0 months
2005-2006 Project Year - Trainee supported for 12 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Name: Sara E. Edge

Total number of months funded: 20

Project Years Active:

2002-2003 Project Year - Trainee supported for 6 months
2003-2004 Project Year - Trainee supported for 10 months
2004-2005 Project Year - Trainee supported for 0 months
2005-2006 Project Year - Trainee supported for 4 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Name: Matt Ferner

Total number of months funded: 35

Project Years Active:

2001-2002 Project Year - Trainee supported for 8 months
2002-2003 Project Year - Trainee supported for 10 months
2003-2004 Project Year - Trainee supported for 5 months
2004-2005 Project Year - Trainee supported for 8 months
2005-2006 Project Year - Trainee supported for 4 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Date Ph.D. Received: 03/2006

Name: Kelly E. Fletcher

Total number of months funded: 26

Project Years Active:

2004-2005 Project Year - Trainee supported for 12 months
2005-2006 Project Year - Trainee supported for 12 months
2006-2007 Project Year - Trainee supported for 2 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Name: Keri M. Goodman

Total number of months funded: 15

Project Years Active:

2007-2008 Project Year - Trainee supported for 12 months
2008-2009 Project Year - Trainee supported for 3 months

Name: Zachary P. Hallinan

Total number of months funded: 36

Project Years Active:

2002-2003 Project Year - Trainee supported for 10 months
2003-2004 Project Year - Trainee supported for 10 months
2004-2005 Project Year - Trainee supported for 4 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 12 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Date left the IGERT project: 05/2005

Left IGERT with a terminal master's degree: No

Reason for stopping the pursuit of the Ph.D.:

Name: Tracy H. Hazen

Total number of months funded: 28

Project Years Active:

2004-2005 Project Year - Trainee supported for 12 months
2005-2006 Project Year - Trainee supported for 12 months
2006-2007 Project Year - Trainee supported for 2 months
2007-2008 Project Year - Trainee supported for 0 months

2008-2009 Project Year - Trainee supported for 2 months

Name: Jennifer M. Hill

Total number of months funded: 25*

Project Years Active:

2005-2006 Project Year - Trainee supported for 12 months

2006-2007 Project Year - Trainee supported for 12 months

2007-2008 Project Year - Trainee supported for 2 months

2008-2009 Project Year - Trainee supported for 2 months

Name: Carolyn M. Holl

Total number of months funded: 6

Project Years Active:

2001-2002 Project Year - Trainee supported for 6 months

2002-2003 Project Year - Trainee supported for 0 months

2003-2004 Project Year - Trainee supported for 0 months

2004-2005 Project Year - Trainee supported for 0 months

2005-2006 Project Year - Trainee supported for 0 months

2006-2007 Project Year - Trainee supported for 0 months

2007-2008 Project Year - Trainee supported for 0 months

2008-2009 Project Year - Trainee supported for 0 months

Date Ph.D. Received: 04/2005

Name: Amy J. Horner

Total number of months funded: 6

Project Years Active:

2003-2004 Project Year - Trainee supported for 6 months

2004-2005 Project Year - Trainee supported for 0 months

2005-2006 Project Year - Trainee supported for 0 months

2006-2007 Project Year - Trainee supported for 0 months

2007-2008 Project Year - Trainee supported for 0 months

2008-2009 Project Year - Trainee supported for 0 months

Date Ph.D. Received: 12/2005

Name: Jennifer L. Jackson

Total number of months funded: 26

Project Years Active:

2004-2005 Project Year - Trainee supported for 12 months

2005-2006 Project Year - Trainee supported for 0 months

2006-2007 Project Year - Trainee supported for 0 months

2007-2008 Project Year - Trainee supported for 12 months

2008-2009 Project Year - Trainee supported for 2 months

Name: Ejae John

Total number of months funded: 10

Project Years Active:

2002-2003 Project Year - Trainee supported for 10 months

2003-2004 Project Year - Trainee supported for 0 months

2004-2005 Project Year - Trainee supported for 0 months

2005-2006 Project Year - Trainee supported for 0 months

2006-2007 Project Year - Trainee supported for 0 months

2007-2008 Project Year - Trainee supported for 0 months

2008-2009 Project Year - Trainee supported for 0 months

Date left the IGERT project: 08/2004

Left IGERT with a terminal master's degree: No

Reason for stopping the pursuit of the Ph.D.:

Name: Shandra Justicia-Leon

Total number of months funded: 15

Project Years Active:

2007-2008 Project Year - Trainee supported for 12 months

2008-2009 Project Year - Trainee supported for 3 months

Name: Cynthia E. Kicklighter

Total number of months funded: 6

Project Years Active:

2002-2003 Project Year - Trainee supported for 6 months

2003-2004 Project Year - Trainee supported for 0 months

2004-2005 Project Year - Trainee supported for 0 months

2005-2006 Project Year - Trainee supported for 0 months

2006-2007 Project Year - Trainee supported for 0 months

2007-2008 Project Year - Trainee supported for 0 months

2008-2009 Project Year - Trainee supported for 0 months

Date Ph.D. Received: 08/2003

Name: Jason P. Landrum

Total number of months funded: 22

Project Years Active:

