

A Brief Look At Some Highlights of the IAS's Activities In 2012

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IAS Project Wins Regional Prize



The Pacific Water and Waste Association recently awarded the 2012 prize for Best Water Infrastructure Innovation Project in the Pacific to a project initiated by the Institute of Applied Science (IAS) at the University of the South Pacific at a ceremony held in Auckland. This was for a water and sanitation project for Votua village, Nadroga. Studies by IAS around 2000 had shown very high nutrient levels in the coral reefs along the Coral Coast which have contributed to algal overgrowth of coral in many places.

Working with the New Zealand National Institute of Water and Atmospheric Research (NIWA), a study was undertaken which showed the nutrients came mainly from human and pig waste. A number of initiatives such as waste composting and development of wetlands were undertaken to retain the nutrients on land.

Based on early successes the NZ government funded NIWA to work with IAS to build a large wetland that would treat all septic tank outflow in Votua Village before the purified waste water was discharged into a village stream. In early community meetings the urgent need for an improved water supply was noted which was achieved via an AUSAID climate change adaptation project to improve water supply. The wetland system was completed in 2010, as much as 90% of the nutrients are removed by the wetland.

Such projects are complex, noted Dr. Chris Tanner, the NIWA project leader. It could only have been successful with the hard work of the Votua people over four years and especially their Water Committee and Community leader Ratu Kini Ravonoloa, resident development and conservation leader Victor Bonito of Reef Explorer, Fiji and Viliame Jeke who served as water engineer and community liaison person. NZAID have approved additional funding to work with IAS to simplify the wastewater management approach and apply it to addition communities with similar problems.



New ICP- OES Installed at IAS

A new ICP- OES (Inductively coupled Plasma - Optical Emission Spectroscopy) machine was installed at IAS in mid June 2012. Installations and pre-training were carried out by a Perkin Elmer engineer, supplier of the instrument. The ICP- OES is a powerful analytical tool and is used in the determination of some 50 elements in various sample types. Those samples can either be in an aqueous or oil medium.

The ICP-OES works by converting a sample solution into an aerosol which is pushed into a spray chamber. From here, only very fine droplets get transported by the nebulizer gas into the plasma. The ICP can generate temperatures of up to 10,000°C resulting in vaporization and atomization of samples. A process of

excitation and ionization also takes place in the plasma. The process of excitation and emission of an element requires a certain amount of energy and this energy is dependent on the emission/excitation wavelength. Each element has a unique emission and excitation wavelengths. By using atomic spectrometry techniques quantitative and qualitative information about a sample can be obtained. In the ICP-OES, concentration of elements in a sample is related to the amount of electromagnetic radiation that is emitted.

The ICP-OES being a multi-element machine will greatly reduce analysis time and cost for samples requiring multi-element determination. With the large number of elements that the ICP-OES is capable of determining,

the Institute is now well placed to be a player in Fiji's booming mining industry.

With the Fiji Government pushing for more bio-fuels at gas stations, the ICP-OES will be used in determining phosphorous and other elements in bio-fuels.

IAS is awaiting the provision of high purity argon gas from which matrix that enters the plasma is made, to hold a training course in machine operation.

The cost of the instrument was supported by the Fijian Government as part of its Bio-fuels Laboratory partnership with the University.

Stakeholders Meet For Planning of Provincial Coastal Management

The University of the South Pacific's Institute of Applied Sciences in partnership with the Fiji Department of Environment recently hosted the Integrated Coastal Management (ICM) planning meeting of stakeholders for the Ra Province in Fiji.

The Ra Province is one of the 14 provinces in the country and is located on the northern part of Viti Levu, the largest island of Fiji.

The meeting, which was held on 8 November, 2012 at the Ra Provincial Office, was well represented by about 60 participants from the Government, NGOs, private sector and communities.

The meeting was led by the Director of the Institute of Applied Sciences (IAS), Professor Bill Aalbersberg. Professor Aalbersberg explained that the main aim of the meeting was to bring together key Ra provincial stakeholders from the public and private sectors to share progress and challenges, in a participatory approach, in regards to ICM issues and to develop a common vision towards the development of an ICM plan for the province.

Main outcomes from the meeting included the development of broad statements towards a vision for the Ra Province ICM Plan, the prioritisation of six main issues that will form the basis of an action plan and the formation

of a Ra Province ICM Committee comprising representation from each of the stakeholder groups that will oversee the implementation of the action plan for the province.

