

CTAHR RESEARCH NEWS

January 2010
Volume 6, Issue 1 (45)



Jon-Paul Bingham investigates Apple snail populations in a taro patch in the shadow of the Ko'olau Mountains, Oahu.

**Slugs and snails,
our friends? Yes!**

**New NSF grant
guidelines**

**Congressional
staffers visit**

In this issue

Snails, slugs and science p 3

PEPS student Jessie Eiben honored p 11

Congressional staffers visit Waimanalo p 12

ScholarSpace holds CTAHR publications . . . p 13

New NSF guidelines . . . p 15

New funding p 16

New publications p 19

From the Associate Dean and Associate Director for Research

Happy New Year! Finally, the UH and UHPA have reached a tentative agreement on a new six-year contract. The good news is we have an agreement; the bad news is we have an agreement. Faculty will receive a 6.67% pay cut for 18 months; salaries will be restored after that plus a 3% pay raise each year for two years. The lost pay in the first 18 months will be paid back in three lump sum payments in the last three years of the contract. That was the good news part. Federal stimulus funds are being used to soften the impact of budget cuts for the moment, however, stimulus funds will disappear at the end of fiscal year 2011. It is doubtful we will receive additional general funds during the contract years. This translates into flat or reduced budgets for the next five to six years. It is likely that we will not be able to fill any vacant positions in the foreseeable future. How will this affect our programs? I do not believe anyone has an answer for it right now. Look at the bright side: at least we still have our jobs with decent wages, much better than those unfortunate people who lost their positions during this recession.

This month we are pleased to introduce Dr. Jon-Paul Bingham of the Department of Molecular Bioscience and Bioengineering. Dr. Bingham works (or plays) with poisonous slugs in his laboratory. I remember vividly when he asked, “have you try to milk a slug before?” Folks, as an animal science major, I have milked plenty of dairy cows in my time. But, no, I have never attempted to milk a slug, unless you count the ones I stepped on by mistake! Enough said, you need

to read J-P’s story to find out why he milks slugs. Who says research has to be boring! His research has many uses, including providing a potential solution to control apple snails infesting our taro fields. A true example of how basic research can benefit a very practical problem. You will enjoy reading about the exciting work that JP and his colleagues are conducting in his laboratory.

Congratulations to Jessie Eiben for winning first place in the Student Competition for the President’s Prize during the Entomological Society of America’s annual meeting. Thanks, Dan, for submitting the piece.

If you submit proposals to NSF, you need to read the new rule about responsible and ethical conduct of research and teaching.

Although no exact dates or names have been released for the final campus interviews for the dean candidates, they are being finalized. Please be prepared to participate in the evaluation process as much as your schedule permits, as it is critical that we identify the best candidate to be our next dean, to guide CTAHR through the coming years.

Finally, please share with us your news worthy items, and publications.



*C.Y. Hu
Associate Dean
and Associate
Director for
Research*



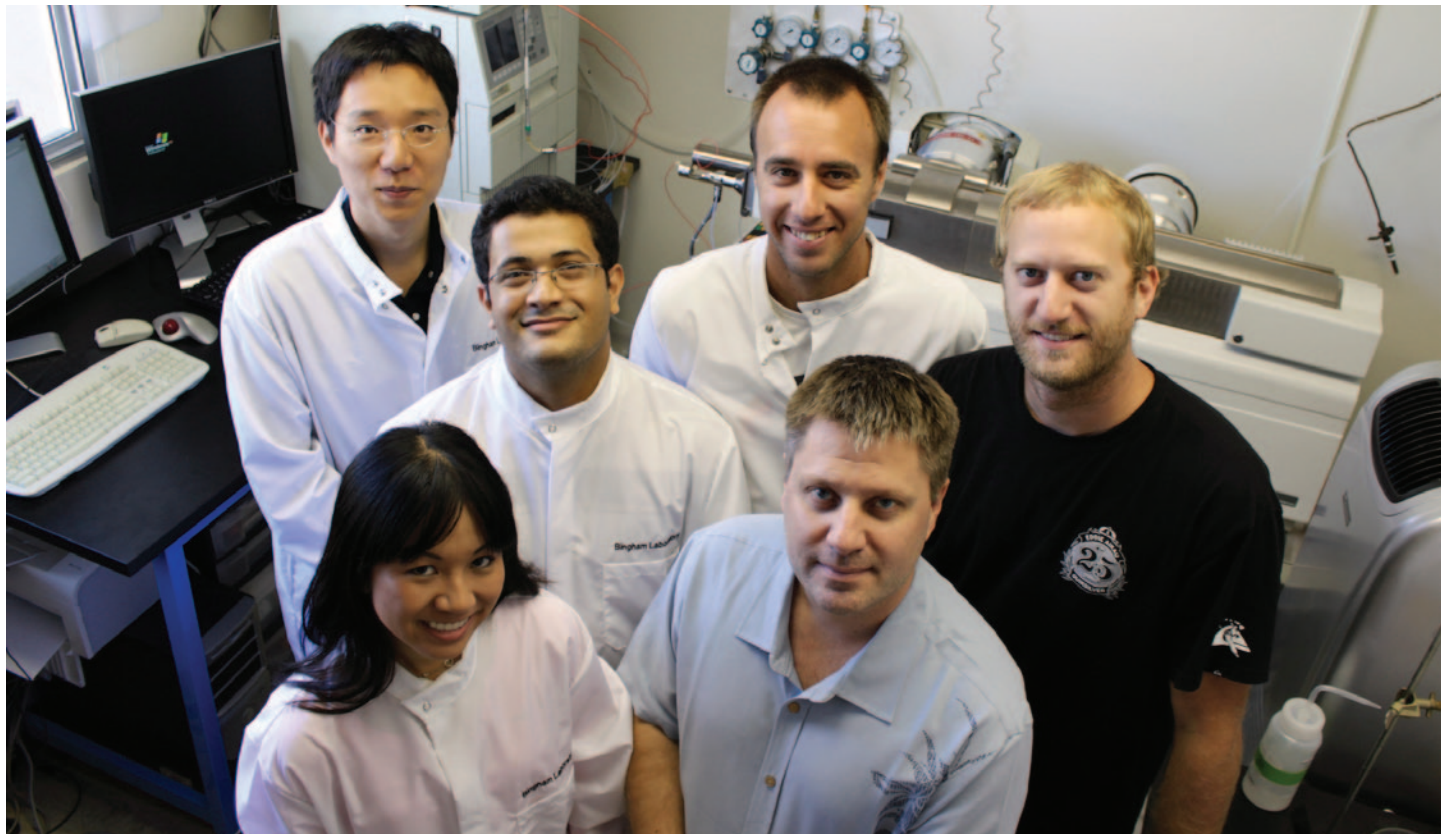
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Local ‘killer’ slugs provide novel leads for medical science and pesticide development

By Jon-Paul Bingham, Assistant Professor
M.S. students Joycelyn Chun, Do Kim and Jeffrey Milisen
Department of Molecular Bioscience and Bioengineering



Bingham Peptide Laboratory: L-R. Back: Mr. Do Kim (South Korea), Mr. Jeffrey Milisen (Connecticut) and Mr. Zachary Bergeron (New York). Middle: Mr. Parashar Thapa (Nepal). Front: Ms. Joycelyn Chun (Oahu) and Dr. Jon-Paul Bingham (Australia).