2002-2003 Project Year - Trainee supported for 10 months
2003-2004 Project Year - Trainee supported for 10 months
2004-2005 Project Year - Trainee supported for 0 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 2 months

Name: Amy L. Lane

Total number of months funded: 33

Project Years Active:

2004-2005 Project Year - Trainee supported for 6 months
2005-2006 Project Year - Trainee supported for 12 months
2006-2007 Project Year - Trainee supported for 6 months
2007-2008 Project Year - Trainee supported for 9 months
2008-2009 Project Year - Trainee supported for 0 months

Name: Rachel S. Lasley

Total number of months funded: 25*

Project Years Active:

2005-2006 Project Year - Trainee supported for 12 months
2006-2007 Project Year - Trainee supported for 12 months
2007-2008 Project Year - Trainee supported for 2 months
2008-2009 Project Year - Trainee supported for 2 months

Name: Liliana Lettieri

Total number of months funded: 28

Project Years Active:

2004-2005 Project Year - Trainee supported for 9 months
2005-2006 Project Year - Trainee supported for 12 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 5 months
2008-2009 Project Year - Trainee supported for 2 months

Name: Zachary Marion H. Marion

Total number of months funded: 15

Project Years Active:

2007-2008 Project Year - Trainee supported for 12 months
2008-2009 Project Year - Trainee supported for 3 months

Name: Heath J. Mills

Total number of months funded: 6

Project Years Active:

2001-2002 Project Year - Trainee supported for 6 months
2002-2003 Project Year - Trainee supported for 0 months
2003-2004 Project Year - Trainee supported for 0 months
2004-2005 Project Year - Trainee supported for 0 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Date Ph.D. Received: 07/2004

Name: Kenyon B. Mobley

Total number of months funded: 7

Project Years Active:

2001-2002 Project Year - Trainee supported for 7 months
2002-2003 Project Year - Trainee supported for 0 months
2003-2004 Project Year - Trainee supported for 0 months
2004-2005 Project Year - Trainee supported for 0 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Date left the IGERT project: 07/2004

Left IGERT with a terminal master's degree: No

Reason for stopping the pursuit of the Ph.D.:

Name: Wendy E. Morrison

Total number of months funded: 21

Project Years Active:

2004-2005 Project Year - Trainee supported for 12 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 5 months
2007-2008 Project Year - Trainee supported for 2 months
2008-2009 Project Year - Trainee supported for 2 months

Name: Elizabeth Padilla

Total number of months funded: 24*

Project Years Active:

2005-2006 Project Year - Trainee supported for 12 months
2006-2007 Project Year - Trainee supported for 12 months
2007-2008 Project Year - Trainee supported for 3 months
2008-2009 Project Year - Trainee supported for 0 months

Name: Staci A. Padove

Total number of months funded: 26

Project Years Active:

2004-2005 Project Year - Trainee supported for 12 months
2005-2006 Project Year - Trainee supported for 12 months
2006-2007 Project Year - Trainee supported for 2 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Name: John D. Parker

Total number of months funded: 29

Project Years Active:

2001-2002 Project Year - Trainee supported for 8 months
2002-2003 Project Year - Trainee supported for 4 months
2003-2004 Project Year - Trainee supported for 10 months
2004-2005 Project Year - Trainee supported for 2 months
2005-2006 Project Year - Trainee supported for 5 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Date Ph.D. Received: 12/2006

Name: Katie Parson

Total number of months funded: 4

Project Years Active:

2001-2002 Project Year - Trainee supported for 4 months
2002-2003 Project Year - Trainee supported for 0 months
2003-2004 Project Year - Trainee supported for 0 months
2004-2005 Project Year - Trainee supported for 0 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Date left the IGERT project: 05/2002

Left IGERT with a terminal master's degree: No

Reason for stopping the pursuit of the Ph.D.:

Name: Daniel Pisut

Total number of months funded: 14

Project Years Active:

2001-2002 Project Year - Trainee supported for 4 months
2002-2003 Project Year - Trainee supported for 10 months
2003-2004 Project Year - Trainee supported for 0 months
2004-2005 Project Year - Trainee supported for 0 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Date left the IGERT project: 05/2003

Left IGERT with a terminal master's degree: Yes

Reason for stopping the pursuit of the Ph.D.:

Name: Kelsey Poulson

Total number of months funded: 15

Project Years Active:

2007-2008 Project Year - Trainee supported for 12 months
2008-2009 Project Year - Trainee supported for 3 months

Name: Emily K. Prince

Total number of months funded: 27

Project Years Active:

2002-2003 Project Year - Trainee supported for 10 months
2003-2004 Project Year - Trainee supported for 4 months
2004-2005 Project Year - Trainee supported for 4 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 4 months
2007-2008 Project Year - Trainee supported for 5 months
2008-2009 Project Year - Trainee supported for 0 months

Name: Anne C. Prusak

Total number of months funded: 16

Project Years Active:

2001-2002 Project Year - Trainee supported for 8 months
2002-2003 Project Year - Trainee supported for 4 months
2003-2004 Project Year - Trainee supported for 4 months
2004-2005 Project Year - Trainee supported for 0 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Date left the IGERT project: 01/2004