This activity was undertaken as part of the Coral Triangle Pacific project which is jointly being implemented by the Fiji Department of Environment and the Institute of Applied Sciences in cooperation with NGOs.

The aim of this project is to improve the resilience of coastal and marine ecosystems and climate change within five countries including Fiji. Ra province is the pilot site for Fiji with the focus of efforts to develop an integrated coastal resource management plan for the province.

SFP/ EU REP Visits IAS Laboratory

A representative of the SFP (Strengthening Fisheries Products) program of the European Union Mr Paul Nichols visited the IAS Microbiology Laboratory on Thursday 14th June, 2012 to evaluate the effectiveness of the assistance given to the Institute.

Over the last three years, particularly 2009, technical experts supported by the program made visits to the Institute to provide training and technical support to improve the capabilities of the laboratory especially for microbiological tests that are required by the European Union for fish export. On top of this, the laboratory through the Ministry of Health received equipment such as a pH meter, oven, water de-ionizer and refrigerators to help boost its equipment base.

As a result of the training and technical advice provided for by the SFP program, the IAS microbiology laboratory achieved international accreditation under ISO17025 for core analyses in 2009 and has been able to expand on its scope since then. Equipment received is either being used or kept as backup.

Mr Nichols expressed his satisfaction on the utilization of their support to IAS. He did mention that a number of countries in the ACP block that received similar support had equipment that was not utilized at all. He added that there will be further rounds of assistance to be made and IAS is now well placed to receive further assistance from them.

This will be especially true as the Economic Partnership Agreement with the EU and the Pacific states is being developed and that could greatly expand the scope of trade. Like tuna, other products will need to meet health and safety standards.

The IAS laboratory has been identified as a possible regional testing laboratory and a team from the EU will visit later in the year to do a feasibility study.

New Plant Discovered In Fiji



A new flowering plant belonging to the *Medinilla* species, similar to that of the famous *Tagimoucia* flower, has been recently discovered on the island of Kadavu in Fiji. The plant was found on the edge of a remnant primary forest during a biodiversity assessment of forests in Nakasaleka district, Kadavu by scientists at the Institute of Applied Sciences (IAS) of the University of the South Pacific working under the IUCN - Water and Nature Initiative project.

Taxonomic work is currently underway to get a proper name of the plant and in the meantime a temporary name has been given for the plant. It is called *Medinilla Matasawalevu*, illustrating the location where it was discovered.

Mr Marika Tuiwawa, Curator of the South Pacific Regional Herbarium and lead scientist and botanist on this particular expedition, highlighted that discovering new things was part of their everyday work at IAS. Commenting on the discovery, Mr Tuiwawa revealed that it was an "opportunistic find". This is despite the fact that there have been many research done since the University came into existence, there are still many species out there that nobody knows about which is yet to be discovered and identified.

"We were actually on our way down to the village of Matasawalevu, after seven hours of hiking, where we were going to spend the night. We were looking around where we were walking and saw this cluster of white flowers in a tree growing at the edge of the grassland. Upon closer examination, I

realised that I was looking at a flower that I had not seen anywhere else in Fiji. Yes, it is definitely a new record for Fiji" he said.

There are about 400 known species of *Medinilla* around the world and of that, 11 can only be found in Fiji. The major threat to the new species is the disappearing of its habitat, Mr Tuiwawa said. The only reason the plant has been discovered is because it is growing at the edge of where the burning of a traditional road, which links two villages, continually takes place to keep the route accessible.

The Global Director of IUCN's Biodiversity Conservation Group, Ms Jane Smart further noted that the fact that only one plant of this kind was found so far and that it occurs in such a vulnerable place should set alarm bells ringing.

The challenge now is to protect the new species and raise awareness of its importance among local communities, to secure its long term future, Ms Smart stated.

Mr Tuiwawa pointed that there was a serious lack of knowledge on the plant within the local community which is why IAS is planning to carry community awareness about the plant.

"I am glad IUCN is willing to provide some funds for community awareness and at the same time enable an assessment to find out if there are other plants of the same type around the vicinity," he added.

Mr Tuiwawa further added that USP plays a very important role in training scientists (taxonomist) within the Pacific region who now have the skills and experience to recognise unique organisms around them.