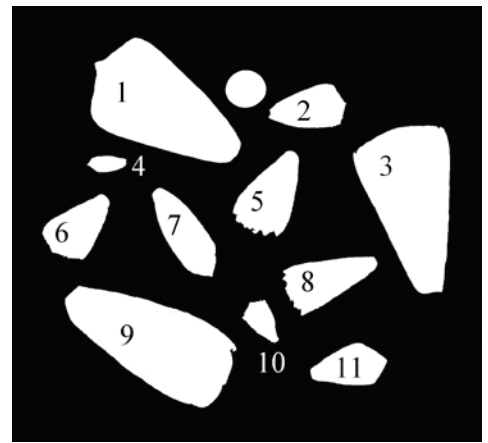
What is the worth of a slug or snail? Most think nothing when happily squashing them before they dine on our prized garden plants or vegetables. In our laboratory, we see their merit—we have found that some snails actually have direct implications in human health, medicine, and even in the development of biodegradable pesticides.

Local ‘killers’

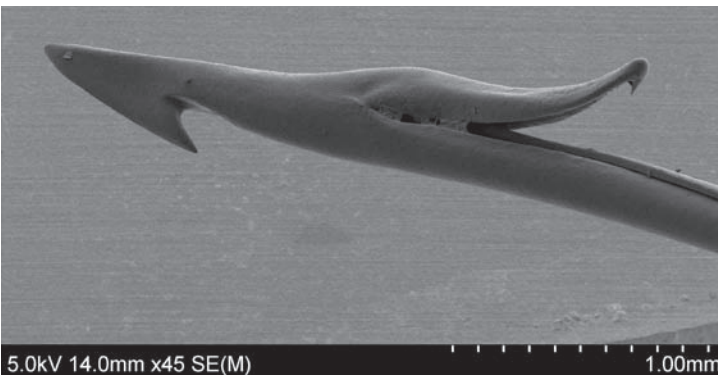
Not all snails were created equally! Though the first image likely to pop into ones head when they hear the word “snail” is the slimy garden variant, the snails we study in the Bingham Laboratory in the Department of Molecular Biosciences and Bioengineering, are actually ‘killer’ snails found in the marine environment off the

shores of Hawai‘i. These snails are highly venomous and are known to have caused 15 human fatalities within the South Pacific.

These unique, highly ornate tropical marine snails have used 50 million years of evolution for drug design and development, all neatly packaged into one highly venomous organism. In nature they are furious predators who selectively kill fish, worms or other mollusks – their toxins are so highly selective they can be used to block specific ion channels, which control physiological functions in their prey in millionths of a second. Here they employ a single-use hypodermic needle like apparatus known as a radula to deliver their deadly cocktail. In our laboratory, we have harnessed the killing power of these seemingly placid snails and



Cone shells from Hawai'i – deadly beauties. (1) *Conus quercinus*, (2) *Conus pulicarius*, (3) *Conus leopardus*, (4) *Conus obscurus*, (5) *Conus marmoreus*, (6) *Conus pennaceus*, (7) *Conus nussatella*, (8) *Conus imperialis*, (9) *Conus striatus*, (10) *Conus ebreus*, and (11) *Conus catus*.



Radula from *Conus striatus* showing the fine structural features of this venom delivery harpoon; designed to get into the dermal layers of the victim and not come out. Shown is approximately 2 mm of the harpoon, which in total is about the length of an eyelash.

have actually chemically synthesized identical-native-like compounds from their venoms to further research to aid the development of novel painkillers for clinical use.

Slugs to drugs

Painkillers from a slug you may ask? This idea is not as far-fetched as you may think. In one of my recent review articles “Drugs from Slugs – past present and future perspectives on conotoxins research” (*Journal*

of Biological Interactions, 2010), I discuss the development of painkillers from these venomous snails, commonly known as cone shells. They actually have a long proven track record as effective medicines. Presently, five new drugs from these snails have been found to eliminate pain. Of these, I have been involved in three candidates that are currently in clinical trials as novel drug leads. The Food and Drug Administration here in the USA has actually approved one of these new drugs, Prialt™ (Elán Pharmaceuticals), for human use.

In the words of my PhD. student Mr. Zachary Bergeron (MBBE), “Prialt™ (conotoxin MVIIA) is an absolute revolution to pain management. This small peptide is 1000 times more potent than morphine, with no development of addiction, tolerance or major side effects, which are all too commonly observed with existing morphine derived medications.” Presently being used in pain management therapies across the USA, Prialt™ (Primary alternative to morphine) is providing relief from back and nerve pain from injuries as well as cancer pain. Recent reports clearly indicate its superior utility in the clinic. We have only touched the tip of the iceberg of highly selective natural products from these carnivorous marine snails.

We estimate approximately 70,000 individual peptides of potential biological use in this genus alone, yet we are the only group in the world who are actively looking into their pesticide applications.

Biological interactions beyond our wildest dreams

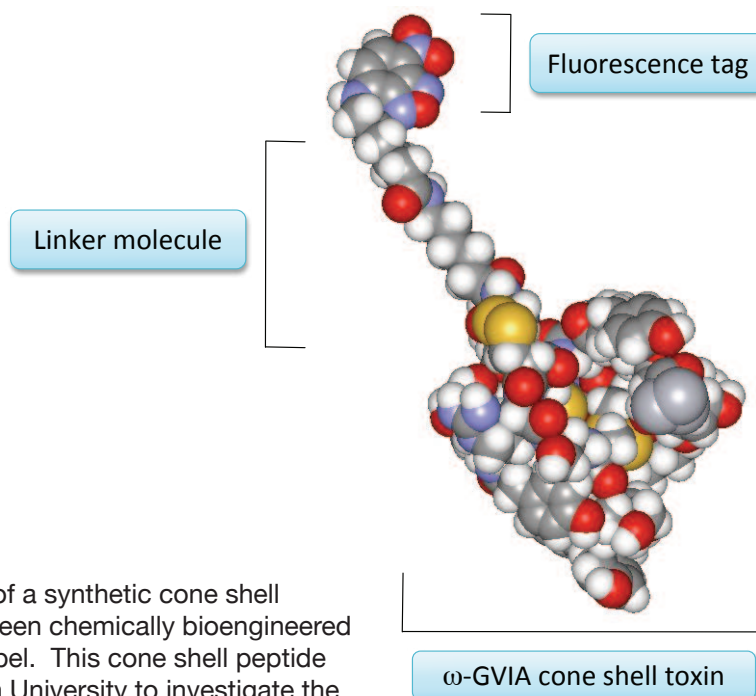
What makes these cone shell toxins so effective as drug or pesticide leads? Cone shells have developed a process unlike any other venomous organism: they have the ability to make hundreds of minor chemical modifications to their peptides that convey greater pharmacological activity and specificity. Some of these toxins are so specific that science has had to re-classify ion channel pharmacology textbooks. The reason for this high specificity and potency is rapid prey immobilization. As a snail you are not the fastest organism in the food chain, and as a consequence you may find yourself inadvertently switching from predator to prey by the scavenging nature of optimistic organisms within the marine environment. Thus to tip the balance in your favor – kill your prey rapidly without commotion and prevent unwanted attention to yourself. Cone shells have mastered this process. Here they also excelled themselves by not just targeting a few receptors or ion channels, but delivering a lethal mixture of hundreds of peptides that target every

imaginable physiological system. Thus cone shells are very successful, as indicated by being one of the largest genus of invertebrates (<600 species) known within the tropical reef ecosystems of the world.