Left IGERT with a terminal master's degree: Yes

Reason for stopping the pursuit of the Ph.D.:

Name: Douglas B. Rasher

Total number of months funded: 15

Project Years Active:

2007-2008 Project Year - Trainee supported for 12 months
2008-2009 Project Year - Trainee supported for 3 months

Name: Douglas A. Rudolph

Total number of months funded: 20

Project Years Active:

2002-2003 Project Year - Trainee supported for 10 months
2003-2004 Project Year - Trainee supported for 10 months
2004-2005 Project Year - Trainee supported for 0 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Date left the IGERT project: 01/2005

Left IGERT with a terminal master's degree: No

Reason for stopping the pursuit of the Ph.D.:

Name: Amisha D. Shah

Total number of months funded: 10

Project Years Active:

2002-2003 Project Year - Trainee supported for 10 months
2003-2004 Project Year - Trainee supported for 0 months
2004-2005 Project Year - Trainee supported for 0 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Name: Stacy M. Shinneman

Total number of months funded: 12

Project Years Active:

2004-2005 Project Year - Trainee supported for 12 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Date left the IGERT project: 09/2006

Left IGERT with a terminal master's degree: No

Reason for stopping the pursuit of the Ph.D.:

Name: Drew Sieg

Total number of months funded: 15

Project Years Active:

2007-2008 Project Year - Trainee supported for 12 months
2008-2009 Project Year - Trainee supported for 3 months

Name: Delbert L. Smee

Total number of months funded: 27

Project Years Active:

2001-2002 Project Year - Trainee supported for 7 months
2002-2003 Project Year - Trainee supported for 0 months
2003-2004 Project Year - Trainee supported for 4 months
2004-2005 Project Year - Trainee supported for 7 months
2005-2006 Project Year - Trainee supported for 9 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Date Ph.D. Received: 05/2006

Name: Hilary A. Smith

Total number of months funded: 15

Project Years Active:

2007-2008 Project Year - Trainee supported for 12 months
2008-2009 Project Year - Trainee supported for 3 months

Name: Sara H. Thomas

Total number of months funded: 22

Project Years Active:

2002-2003 Project Year - Trainee supported for 10 months
2003-2004 Project Year - Trainee supported for 0 months
2004-2005 Project Year - Trainee supported for 12 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Name: Terry J. Watt

Total number of months funded: 20

Project Years Active:

2002-2003 Project Year - Trainee supported for 10 months
2003-2004 Project Year - Trainee supported for 10 months
2004-2005 Project Year - Trainee supported for 0 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Name: Miranda Watts

Total number of months funded: 25*

Project Years Active:

2005-2006 Project Year - Trainee supported for 12 months
2006-2007 Project Year - Trainee supported for 12 months
2007-2008 Project Year - Trainee supported for 2 months
2008-2009 Project Year - Trainee supported for 2 months

Name: Alan E. Wilson

Total number of months funded: 7

Project Years Active:

2001-2002 Project Year - Trainee supported for 7 months
2002-2003 Project Year - Trainee supported for 0 months
2003-2004 Project Year - Trainee supported for 0 months
2004-2005 Project Year - Trainee supported for 0 months
2005-2006 Project Year - Trainee supported for 0 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Date Ph.D. Received: 03/2006

Name: Clifton B. Woodson

Total number of months funded: 33

Project Years Active:

2001-2002 Project Year - Trainee supported for 7 months
2002-2003 Project Year - Trainee supported for 0 months
2003-2004 Project Year - Trainee supported for 9 months
2004-2005 Project Year - Trainee supported for 12 months
2005-2006 Project Year - Trainee supported for 5 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Date Ph.D. Received: 12/2006

* The total number of months funded has been adjusted to account for the change in reporting period that happened in the 2006-2007 project year. Due to the changes in the reporting period there was a 3 month overlap between the 2005-2006 and 2006-2007 project years.

Associates

Name: Yin Chang

Project Years Active: 2001-2002, 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009

Publications, Presentations, and Patents

Journal Articles in Non-Refereed Publications

*Burkepile, Deron and Hay, Mark. (2006) Ecosystems: Coral Reefs, Encyclopedia of Ecology, in press(in press), in press.

Journal Articles in Refereed Publications

Long, Jeremy and Hay, Mark. (2006) When intraspecific exceeds interspecific variance: effects of phytoplankton morphology and growth phase on copepod feeding and fitness, *Limnology and Oceanography*, 51(2), 988-996.

*Parker, John D.; *Burkepile, Deron; and Hay, Mark. (2006) opposing effects of native and exotic herbivores on plant invasions, *Science*, 311(5766), 1459-1461.

*Prince, Emily K.; *Lettieri, Liliana; McCurdy, K. J.; and Kubanek, Julia. (2006) Fitness consequences of copepod feeding on a red tide dinoflagellate, *Oecologia*, 147(3), 479-488.

Long, Jeremy and Hay, Mark. (2006) fishes learn aversion to nudibranch chemical defenses, *Marine Ecology Progress Series*, 307, 199-208.

*Edge, Sara E.; Morgan, Steve; Gleason, Danny; and Snell, Terry. (2005) Development of a coral DNA array to examine gene expression profiles in *Montastrea* exposed to environmental stress, *Marine Pollution Bulletin*, 51(5-7), 507-523.

Morgan, Steve; *Edge, Sara E.; and Snell, Terry. (2005) Profiling differential gene expression of corals along a transect of waters adjacent to the Bermuda municipal dump, *Marine Pollution Bulletin*, 51, 524-533.

Kubanek, Julia; *Prusak, Anne C.; Snell, Terry; Giese, R. A.; Hardcastle, K.; Fairchild, Craig; Aalbersberg, William; Santos-Suarez, C.; and Hay, Mark. (2005) Antineoplastic diterpene-benzoate macrolides from the Fijian red alga *Callophycus serratus*, *Organic Letters*, 7(23), 5261-5264.

*Wilson, Alan E.; Sarnelle, A. E.; Neilan, B. A.; Salmon, T. P.; Gehringer, M. M.; and Hay, Mark. (2005) genetic variation of the bloom forming cyanobacterium *Microcystis aeruginosa* within and among lakes: Implications for harmful algal blooms, *Applied and Environmental Microbiology*, 71(10), 6126-6133.

*Woodson, Clifton B.; Webster, Donald R.; Weissburg, Marc; and Yen, Jeannette. (2005) Response of copepods to physical gradients associated with structure in the ocean, *Limnology and Oceanography*, 50(5), 1552-1564.

*Parker, John D. and Hay, Mark. (2005) Biotic Resistance to plant invasions? Native herbivores prefer non-native plants, *Ecology Letters*, 8(9), 959-967.

*Prusak, Anne C.; O'Neal, A. C.; and Kubanek, Julia. (2005) Prevalence of chemical defenses among freshwater plants, *Journal of Chemical Ecology*, 31(5), 1145-1160.

*Mills, Heath J.; Martinez, R. J.; Story, S.; and Sobecky, Patricia A. (2005) Characterization of microbial community structure in the Gulf of Mexico gas Hydrates: Comparative analysis of DNA- and RNA-derived clone libraries, *Applied and Environmental Microbiology*, 71(6), 3235-3247.

Kubanek, Julia; Hicks, M. K.; Naar, J.; and Villareal, T. A. (2005) Does the red tide dinoflagellate *Karenia brevis* use allelopathy to outcompete other phytoplankton?, *Limnology*

and Oceanography, 50(3), 883-895.

Barsby, T and Kubanek, Julia. (2005) Isolation and structural elucidation of the feeding deterrent diterpenoids from the sea pansy, *Renilla reniformis*, J. Nat. products, 68(4), 511-516.

*Ferner, Matt and Weissburg, Marc. (2005) Slow-moving predatory gastropods track prey odors in fast and turbulent flow, J. Exp. Biol, 208(5), 809-819.

*Kicklighter, Cynthia E. and Hay, Mark. (2006) To avoid or deter: Interactions among defensive and escape strategies in sabellid worms., *Oecologia*, in press, unknown.

*Burkepile, Deron; *Parker, John D.; *Woodson, Clifton B.; *Mills, Heath J.; Kubanek, Julia; Sobecky, Patricia A.; and Hay, Mark. (2006) Chemically-mediated competition between microbes and animals: microbes as consumers in food webs., *Ecology*, in press, in press.

*Burkepile, Deron and Hay, Mark. (2006) Herbivore versus nutrient control of marine primary producers: Context-dependent effects, *Ecology*, in press(in press), in press.

*Parker, John D.; Collins, D; Kubanek, Julia; Sullards, M; Bostwick, D; and Hay, Mark. (2006) Chemical defenses promote persistence of the aquatic plant *Micranthemum umbrosum*, J. chemical Ecology, in press(in press), in press.

*Kicklighter, Cynthia E. and Hay, Mark. (2006) Defenses of mobile marine invertebrates are integrated with life-style, mobility, and distribution, *Ecological Monographs*, 76, 195-215.

*Lane, Amy L. and Kubanek, Julia. (2006) Structure-activity relationship of chemical defenses from the freshwater plant *Micranthemum umbrosum*., *Phytochemistry*, in press, in press.

Dodd, M C.; *Shah, Amisha D.; von Guten, U; and Huang, Ching-Hua. (2005) Interactions of Fluoroquinolone Antibacterial Agents with Aqueous Chlorine: Reaction Kinetics, Mechanisms, and Transformation Pathways, *Environmental Science and Technology*, 39, 7065-7066.

*Watt, Terry J. and Doyle, Donald. (2005) ESPSearch: A Program for Finding Exact Sequences and Patterns in DNA, RNA, or Protein, *Biotechniques*, 38, 109-215.

*Dobbs, Gary T. and Mizaikoff, Boris. (2006) Shining New Light at Old Principles: Localization of Evanescent Field Interactions at IR-ATR Sensing Interfaces, *Applied Spectroscopy*, in press, in press.

Sung, Y; *Fletcher, Kelly E.; and Loeffler, Frank. (2006) *Geobacter lovleyi* sp. nov. Strain SZ, a Novel Metal-Reducing and Tetrachloroethene-Degrading Bacterium, *Applied and Environmental Microbiology*, 72, 2775-27.