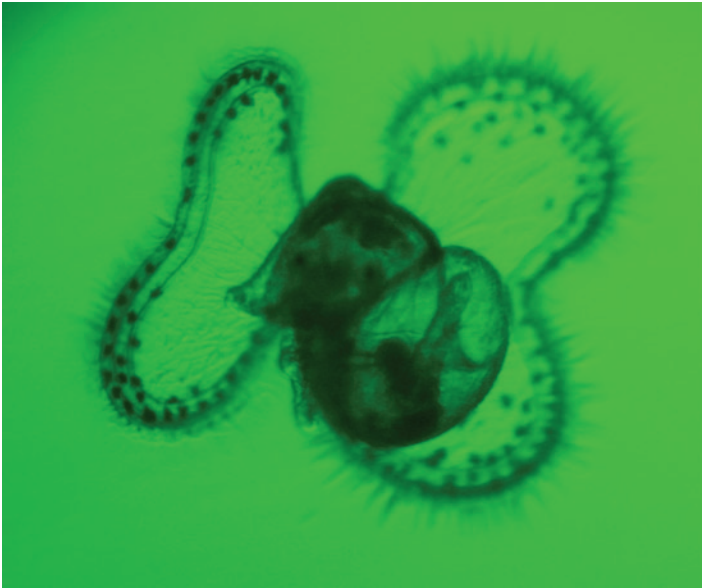
Aside from being physiologically specific, cone shell toxins are phyla specific, meaning they are specially formulated by nature to be most lethal on certain types of animals. In our work, we have found this to be a result of the specific snail's diet. If the species we are working with is a molluscivore, meaning it feeds mainly on other snails, its toxins are most effective on mollusks.

Slugs to pesticide development

Utilizing this nature-created phyla specificity, we are able to create specialized pesticides which are effective against controlling target populations while reducing or eliminating the risk of harming others. Said best in the words of my graduate student **Ms. Joycelyn Chun** (MBBE, M.S. student), “the application of these peptide toxins has great implications where one needs phyla selective toxicity and potency. Here we can selectively target ion channels that are unique in pest mollusks, such as the golden Apple snail (*Pomacea canaliculata*) to protect important crops such as taro. We are using nature as a guide and template to wage war on invasive terrestrial snails, all originating from the venom of our



Three dimensional model of a synthetic cone shell peptide toxin, which has been chemically bioengineered to contain a fluorescent label. This cone shell peptide is being supplied to Brown University to investigate the presence of ion channel expression in cells.



Veliger snail or hatchling from *Conus striatus*, no bigger than a grain of sand. We hope that this adult will bring to light new peptide compounds that will revolutionize health care, food safety and agriculture.

killer marine gastropods – we are fighting fire with fire.”

The use of biodegradable and selective pesticides has great commercial potential and agriculture, and in recent months local concerns about molluscan borne or vectored parasites have caught the attention of health agencies and the media. Rat lungworm (*Angiostrongylus cantonensis*), as observed on the Big Island, is a potential threat to human health and food safety.

Yet snails are known to carry numerous internal pests including *Schistosoma*, which presently infests over 200 million worldwide, leading to the serious disability of approximately 20 million people and causing 280,000 associated deaths in sub-Saharan Africa alone. Our own local giant African land snail (*Achatina fulica*) is considered both as one of the most agricultural damaging land snails in the world, and a potential vector of *Schistosoma*! The ability to break life cycles of parasites by selectively targeting these pest-carrying snails using small peptides is a major advancement in pest management, food safety and human health; we hope to achieve this goal.

Slugs to bioengineered research tools

Whether it may be for formulating pharmaceuticals to ease the pain of cancer victims, attempting to eradicate a worldwide parasite problem or protecting valuable food crops using cone shell peptide toxins, we depend on our training, expertise and the modern scientific

technology we possess in our laboratory. Present in our laboratory is a mixture of analytical instruments that are used to synthesize and separate complex mixtures of venom peptides. We see ourselves as an in-house peptide production facility, from chemical synthesis to high-resolution mass spectrometry and biological assessment. The majority of mainland universities do not have access to such instrumentation and expertise—all under one roof.

Professor Diane Libscomb and Mr. Spiro Marangoudaki (Brown University, RI) rely on the Bingham’s laboratory for their supply of novel fluorescently labeled peptide toxins; which are commercially unavailable. “We model some of these toxins to make them become pharmacological probes,” says UH graduate **Mr. Do Kim** (MBBE, M.S. student), who is presently working with Brown University to increase their chemical utility, “it is a very rewarding moment when we provide our collaborators with the final bioactive bioengineered product. The discoveries they will make will enhance our current understanding of pharmacology and molecular medicine”.

“But this is no easy task” states **Mr. Zeb Philips** (MBBE, M.S. student), who has been bioengineering a novel spider toxin for Associate Professor Theodore Cummins (The Stalk Institute of Neuroscience, Indiana University School of Medicine). “Each bioengineered peptide is unique, each requires modeling and engineering to achieve the final objective of materials that hold the same selectivity and specificity as the original toxin – yet we do it!”

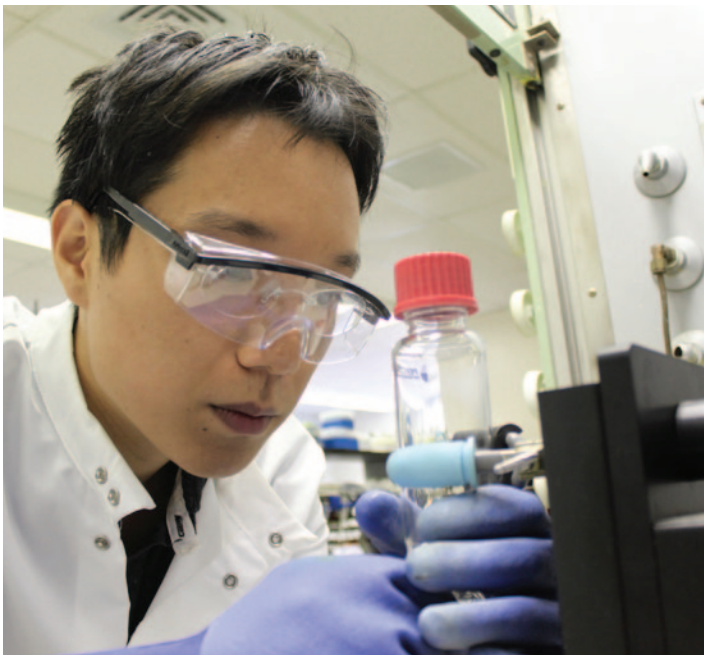
Nonetheless, our finest achievement is our live snail collection. We are one of two laboratories in the world that have the dedicated skill, resources and expertise to develop novel approaches to provide research materials to advance our scientific knowledge and cone shell peptide toxin applications to benefit humanity. Yet we go one further step beyond, we are snail farmers!