*Smee, Delbert L. and Weissburg, Marc. (2006) Clamming up: environmental forces diminish, *Ecology*, in press, in press.

*Smee, Delbert L. and Weissburg, Marc. (2006) Hard clams (*Mercenaria mercenaria*) evaluate predation risk using chemical signals from predators and injured conspecifics, *Journal of Chemical Ecology*, 32, 605-619.

*Ferner, Matt; *Smee, Delbert L.; and Chang, Yin. (2006) Cannibalistic crabs respond to the scent of injured conspecifics: Danger or Dinner?, *Marine Ecology Progress Series*, 30, 193-200.

*Burkepile, Deron and Hay, Mark. (2007) Ecosystems: Coral Reefs, In *Encyclopedia of Ecology*. Editor S.E. Jorgensen, Elsevier Press, Oxford, England, ---, in press.

*Burkepile, Deron and Hay, Mark. (2007) Predator release of the gastropod *Cyphoma gibbosum* increases predation on gorgonian corals, *Oecologia*, ---, in press.

*Holl, Carolyn M.; Villareal, T A.; Payne, c d.; Clayton, t d.; Hart, c; and Montoya, Joseph. (2007) Stable isotopic evidence for *Trichodesmium* N₂-fixation: Implications for nitrogen and carbon cycling in the Gulf of Mexico., *Limnology and Oceanography*, in press(---), ---.

*Holl, Carolyn M.; Waite, a m.; Pesant, s; Thompson, p; and Montoya, Joseph. (2007) Unicellular diazotrophy as a source of nitrogen to Leeuwin Current Coastal Eddies., *Deep-Sea Research*, in press(---), ---.

*Page, Jennifer L.; Rahman, s; Webster, Donald R.; and Weissburg, Marc. (2007) Behavioral ramifications of bed roughness effects on boundary layer turbulence: a case study of the odor tracking behavior of blue crabs (*Callinectes sapidus*)., *Limnology and Oceanography*, in press(---), ---.

*Lane, Amy L. and Kubanek, Julia. (2007) Secondary metabolite defenses against pathogens and biofoulers, *Algal Chemical Ecology* (peer-reviewed book edited by C. Amsler)., in press(---), ----.

Waite, a m.; *Holl, Carolyn M.; Montoya, Joseph; Thompson, p; Pesant, s; Beckley, l; Muhling, b; and Strezelecki, j. (2007) Food web structure in two counter-rotating eddies based on d15N and d13C isotopic analyses, *Deep Sea Research II*, in press(----), ----.

Sanford, r a.; Wu, q; Sung, Y; *Thomas, Sara H.; and *Prince, Emily K. (2007) Hexavalent Uranium Supports Growth of *Anaeromyxobacter dehalogenans* and *Geobacter* spp. With Lower than Predicted Biomass Yields, *Environmental Microbiology*, in press(---), ----.

*Cantor, Ryan S.; Webster, Donald R.; Brown, J; and Yen, Jeannette. (2007) Quantitative analysis of tethered and free-swimming copepodid flow fields., *Journal of Experimental Biology*, 210, 299-310..

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Long, Jeremy; Smalley, g w.; Barsby, T; Anderson, j t.; and Hay, Mark. (2007) Chemical cues induce consumer-specific defenses in a bloom-forming marine phytoplankton, *Proceedings National Academy of Sciences USA*, 104, 10512-10517.

*Parker, John D.; *Burkepile, Deron; Collins, D; Kubanek, Julia; and Hay, Mark. (2007) Mosses as chemically-defended refugia for freshwater macroinvertebrates., *Oikos*, 116(--), 302- 312.

*Parker, John D.; Caudill, c c.; and Hay, Mark. (2007) Beaver herbivory on aquatic plants, *Oecologia*, 151, :616-625.

*Wilson, Alan E. and Hay, Mark. (2007) A direct test of cyanobacterial chemical defense: Variable effects of microcystin-treated food on two *Daphnia pulex* clones, *Limnology and Oceanography*, 52, 1467-1479.

*Woodson, Clifton B.; Webster, Donald R.; Weissburg, Marc; and Yen, Jeannette. (2007) Environmental gradients elicit behavioral responses in the calanoid copepod, *Temora longicornis*: Ecological implications of oceanographic structure., *Marine Ecology Progress Series*, 330, 163-177.

*Burkepile, Deron; *Parker, John D.; *Woodson, Clifton B.; *Mills, Heath J.; Kubanek, Julia; Sobecky, Patricia A.; and Hay, Mark. (2006) Chemically-mediated competition between microbes and animals: microbes as consumers in food webs, *Ecology*, 87, 2821-2831.

*Horner, Amy J.; Nickles, s s.; Weissburg, Marc; and Derby, Charles. (2006) Source and specificity of chemical cues mediating shelter preference of Caribbean spiny lobsters, *Biological Bulletin*, 211, 128-139.

*Kicklighter, Cynthia E. and Hay, Mark. (2006) Defenses of mobile marine invertebrates are integrated with life-style, mobility, and distribution., *Ecological Monographs*, 76, 195-215.

Kubanek, Julia; *Prusak, Anne C.; Snell, Terry; Giese, r a.; Fairchild, Craig; Aalbersberg, William; and Hay, Mark. (2006) *Bromophycolides C-I* from the Fijian red alga *Callophycus serratus*., *Journal of Natural Products*, 69, 731-735.

Long, Jeremy and Hay, Mark. (2006) When intraspecific exceeds interspecific variance: Effects of phytoplankton morphology and growth phase on copepod feeding and fitness., *Limnology and Oceanography*, 51, 988-996.

Long, Jeremy and Hay, Mark. (2006) Nudibranch chemical defense creates learned aversions in fishes., *Marine Ecology Progress Series*, 307, 199-208.

*Parker, John D.; *Burkepile, Deron; and Hay, Mark. (2006) Response to comment on "Opposing effects of native and exotic herbivores on plant invasions.", *Science*, 313, 298.

*Parker, John D.; *Burkepile, Deron; and Hay, Mark. (2006) Opposing effects of native vs. exotic herbivores on plant invasions., *Science*, 311, 1459-1461.

*Parker, John D.; Collins, D; Kubanek, Julia; Sullards, M; Bostwick, D; and Hay, Mark. (2006) Chemical defenses promote persistence of the aquatic plant *Micranthemum umbrosum*., *Journal of Chemical Ecology*, 32, 815-833.

*Prince, Emily K.; *Lettieri, Liliana; McCurdy, K J.; and Kubanek, Julia. (2006) Fitness consequences for copepods feeding on a red tide dinoflagellate: deciphering the effects of nutritional value, toxicity, and feeding behavior., *Oecologia*, 147, 479-488.

*Smee, Delbert L. and Weissburg, Marc. (2006) Clamming up: Environmental forces diminish the perceptive ability of bivalve prey., *Ecology*, 87, 1587-1598.

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*Rachel Lasley presented a talk titled, The Causes and Consequences of Fertilization Limitation in Marine Copepods at the ASLO conference in Orlando, FL in March 2008.

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*Cantor, R.; Weissburg, M.; Janata, J.. "Extracting Chemical Information from Turbulent Plumes" GT/GTRI Workshop on Underwater Sensors Networks Atlanta, GA, June 2007

*Miranda Watts, "Ramifications of covering behavior in a New Zealand sea urchin, *Evechinus chloroticus*" Benthic Ecology Meeting, 2007.

*Miranda Watts, "Habitat structure: Mediation of predator-prey interactions by oyster reefs in a salt marsh community" Benthic Ecology Meeting, 2008.

*Elizabeth Padilla 2007 American Geophysical Union Meeting (AGU). Dec. 14, 2007 San Francisco, CA. Presentation entitled: MINORITY RETENTION AND SUCCESS THROUGH PROFESSIONAL DEVELOPMENT INITIATIVES.

*Elizabeth Padilla 2006 SACNAS (Society for Advancement of Chicano/Latinos and Native Americans in Science) National Conference Oct. 2006 Tampa, FL. Presentation entitled: CHARACTERIZATION OF THE MICROBIAL COMMUNITIES IN MIXED WASTE SITE SEDIMENTS

*Lane AL, Kubanek J. (2008) Invited oral poster. Antifungal chemical defenses of the Fijian red alga *Callophycus serratus*. Gordon Conference on Marine Natural Products. Ventura, CA.

*Lane AL; *Edge S; Snell T; Kubanek J. (2007) Chemical mechanisms of coral-algal competition. Poster. Benthic Ecology Meeting. Atlanta, Georgia.

*Lane AL; Kubanek J. (2006) Novel diterpene benzoates from the Fijian Red Alga *Callophycus serratus*. Poster. ACS National Meeting. Atlanta, Georgia.

*Lane AL; Kubanek J. (2006) Novel diterpene benzoates from the Fijian Red Alga *Callophycus serratus*. Poster. Gordon Conference on Marine Natural Products. Ventura, California.

*Lane AL; Kubanek J. (2005) Structure-activity relationship of chemical defenses from the freshwater plant *Micranthemum umbrosum*. Poster. Nations Symposium on Analytical, Biochemical, and Biological Sensors in the Ocean. Atlanta, Georgia.

*K.B. Catton, D.R. Webster and J.Yen. Can krill mix the ocean? ASLO 2008 Ocean Sciences Meeting, Orlando, FL March 2008.

*K.B. Catton, D.R. Webster, and J.Yen. Comparison of the hydrodynamic wakes of temperate and tropical Euchaeta species Society of Integrative and Comparative Biology Meeting, San Antonio, TX, January 2008.

*K.B. Catton, D.R. Webster and J. Yen. Biologically-generated Turbulence by Two Krill Species American Physics Society DFD 07 Meeting, Salt Lake City, November 2007.

*K.B. Catton, D.R. Webster, J. Brown, and J. Yen, Quantification of the Hydrodynamic Wake of Swimming *Euphausia pacifica* and *Euphausia superba*, ASLO 2007 Aquatic Sciences Meeting, Santa Fe, NM, February 2007.

*Hazen, T. H. Characterization of *Vibrio* Plasmid Diversity: Insights into *Vibrio* HGT. Central South University, Changsha, China, December 18, 2007.