Marine biosustainability

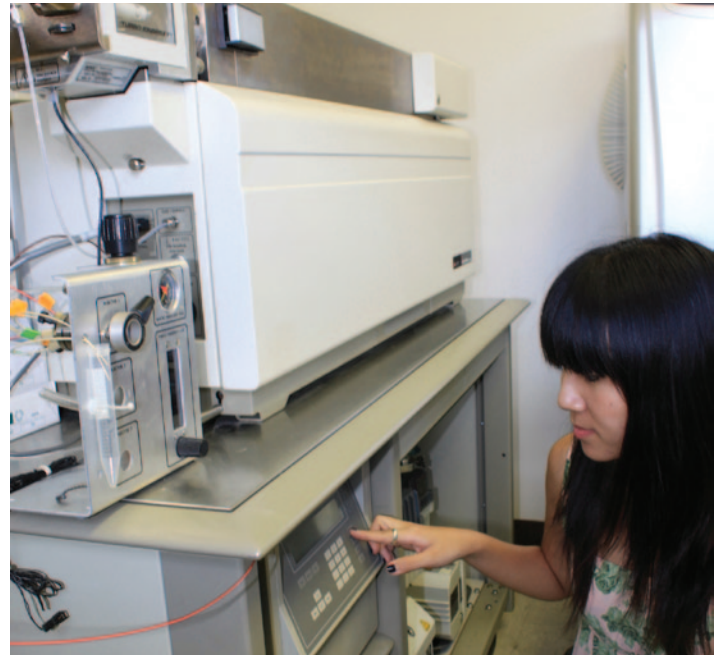
With the snails we sustain in our laboratory, we can carefully obtain small quantities of venom through milking. We utilize a similar process to that used for milking snakes to obtain antivenom. But no antivenom here, we are collecting the killing agents themselves. My head snail farmer and MS graduate **Mr. Jeffrey Milisen** (MBBE, M.S. student) makes this comment: “we do this biosustainably; the animal is worth more to us alive than dead—we want to understand the



Mr. Zachary Bergeron conducting High Pressure Liquid Chromatographic separation of a synthetic cone shell toxin peptide, an analytical process commonly used in our development of novel pesticides.



Mr. Do Kim prepares to chemically synthesize a new cone shell peptide toxin for investigating its application to controlling invasive terrestrial snails. Here Mr. Kim can make many different synthetic peptides, analogous to assembling Lego bricks.



Ms. Joycelyn Chun programming our Liquid Chromatographic pumps to deliver cone shell peptides for precise molecular mass determination using our API Sciex 3000 Electrospray Mass Spectrometer. With this machine we can determine molecule masses of new compounds with 0.01 atom mass units! (real precise).

metabolism and growth of these venom producers in captivity. We've become a snail dairy." By this, Mr. Milisen makes the reference that we work with our snails in a manner parallel to how dairy farmers

work with their cows. We take their milk and keep the animals alive and healthy. In this way, we maximize the amount of useful materials we can gather for our work, while minimizing the number of organisms that



Mr. Jeffrey Milisen, Head Aquaculturist, carefully milks *Conus striatus* (No.6) for its deadly venom. This material is used for research here in Hawai'i and for collaborative research projects on the mainland.



“Down on the snail farm,” cone shells are individually tagged to enable quantification of their feeding and milking behaviors. These snails live in the “Cone Shell Hilton” — compared to their local country cousins.

are sacrificed in the process.

The parallels with modern dairy farming don't stop there. Through mariculture, we are hoping to produce a captive strain of snails — we can call them Holsteins — from which future research materials can be drawn. This would allow us to maintain a controlled strain of snails while relieving environmental stress through collecting. Unfortunately, breeding marine snails isn't as commonplace as raising cattle. In fact, it has never been done for cone shells, which presents enough obstacles to keep us busy for a while. The first step in developing a snail mariculture program is figuring out what the animal will eat as a newborn, or veliger. After they hatch, marine snails enter into a free-floating, nearly microscopic veliger stage that is notoriously difficult to feed and may change food preferences multiple times before reaching adulthood. For that reason, our snail culture program is still in its...ahem...infancy.

For now our existing collection of adult snails lives extravagantly in two systems of ten tanks apiece. They are fed roughly once a week, offering venom at every feeding. The collected venoms are stored frozen as a sort of venom bank to make materials available to other research institutions in the USA.

Conclusion

Snails have been cast aside as meaningless and even detrimental components of the world's ecosystems (which some are). In Hawai'i alone, countless dollars have been spent and two invasive snail species have been rashly introduced to rid our islands of the giant African snail. Marine cone snails can be blamed for at least fifteen deaths worldwide and present yet another reason little Johnny is scared to go in the water.

Until recently, the best use we have found for these slimy denizens have been in escargot. From powerful pesticides to potent painkillers, our team has been finding value in otherwise harmful animals. Our aquaculture facility allows us to offer cone snail toxins to interested researchers around the world while our state of the art laboratory gives us the ability to synthesize and work with the complex and useful peptides constructed by our snails. In answer to the question posed at the opening of this article, "What is the worth of a slug or a snail?" We are working hard to find out.

Collaborations

Having been now in CTAHR for nearly three years, I have found the expertise of my laboratory team



Dr. J-P. Bingham, holds an empty shell of one of the most deadly cone shells found in Hawai'i, *Conus obscurus* — obscure by name and by nature. The venom contents of this shell may hold cures for diseases and help deter pest related crop damage.

being called upon for many interesting projects which use our analytical skills and capabilities. These in themselves have provided the Bingham Laboratory a greater appreciation of our agricultural purpose as chemical-based research scientists. These efforts deserve recognition: with **Ms. Archana Pandey** (TPSS PhD. student) and **Dr. Ted Radovich** (TPSS) we are examining the concentration of various micronutrients in vermicompost and now broadening our horizons to the analytical analysis of carotenoids in potato varieties; with **Dr. Abby Cuttriss** and **Professor David Christopher** (MBBE), we are just starting an exciting project on High-through-put carotenoid analysis; which we hope will see many other researchers interested in its application; and **Ms. Erin Yafuso** and **Professor Robert Paull** (TPSS) have provided us with great interest in applying our analytical technologies to analyze and quantify flavinoid compounds that give flowers their color. We welcome any CTAHR collaborative projects that need our analytical skill and expertise.

Acknowledgements

We would like to thank the efforts of **Ms. Majdouline LeRoy** (MBBE, M.S. student) for her assistance in undertaking Scanning Electron Microphotography of cone shell radular. We would also like to thank the support our granting agencies, USDA, NIH and Sea Grant (HI) for their continued commitment to our research endeavors.



Mr. Zan Halford (Biology, undergraduate) project involves helping to care for the snail farm. Here he is examining our most recent brood of cone shell babies (veliger).

Jon-Paul 'JP' Bingham

Born: Peterborough, United Kingdom

Hometown: Gold Coast, Queensland, Australia

Joined CTAHR: 2007



Educational History: PhD. in Biochemistry, University of Queensland (1992-1998); BSc. Hons. in Clinical Biochemistry, Griffith University, Nathan, Queensland (1992); BSc. in Biological Chemistry and Physiology, Griffith University, Nathan, Queensland (1989-1991).

Specialization: Toxinology, peptide synthesis and engineering, proteomics, marine natural products, clinical drug development and novel pesticide discovery.

Current work: Peptide toxin discovery and bioengineering for medical and agricultural research.

Languages Spoken: English

Selected publications:

Bingham, J-P. Mitsunaga, E. Bergeron Z.L.. 2010 Drugs from Slugs – Past, Present and Future Perspectives

of omega-Conotoxin Research. *Chemico-Biological Interactions* 183(1):1-18.

Bingham JP, Chun JB, Ruzicka MR, Li QX, Tan ZY, Kaulin YA, Englebretsen DR, Moczydlowski EG. 2009. Synthesis of an iberitoxin derivative by chemical ligation: a method for improved yields of cysteine-rich scorpion toxin peptides. *Peptides*. 30(6):1049-57.

Nelson L. 2004. Venomous snails: one slip, and you're dead. *Nature*. 2004 Jun 24; 429(6994): 798 – 9.

Selected grants:

Bingham. Application of Fluorescent Peptide Toxins in Cellular Imaging of Selective Ion Channels Underlying LQT Syndromes. (0530204N; The American Heart Association-Scientist Development Grant, National Center Research Program) \$260,000.

Cummins and Bingham. Development of isoform specific sensory neuronal sodium channel blockers. (NS054642; NINDS) \$275,000.

Bingham. Investigating the Application of Peptide Pesticides: Diversifying Molluscicide Targeting Capabilities and Enhancing Bidelivery (USDA CSREES) \$100,000.

Exploring the Evolution and Diversity of Hawaii's Endemic Seed Bugs: *Nysius* (Hemiptera: Lygaeidae)

By Dan Rubinoff
Plant and Environmental Protection Sciences

The National ESA meeting is the premier venue for Entomology research in the USA. Entomologists and professionals from related disciplines from around the world met in Indianapolis from December 13-17, 2009 to exchange scientific information and ideas, enhance professional knowledge and skills, and network with colleagues. Approximately 2,500 entomologists attended the meeting.



Hawaiian *Nysius*.

One of our own CTAHR graduate students won first place in the Entomological Society of America; Student Competition for the President's Prize; Section: Systematics, Evolution and Biodiversity; Subsection: Phylogenetics and Evolution.

Jesse Eiben's research used molecular phylogenetics and morphology to explore the species relationships of *Nysius* seed bugs in the Main and NW Hawaiian Islands, including the endemic Wekiu Bug from Mauna Kea which is an endangered species candidate. The main Hawaiian Island *Nysius* comprise one lineage, but surprisingly, the NWHI *Nysius* are separate and quite removed from the Main Hawaiian Islands group. The information gained from these analyses aid identification of new insect pests in Hawaii and provides valuable information about the conservation status of these endemic Hawaiian species.



Jessie Eiben doing entomological fieldwork.

Congressional staffers visit CTAHR

By Po-Yung Lai
Special Program Director for Grants and Contracts

Five professional staff of the Senate Agricultural Appropriations Committee toured the Waimanalo Experiment Station on January 22, 2010. The tour was organized by Dr. Chauncey Ching to increase committee staff awareness of Hawaii's "security" issues on food, environment and energy, with an emphasis on such topics as coqui frog, varroa mite, VOG (volcanic fog), food security, food safety, disaster assistance, limited water resources, and aging agricultural infrastructure. At the experiment station, Dean Hashimoto welcomed the committee staff and other guests representing USDA APHIS, FSA and Senator Inouye's office by providing an overview of the accomplishments and impacts to communities made by federally funded research projects undertaken by CTAHR. After the Dean's briefing, Drs. Mark Wright and Ethel Villalobos provided the history of discovering the varroa mite on the Big Island and Oahu and the damage caused by this mite to the beekeeping industry in Hawaii. Significant contributions have been made by Mark and Ethel's research in developing pest management strategies, including testing of formic acid and other environmentally friendly chemicals, for the control of these mites without damaging the honey bees.



Guests included, l-r (front): Galen Fountain, Jessica Frederick, Steve Peterson, Dianne Nellor.

Dr. Ted Radovich showed the committee staff the 3-acre organic field certified by HOFA, where eggplant, banana and other crops are grown. Ted briefed the staff on the support of the TSTAR grant to CTAHR's sustainable agricultural research and outreach programs, which enables CTAHR to leverage for extramural funding for its sustainable agricultural programs and to assist stakeholders in getting their organic farms successfully certified by HOFA. The Congressional staff was then



Dean Andy Hashimoto, right, addresses Congressional staffers and invited guests. l-r: Marie Blanco, Bob Ross, Stacy McBride, Jessica Frederick, Edmond Aczon, Diane Ley (FSA-HI), and Steve Peterson (FSA-HI).

briefed by Drs. Goro Uehara, Richard Ogoshi and Brian Turano on the germplasm collection of different grasses from Hawaii and elsewhere to be tested under the research project funded by the U.S. Department of Energy for their adaptability under different environmental conditions and suitability for bio-ethanol extraction. Genetic profiles of the grasses collected and their agronomical traits are being established under this project. Raymond Uchida, Oahu County Administrator; Roger

Corrales, station manager; and station crew members are to be congratulated for the excellent job done in preparation for the briefing.

CTAHR pubs in ScholarSpace

By Eileen Herring
Science Technology Reference Librarian, Hamilton Library

An institutional repository is a Web-accessible digital collection of the intellectual output of an institution. The development of institutional repositories is the result of technological advancements such as the increasing affordability of disk storage space as well as the increasing discussion about shifting scholarly publishing to Open Access models. Current increases in the generation of born-digital scholarly publications has provided the impetus for many academic institutions to create repositories to organize, preserve, and provide access to this information. The New World Encyclopedia reports that as of January 2009 there are about 1,300 institutional repositories worldwide.

Development of the UH Manoa institutional repository, ScholarSpace (<http://scholarspace.manoa.hawaii.edu>), began in late 2006. Dr. Robert

Schwarzwalder, the UH Manoa Library IT division head at the time, understood the need for a repository that would showcase UH Manoa's unique research to both the scholarly community and to the general public. In early 2007, the open source software DSpace was selected as the basis for the repository and several pilot projects were instituted. One of the first of these projects was the Proceedings of the Hawaiian Entomological Society (<http://scholarspace.manoa.hawaii.edu/handle/10125/19>).

As UH Manoa's institutional repository, ScholarSpace provides free access to the materials that are housed in it. While it can house any type of digital item, most of the items currently in the various collections are text. The DSpace software provides the user with the ability to search the full text of all of the items in the entire repository or any of its subunits. The

The screenshot shows the ScholarSpace website interface. At the top, there is a navigation bar with the ScholarSpace logo and the University of Hawaii at Manoa logo. Below the navigation bar, there is a search box and a list of navigation links. The main content area displays a search results page for the 'Bulletin (Hawaii Agricultural Experiment Station)' by issue date. The results are sorted by issue date in ascending order, showing 14 results. The table below summarizes the results.