*Hazen, T. H. Characterization of *Vibrio* Plasmid Diversity: Insights into *Vibrio* HGT. Chinese Microbial Ecology Society Annual Meeting, XinXian, China, December 16, 2007.

*Hazen, T. H. Characterization of *Vibrio* parahaemolyticus natural mutator strains and the role of *mutS* for mutator phenotypes. 60th Annual Southeast Branch ASM Regional meeting, Auburn University, Auburn, AL, November 9, 2007.

*Hazen, T. H., Chen, S., & Sobecky, P. A. The role of inactivation of mismatch repair and quorum-sensing for survival of *Vibrio* parahaemolyticus. 12th Annual International Society for Microbial Ecology Meeting, Cairns, Australia. August 17-22, 2008.

*Hazen, T. H., Silberger, D. J., Chen, S., Parsons, M., Bopp, C. A., & Sobecky, P. A. Role of *Vibrio* parahaemolyticus plasmids in horizontal transfer of genomic island genes. 108th Annual American Society for Microbiology meeting, Boston, MA. June 1-5, 2008.

*Hazen, T. H., Kennedy, K. D., Criminger, J. D., Bopp, C. A., Lovell, C. R., & Sobecky, P. A. Role of *mutS* for mutator phenotypes of *Vibrio* parahaemolyticus. 107th Annual American Society for Microbiology meeting, Toronto, Canada, May 2007.

*Prince EK, Myers TM, Naar J, Kubanek J (2007) Chemically mediated competition: Interactions between the red tide dinoflagellate, *Karenia brevis*, and co-occurring phytoplankton. Oral presentation. 4th Symposium on Harmful Algal Blooms in the United States. Woods Hole. Massachusetts.

*Prince EK, Myers TM, Naar J, Kubanek J (2007) Chemical communication in the plankton: complex interactions involving the red tide dinoflagellate, *Karenia brevis*. Poster presentation. International Society of Chemical Ecology. Jena, Germany.

*Prince EK, Kubanek J (2007) How do allelopathic compounds produced by the red tide dinoflagellate, *Karenia brevis*, affect the physiology of competing phytoplankton? Poster presentation. Benthic Ecology Meeting, Atlanta, Georgia, USA.

*Prince EK, Myers TL, Naar J, Kubanek J. (2007) Competing phytoplankton undermine allelopathy of *Karenia brevis*, the red tide dinoflagellate. Oral Presentation. American Society of Limnology and Oceanography, Santa Fe, New Mexico, USA

*Ferner M., *D.L. Smee. 2007. Ecological Society of America Annual Meeting, San Jose, California. Alteration of sensory abilities regulates the scale of nonlethal predator effects

*Jackson, JL, BD Dickman, DR Webster, and MJ Weissburg, Real-time turbulent odor plume quantification: II. Correlation to specialized behaviors in blue crabs, Oral presentation, ASLO 2008 Ocean Sciences Meeting, Orlando, FL, February 2008.

Dickman, BD, *JL Jackson, DR Webster, and MJ Weissburg, Real-time turbulent odor plume quantification: I. Signal structure perceived by blue crabs, Oral presentation, ASLO 2008 Ocean Sciences Meeting, Orlando, FL, February 2008.

Webster, DR, BD Dickman, *JL Jackson, MJ Weissburg, Quantifying turbulent plume signals used by actively tracking blue crabs, Oral presentation, 2007 American Physical Society Meeting, Salt Lake City, UT, November 2007.

Outreach Activities

Title: an ecologist enjoys a smelly experience on a neglected link in food webs

Media Outlet/Organization: Nature

Activity Date: 04/26/2007

Description: Nature 2007. 446:953 coverage of our IGERT student's publication in Ecology

Title: Bio@Tech Teaching
Media Outlet/Organization: ga tech
Activity Date: 01/01/2007
Description: Jennifer Jackson - Instructed high school students in an intensive, three-week, investigative biology summer experience

Title: biology experience for high school students
Media Outlet/Organization: BIO@TECH
Activity Date: 05/15/2007
Description: in conjunction with the Center for Education Integrating Science, Math and Computing an IGERT student is running the ecology part of a three-week biology experience for high school students with strong interests in the biological sciences.

Title: Children's Restoration Network of Atlanta.
Media Outlet/Organization: Children's Restoration Network of Atlanta.
Activity Date: 01/01/2007
Description: Rachel Lasley - One day/week she tutors elementary and middle school children at a homeless shelter.

Title: decomposers nature's garbage men
Media Outlet/Organization: pittsburgh post-gazette
Activity Date: 11/14/2006
Description: ran an article on our IGERT student's publication explaining why fish rot.

Title: degrading toxic algal blooms
Media Outlet/Organization: Nature
Activity Date: 08/20/2008
Description: Nature covered papers by our IGERT students that dealt with the findings that some non-toxic plankton can degrade the toxins produced by other species.

Title: Family Science Night
Media Outlet/Organization: Morningside Elementary School.
Activity Date: 01/17/2007
Description: early 2007 - professor Joseph Montoya gave 3 lectures as part of Morningside School's family night science series.