Issue Date	Title	Name(s)
1902	The Root Rot of Taro	<i>Sedgwick, T F</i>
1904	The Banana in Hawaii	<i>Higgins, J E</i>
1905	Citrus Fruits in Hawaii	<i>Higgins, J E</i>
1906	The Mango in Hawaii	<i>Higgins, J E</i>
1907	Marketing Hawaiian Fruits	<i>Higgins, J E</i>
1910	Shield Budding the Mango	<i>Higgins, J E</i>
1911	The Avocado in Hawaii	<i>Higgins, J E; Hunn, Chester J; Holt, Valentine S</i>
10-Sep-1912	The Effect of Manganese on Pineapple Plants and the Ripening of the Pineapple Fruit	<i>Wilcox, E V</i>
27-Jul-1917	The Litchi in Hawaii	<i>Higgins, J E</i>
Nov-1933	The Manufacture of Poi from Taro in Hawaii: With Special Emphasis upon Its Fermentation	<i>Allen, ON; Allen, Ethel K</i>
1939	Taro Varieties in Hawaii	<i>Whitney, Leo D; Bowers, F A I; Takahashi, M</i>
May-1939	Grasses of the Hawaiian Ranges	<i>Whitney, LD; Hosaka, EY; Ripperton, JC</i>
Uns-1942	Vegetation Zones of Hawaii	<i>Ripperton, JC; Hosaka, EY</i>
Mar-1944	Legumes of the Hawaiian Ranges	<i>Hosaka, EY; Ripperton, JC</i>

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ScholarSpace at University of Hawaii at Manoa >
College of Tropical Agriculture and Human Resources >
Publication Series >
Soil and Crop Management, 1998 - present >

Please use this identifier to cite or link to this item: <http://hdl.handle.net/10125/13445>

Title: Benefits and Costs of Using Perennial Peanut as Living Mulch for Fruit Trees in Hawaii

Author(s): [Radovich, Ted](#)
[Cox, Linda J](#)
[Sugano, Jari](#)
[Idol, Travis](#)

Keywords: Arachis pintoi
live mulches
cost analysis
fruit crops
Hawaii

Issue Date: Aug-2009

Publisher: University of Hawaii

Citation: Radovich T, Cox LJ, Sugano J, Idol T. 2009. Benefits and costs of using perennial peanut as living mulch for fruit trees in Hawaii. 10 p. Honolulu (HI): University of Hawaii. (Soil and Crop Management; SCM-27).

Series/Report no.: Soil and Crop Management
SCM-27

Abstract: To help Hawaii growers make management decisions about the use of a living mulch, this publication describes experiments conducted to study the effects of perennial peanut planting method and density on (1) groundcover canopy development, (2) selected indicators of soil quality, (3) fruit tree nutrient status, and (4) the cost of establishing the living mulch.

Number of Page(s): 10

URI: <http://hdl.handle.net/10125/13445>

Appears in Collections: [Soil and Crop Management, 1998 - present](#)

A record-level view of content in ScholarSpace.

repository also provides a permanent address for each item; this eliminates the problem of broken links for citations. The Library's ScholarSpace team ensures the safety, long-term retention, and forward-migration of the materials in the repository.

ScholarSpace has continued to grow steadily since the first PHES files were added, and it currently contains almost 30 different groups of collections totaling over 10,000 items. CTAHR began its participation in ScholarSpace in the fall of 2008. Dale Evans and the college's Office of Communication Services has provided the leadership and editorial support for this participation. The CTAHR ScholarSpace "community" (<http://scholarspace.manoa.hawaii.edu/handle/10125/1877>) currently includes books, conference proceedings, and over 50 publication series. Almost all of CTAHR's current born-digital free publications are now available in ScholarSpace. In addition, a growing number of print publications have been digitized and are available as PDF files. Some of these are publications that are still being used by CTAHR personnel and some of them are legacy publications of the college. All of them are full-text searchable, and they can be browsed by title, date,

author, or National Agricultural Library Thesaurus subject headings. Right now, the CTAHR publications collection contains almost 900 items.

In addition to the CTAHR publications and the Proceedings of the Hawaiian Entomological Society, there are a number of collections that might be of interest to CTAHR faculty and students:

- Pacific Science (1947–2004) (<http://scholarspace.manoa.hawaii.edu/handle/10125/364>)
- Water Resources Research Center (<http://scholarspace.manoa.hawaii.edu/handle/10125/1678>)
- Dissertations and Theses (<http://scholarspace.manoa.hawaii.edu/handle/10125/561>)

There are many more collections to explore. In addition, it is possible for UH Manoa faculty have a space set up for them to archive their own publications. The ScholarSpace Manager, Beth Tillinghast, would be happy to talk with faculty about this and to provide information about copyright restrictions. She can be contacted at <betht@hawaii.edu> or 956-6130.

New NSF Responsible and Ethical Conduct of Research and Teaching training requirements

By Sharee Pepper (after document from UH ORS)
Grant coach

The National Science Foundation (NSF) recently announced that every proposal submitted to the NSF must include plans for the appropriate training and oversight in the responsible and ethical conduct of research and teaching. Beginning **January 4, 2010**, every proposal submitted to the NSF must include a statement that the UH has a plan for the appropriate training and oversight in the responsible and ethical conduct of research and teaching. The requirement applies to all undergraduate and graduate student postdoctoral researchers who are to participate in proposed NSF-funded projects and programs. However, all members of the research community who are responsible for the design, conduct or reporting of research, regardless of the source of support, are also encouraged to complete these training requirements. How the University of Hawai'i (UH) at Mānoa's plans to provide this training and oversight follows:

Principal Investigator's (PI's) responsibilities

All NSF PIs are strongly encourage to complete the Collaborative Institutional Training Initiative (CITI) Responsible Conduct of Research (RCR) training course (see URL below). NSF PIs will also be responsible for ensuring that all applicable students and postdoctoral researchers obtain the proper **online training within 30 days** of the receipt of NSF support, as well as completion of the **interactive requirements within 12 months** (see below). In accordance with NSF's mandate for each institution that accepts NSF funds to provide program oversight, PIs will be responsible for maintaining a **written log** of individuals completing RCR training, and provide this information upon request for all individuals supported by NSF.

On-line module and interactive sessions

The UH has registered with the CITI for use of their interactive, online platform on the RCR. CITI's multi-disciplinary approach allows the UH to effectively

achieve appropriate training among the diverse campuses, and will be used to partially fulfill NSF's requirement. **All undergraduate students, graduate students, and postdoctoral researchers who receive new, renewal or extension of NSF support on or after January 4, 2010 will be required to complete the CITI RCR online course within 30 days of the initiation of the support.** The support may be in the form of salaries, wages, facilities, supplies, or equipment financed by NSF whether provided **directly to an individual or indirectly** through the provision of access to facilities, equipment, supplies, and/or staff support. RCR training is **valid for 4 years**, after which full recertification is required.

Instructions for use of CITI's online RCR Course:

1. Access CITI's Website: <https://www.citiprogram.org/default.asp>
2. Follow their instructions to register as a new user, selecting the UH as the participating institution.
3. When registering please provide Campus affiliation, Department name, Employer/PI/Mentor's name if applicable, and a phone number contact.
4. After reading the introductory pages, select the course most appropriate for your discipline, and complete the course with a grade of 80 or higher. Scores will be automatically recorded with the Office of the Vice Chancellor for Research and Graduate Education (OVCRGE) and the Office of Research Services (ORS).

In addition to the online CITI course, individuals will be required to attend one RCR **Interactive Session presented by institutional experts**. Sessions will be offered **at least twice a year** to allow flexibility in fulfilling this requirement. An updated schedule of

continued on page 17. . .

Good grants are available now!

By Sharee Pepper
Grant coach

The following list includes some current funding opportunities that may be of interest to CTAHR faculty. If the deadline is too short for this year, it is still a good indication of the likely due date for next year. Let us know if we can be of any assistance with developing and editing your grant application.

For information on submitting grants electronically on grants.gov the following publication may be useful. USDA, NIFA Grants.gov Application Guide – A guide for the preparation and submission of NIFA applications via grants.gov.

http://www.nifa.usda.gov/funding/grant_forms/electronic_app_guide.pdf

Agriculture, Rural and Community Development Grants

\$ - USDA, NIFA - Agriculture and Food Research Initiative (AFRI) Competitive Grants Program (Note: includes prior NRI grants)

Deadline: all have expired (use as guide for 2010)

http://www.nifa.usda.gov/funding/afri/pdfs/program_announcement.pdf or <http://www.nifa.usda.gov/funding/afri/afri.html>

\$ - USDA, NIFA - Increasing Scientific Data on the Fate, Transport and Behavior of Engineered Nanomaterials in Selected Environmental and Biological Matrices

Deadline: February 2, 2010

http://www.epa.gov/ncer/rfa/2010/2010_star_nano.html

\$ - Oregon Health & Science University - Training and Education Programs
Native Researchers' Cancer Control Training Program (NRCCTP)

Deadline: February 3, 2010

www.oregonprc.org

\$ - USDA, NIFA - Organic Agriculture Research and Extension Initiative (OREI)

Deadline: February 16, 2010 (New Date)

<http://www.nifa.usda.gov/funding/rfas/OREI.html>

\$ - USDA, NIFA, AFRI – Microbial Biology: Microbial Associations with Plants

Deadline: February 16, 2010

<http://www.nifa.usda.gov/fo/microbialbiologyplantmicrobeassociationsafri.cfm>

\$ - USDA, NIFA, AFRI - Plant Biology: Growth and Development

Deadline: March 2, 2010

<http://www.nifa.usda.gov/fo/plantbiologygrowthanddevelopmentafri.cfm>

\$ - USDA, NIFA - Special Research Grants Program - Pest Management Alternatives

Deadline: March 3, 2010

<http://www.nifa.usda.gov/funding/rfas/pmap.html>

\$ - USDA, NIFA, AFRI - Animal Genome: Genetics and Breeding

Deadline: March 5, 2010

<http://www.nifa.usda.gov/fo/animalgenomegeneticsandbreedingafri.cfm>

\$ - USDA, NIFA, AFRI – Integrated Solutions for Animal Agriculture

Deadline: March 16, 2010

<http://www.nifa.usda.gov/fo/integratedsolutionsforanimalagricultureafri.cfm>

\$ - USDA, NIFA - Integrated Pest Management: Crops at Risk, Risk Avoidance and Mitigation, and Methyl Bromide Transitions Competitive Grants Programs

Deadline: March 22, 2010

<http://www07.grants.gov/search/search.do?&mode=VIEW&flag2006=false&opId=51286>

\$ - USDA, NIFA - New Era Rural Technology Competitive Grants Program (RTP)

Deadline: April 14, 2010

http://www.nifa.usda.gov/funding/rfas/new_era.html

\$ - USDA, NIFA, AFRI - Biology of Weedy and Invasive Species in Agroecosystems

Deadline: April 20, 2010

<http://www.nifa.usda.gov/fo/weedyandinvasivespeciesafri.cfm>

\$ - Farm Foundation

Deadlines: April 30 and October 31

<http://www.farmfoundation.org/webcontent/Farm-Foundation-NFP-Small-Grants-Program-357.aspx?z=85&a=357>

\$ - USDA, NIFA - Western Sustainable Agriculture Research and Education Program
Sustainable Agriculture Tours

Deadline: Open until funding is exhausted

http://wsare.usu.edu/grants/docs/RFA_SAT.pdf

\$ - USDA, Rural Development
Community Facilities Loan and Grant Program

Deadline: Applications accepted on an ongoing basis

<http://www.rurdev.usda.gov/rhs/cf/cp.htm>

http://www.rurdev.usda.gov/rhs/cf/brief_cp_grant.htm

Education

\$ - USDA, NIFA - Higher Education Challenge (HEC) Grants Program

Deadline: February 5, 2010

http://www.nifa.usda.gov/funding/rfas/higher_education_challenge.html

\$ - NOAA - Environmental Literacy Grants (ELG) for Informal/Nonformal Science Education

Deadlines - Letters of Intent (Required): February 16, 2010.

Deadline for full applications: April 6, 2010.

An informational teleconference: January 21, 2010.

http://www.oesd.noaa.gov/funding_opps.html

\$ - NSF - Undergraduate Research and Mentoring in the Biological Sciences (URM)

Deadline: March 2, 2010

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=500036&org=NSF&sel_org=NSF&from=fund

\$ - Human Frontier Science Program – Short Term Fellowship Program

Deadline: rolling – applications accepted year round

http://www.hfsp.org/how/appl_forms_STF.php

\$ - NSF – Active Funding Opportunities

Deadline: Multiple

http://www.nsf.gov/funding/pgm_list.jsp?org=NSF&ord=date

Environment, Water, Energy, Invasive Species Grants

\$ - USDA, NIFA – Air Quality

Deadline: March 5, 2009

<http://www.nifa.usda.gov/fo/airqualityafri.cfm>

\$ - National Forest Foundation: Community Assistance Program

Local Forest Partnerships Fund

Deadline: proposals accepted on a rolling basis throughout year

http://www.natlforests.org/consp_05_cap.html

\$ - National Geographic Conservation Trust Offers Funding to Preserve Earth's Resources

Deadline: Open

<http://www.nationalgeographic.com/field/grants-programs/conservation-trust-application.html>

Families, Youth and Children Grants

\$ - CHS Foundation

Rural Youth and Leadership Development

Deadline: rolling – applications accepted year round

<http://www.chsfoundation.org/programs/ryld.htm>

Financial Grants

\$ - Money Management International Financial Education Foundation,
Financial Education Grants

Deadline: rolling – applications accepted year round

<http://www.mmifoundation.org/GrantSeekers.asp>

\$ - [Hitachi Foundation: Business and Communities Grants Program](http://www.hitachifoundation.org/grants/businessandcommunitiesgrantsprogram)

Grants Address Economically Isolated Communities
Interested organizations may submit an online inquiry to provide information about project ideas **at any time** and the Foundation's will determine if it fits their priorities.