Title: Georgia Tech Hispanic Alumni Network
Media Outlet/Organization: Georgia Tech Hispanic Alumni Network
Activity Date: 01/01/2007
Description: Elizabeth Padilla - volunteer (2007), Executive committee member (2007-PRESENT), Secretary (2008-PRESENT). Also volunteer for GaTech's HSF student chapter tutoring program.

Title: IGERT students teach in local high schools
Media Outlet/Organization: Georgia high schools
Activity Date: 08/15/2007
Description: 3 IGERT students worked with local, minority serving high school science classes on a weekly basis 2006-2007 to (1) advance their teaching skills, and (2) increase the mathematics and science performance of Atlanta-area high school students.

Title: mentoring
Media Outlet/Organization: Ga Tech
Activity Date: 01/01/2007
Description: Kim Catton - Mentored NSF-REU students in the GT Math/Biology REU summer program

Title: mentoring minority high school students
Media Outlet/Organization: Westlake High School
Activity Date: 01/12/2007
Description: an IGERT student worked with the AP biology class for the 2006-2007 school year to expose students to chemical ecology, to oversee students labs, to instruct students formally once/week and tutored students for the AP Biology test every Saturday.

Title: microbes compete with animals for food by making it stink
Media Outlet/Organization: yubanet.com
Activity Date: 11/03/2006
Description: <http://www.yubanet.com/cgi-bin/artman/exec/view.cgi/21/44957> coverage of our IGERT student's research published in Ecology

Title: microbes scent knocks out competitors
Media Outlet/Organization: seedmagazing
Activity Date: 11/21/2006
Description: seedmagazing.com coverage of our IGERT student's Ecology publication
http://www.seedmagazine.com/news/2006/11/microbes_scent_knocks_out_comp_3.php

Title: Naked Science
Media Outlet/Organization: national Geographic
Activity Date: 10/01/2007
Description: Mark Hay- featured on Nat. Geo. TV series Naked Science program on "Dangers of the Deep" - I think it aired in October or Nov. of 2007 but am unsure.....

Title: nature's recyclers perform key work
Media Outlet/Organization: Charleston Gazette
Activity Date: 11/14/2006
Description: story on our IGERT student's publication in Ecology

Title: NSF K-12 STEP teacher
Media Outlet/Organization: Westlake HS
Activity Date: 01/01/2007
Description: Jenn Jackson - Taught AP Biology/Advanced Topics class, implemented AP Labs, developed lectures, supplemental labs, activities, field trips; conducted after school tutoring for AP Biology exam.

Title: Reef Education in Fiji
Media Outlet/Organization: Votua Village Fiji
Activity Date: 01/12/2007
Description: Doug rasher - Talk presented to Fijian villagers on coral reef ecology, followed by a month long involvement by some villagers in experiments focused on assessing the impacts of fishing and pollution on thier reef.

Title: research experience for high school teachers
Media Outlet/Organization: Westlake High School in Atlanta
Activity Date: 05/15/2007
Description: This summer, a biology teacher at Westlake High School and 4 students are being mentored an IGERT student in aquatic chemical signaling. the students will enter their work in the Siemens Competition in Math, Science, and Technology.

Title: Science Professional Development Program
Media Outlet/Organization: Minority Striving and Pursuing Higher Degrees of Success in Earth System
Activity Date: 01/01/2007
Description: Elizabeth Padilla - DREAM TEAM/EXECUTIVE COMMITTEE MEMBER (2007-2008), AND STUDENT MENTOR (2006-PRESENT). This national program provides minority undergraduate with exposure, interaction and participation in the Earth System Science community

Title: see comment
Media Outlet/Organization: see comment
Activity Date: 01/01/2007
Description: several of our outreach activities were long-term and cannot be described in the mm/dd/yyyy format - for these i put 01/01/2007 if they were ongoing throughout the year

Title: Taught in minority high school
Media Outlet/Organization: Miller Grove high school
Activity Date: 01/01/2007
Description: Trainee Emily Prince taught 10 hours per week in local high school, started an after school tutoring program focused on graduation tests, took 16 after school program students to tour campus of Georgia Tech and the new Georgia Aquarium.

Title: teacher training
Media Outlet/Organization: high school
Activity Date: 01/01/2007
Description: Jennifer Jackson - Mentored teacher and 4 students in aquatic chemical signaling research, assisted teacher in adapting the research into several classroom lesson plans.

Title: training REU students
Media Outlet/Organization: GA TECH
Activity Date: 01/01/2007
Description: Jennifer Jackson - Supervised research of six undergraduate students as part of REU or other activities

Title: TV program Interview
Media Outlet/Organization: National Geographic
Activity Date: 05/02/2007
Description: Mark Hay (PI) interviewed for an upcoming National Geographic program in their "naked Science" series on the future of the world's oceans.

Title: when it rots it stinks
Media Outlet/Organization: the Why files
Activity Date: 11/10/2006
Description: coverage of our IGERT student's publication in Ecology
http://whyfiles.org/shorties/219bacterial_stink/

Title: why meat rots
Media Outlet/Organization: physorg
Activity Date: 11/01/2006
Description: physorg (<http://www.physorg.com/news81603081.html>) ran a story on our IGERT student's publications on microbes using chemistry to compete with larger organisms

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