<http://www.hitachifoundation.org/grants/guidelines/index.html>

Health, Nutrition, Food & Biomedical Grants

\$ - Robert Wood Johnson Foundation and Pew Charitable Trusts Announce Health Impact Project

Deadline: Open

<http://www.rwjf.org/applications/solicited/cfp.jsp?ID=20921>

Science Grants

\$ - USDA, NIFA, AFRI – Arthropod and Nematode Biology and Management: Tools, Resources, and Genomics

Deadline: April 1, 2010

<http://www.nifa.usda.gov/fo/arthropodnematodetoolsresourcesgenomicsafri.cfm>

NSF – Active Funding Opportunities

Deadline: Multiple

http://www.nsf.gov/funding/pgm_list.jsp?org=NSF&ord=date

\$ - National Geographic Society – Waitt Grants Program

Deadline: Rolling

<http://www.nationalgeographic.com/field/grants-programs/waitt-grants-application.html>

UH, Hawaii and Regional Grants

\$ - UH, University Research Council - Faculty Travel Funds
Proposal Deadline: rolling – applications must be in >4 weeks before travel.

http://www.hawaii.edu/urc/pdf/factravel_g.pdf
http://www.hawaii.edu/urc/pdf/factravel_f.pdf

... continued from NSF on page 14

UNIVERSITY of HAWAII' I MĀNOA

UH Mānoa | Facts | A-Z Index

Research & Graduate Education

Office Home
Staff
Units
Communications
Distinguished Lecture Series
Research Support Services
Biosafety Program
Committee on Human Studies
Environmental Health & Safety Office
Institutional Biosafety Committee
Laboratory Animal Services
Research Integrity

Responsible Conduct of Research

- [NSF COMPETES Act \(PDF\)](#), November 12, 2009
- [Responsible Conduct of Research \(RCR\) Training \(PDF\)](#), December 17, 2009
- [NSF-RCR UHM Institutional Plan memo \(PDF\)](#), January 4, 2010
- [NSF-RCR UHM Institutional Plan \(PDF\)](#), January 4, 2010
- [NIH-RCR UHM Institutional Plan \(PDF\)](#), January 21, 2010

More information on the new NSF requirements can be found on the OVCRGE's website.

interactive sessions (specific requirement, date and location), will be posted on the OVCRGE website (<http://www.uhm.hawaii.edu/ovcrge/research/rcr.html>) beginning early 2010. Participation in required interactive sessions must be accomplished **within 12 months of acceptance of NSF support.**

Current NSF-awardees are not required to obtain RCR training; however, individuals submitting any NSF proposal seeking **new support, renewal or extension of support** must fulfill the above RCR training requirements.

NSF proposals submitted after January 4, 2010 will automatically include as part of the submission that the UH has formulated a plan to fulfill NSF's mandate for the appropriate training and oversight in the responsible

and ethical conduct of research. In addition, each **proposal should include the following statement:**

“Assuming funding of this NSF proposal, as the designated PI, I will be responsible for insuring compliance with the University of Hawaii's plan for the appropriate training and oversight in the responsible and ethical conduct of research for all undergraduate and graduate students, and postdoctoral researchers supported by NSF.”

Additional information and copies of the memorandums with referencing regulations are located at the OVCRGE website: <http://www.uhm.hawaii.edu/ovcrge/research/rcr.html>.

Faculty publications

Greg Bruland (NREM)

Bruland, G.L., and R.A. MacKenzie. 2010. Nitrogen source tracking with $\delta^{15}\text{N}$ content of coastal wetland plants in Hawaii. *Journal of Environmental Quality* 39:409-419.

Chennat Gopalakrishnan (NREM)

Sheild, L. D., C. Gopalakrishnan and C. Chan-Halbrendt. 2009. "Aligning Stakeholders' Preferences with Public Trust in Managing In-stream Flow: The Case of Hawai'i", *Water Resources Development* 25(4): 657-679.

Gunatilake, H., C. Gopalakrishnan and F.D. De Guzman. 2009. "Role of the Private Sector in Managing the Asian Environment: A Review", *Journal of Natural Resources Policy Research* 1(4): 335-351.

Levy, J.K. and C. Gopalakrishnan. 2009. "Multicriteria Analysis for Disaster Risk Reduction in Virginia, USA: A Policy-Focused Approach to Oil and Gas Drilling in the Outer Continental Shelf". *Journal of Natural Resources Policy Research* 1(3): 213-228.

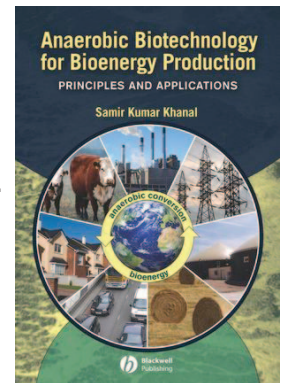
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Ken Grace (PEPS)

Husseneder, C., Berestecky, J., and Grace J. K. 2009. Changes in the composition of the culturable bacteria community in the gut of the Formosan subterranean termite depending on rearing conditions of the host. *Annals of the Entomological Society of America* 102: 498-507.

Samir Khanal (MBBE)

Khanal, S.K. 2008. *Anaerobic Biotechnology for Bioenergy Production: Principles and Application*. Wiley-Blackwell. 320 pages. <http://www.wiley.com/WileyCDA/WileyTitle/productCd-0813823463.html>



Khanal, S.K. ed. 2010. *Biofuel and Bioenergy from Biowastes and Biomass*, Lead Editor. American Society of Civil Engineers (ASCE). Due out Feb 2010.

Russell Messing (PEPS)

Muratori, F.B., Borlee, S. and R.H. Messing. 2010. Induced niche shift as an anti-predator response for an endoparasitoid. *Proceedings of the Royal Society B*: published online 13 January 2010: doi: 10.1098/rspb.2009.2029

Rachel Novotny (HNFAS)

Novotny R, Daida YG. 2009. Mixed race/ethnicity assessment using the BLEND method. *Hawaii Journal of Public Health* 2(1):1-6.

Epplein M, Novotny R, Daida Y, Vijayadeva V, Onaka OT, Le Marchand L. 2009. Association of maternal and intrauterine hormone-related exposures with age at menarche in a multiethnic population in Hawaii. *Cancer Causes and Control* DOI 10.1007/s10552-009-9457-1, online October 28.

Leon Guerrero RT, Gebhardt SE, Holden J, Kretsch MJ, Todd K, Novotny R, Murphy SP. 2009. White rice sold in Hawaii, Guam and Saipan often lacks nutrient enrichment. *Journal of the American Dietetic Association* 109:1738-1743.

Novotny R, Williams A, Vinoya A, Oshiro C, Vogt TM. 2009. US acculturation, food intake, and obesity among Asian-Pacific hotel workers. *Journal of the American Dietetic Association*. 109:1712-1718.

Murphy SP, Martin CL, Davison N, Cheung L W-K, Au DL, Novotny R. 2009. A Comparison of Two Systems for Entering and Assessing Dietary Data for a Research Study. *Journal of the American Dietetic Association*. 2009;109:905-908.

Dan Rubinoff (PEPS)

Rubinoff, D. B.S. Holland, A. Shibata, R. H. Messing, and M. G. Wright. 2010. Rapid invasion despite extremely low genetic diversity in the invasive Erythrina Gall Wasp (*Quadrastichus erythrinae* Kim Delvare and La Salle 2004. *Pacific Science* 64:23-31.

Rubinoff, D, K. H. Osborne, and A. Kawahara. 2009. Synonymization of the euphonious *Arctonotus Boisduval*, 1852 (Sphingidae: Macroglossinae) based on molecular phylogenetic analysis. *Journal of the Lepidopterist's Society* 63:233-235.

Ashley Stokes (HNFAS)

Stokes AM, Eades SC, Moore RM. *The pathophysiology and treatment of acute laminitis*. In: Reed SM, Bayly WM, Sellon D, eds. *Equine Internal Medicine*. 3rd ed. Philadelphia: Elsevier, 2010.