Manager Analytical Services Attends Kava Meeting in Vanuatu



Mr Usaia Dolodolotawake(6th from left) with Conference Participants at Vanuatu.

The manager Analytical services, IAS, Mr Usaia Dolodolotawake attended a High Level Conference on Kava in Port Vila Vanuatu from 12 – 15th March, 2012. Mr. Dolodolotawake was part of the Fiji Government delegation that attended the meeting. The meeting was attended by kava producing countries namely; Fiji, Samoa, Tonga, Papua New Guinea, Solomon Islands, Federated States of Micronesia and hosts Vanuatu. Delegates include Government Officials, kava grower's representatives, exporters and scientists.

The purpose of the meeting was to formulate an action plan to further try and convince the European Union, in particular Germany, to lift its ban on Kava products being sold in its markets. The ban stemmed from allegations that kava products were toxic to the liver and was alleged to have been responsible for a handful of deaths in Germany. A later WHO report disputed these findings.

It was agreed that to further the Pacific Islands' case, a Codex Standard for kava and kava products be formulated and a harmonized Pacific standard shall be proposed to become the international standard.

Some of the requirements of the standard are: that all kava varieties in-countries be identified and

kava lactones profile and content determined. Kava lactones profiling will ensure that the desirable 2, 4... and 4, 2... varieties are propagated and exported (2 and 4 refer to two of the six kava lactones thought to have the most positive relaxation qualities). Further, the determination of the ratio of kavain and methysticin may add to safety by further excluding unwanted varieties. The determination of flavokavains B will act as markers for the presence of the undesirable two-day kava as well as other botanical species such as *Piper aduncum* which also contain kava lactones. The possibility of determining aflatoxins was also mentioned. Physical parameters to be determined will include moisture, ash and presence of foreign matter.

From ensuing discussions, it was noted that the IAS laboratory was in a position to become the regional laboratory in the assay of kava and kava products to ensure conformity to the standard.

During the course of the meeting, informal discussions were held with stakeholders as well as distributing IAS brochures.

IAS will now work closely with the Fijian Government to ensuring that its activities required under Codex are met.



Group photo of IAS members during the visit of the two renowned scientists.

IAS Hosts Two Renowned Scientists

Thursday 9th of August, the day before USP's Open Day, will go down as a very special day in the history books for the Institute of Applied Sciences "Center for Drug Discovery and Conservation" (CDDC) unit. They were hosting Nobel Prize winner (Chemistry) Professor Suzuki from 9-10.30am for some discussions centering on his famous reaction and presentations of the unit made to discuss their relentless efforts to discover new potential drug leads from marine bacteria, algae and invertebrates. Prof Suzuki was impressed about the work and the laboratory set-up at lower campus.

Prof. Aalbersberg, the director of IAS, took his Japanese colleague to a tour at IAS and said he was indeed honored of hosting this special guest. Both then stayed on to attend a presentation by Dr Patrick Colin, the famous author of the book: "Tropical Pacific Invertebrates: A field guide to the marine invertebrates occurring on tropical Pacific coral reefs, seagrass beds and mangroves." He presented a talk on the history of the National Cancer Institute's marine collections program: "Integrating taxonomy, zoogeography and drug discovery", which is in many ways similar to the CDDC work. He also indicated his willingness of collaborating with the IAS team including a possible collection trip to the Solomon Islands early next year. The following discussions were led by Prof. Randy Thaman.



Algal taxonomist, Dr. Antoine De Ramon N'Yeurt (3rd from right) with the workshop participants.

Marine Biologists Get Trained On Algal Taxonomy

A workshop aimed at training marine biologists in the identification of common tropical marine algae (seaweeds) occurring in the Pacific Islands region was held recently at the Institute of Applied Sciences (IAS) based at the University of the South Pacific in Suva.

The three-day workshop, which ran from 14-16 August 2012, was organised by Mr Klaus Feussner and Dr Katy Soapi from IAS.

It was attended by staff members from IAS, the School of Marine Studies and Georgia Institute of Technology, Atlanta in the United States.

Identifying seaweeds is a skill useful when undertaking surveys and scientific research for natural products, as well as doing biodiversity assessments or environmental impact assessment.

Seaweeds are important primary producers and the base of the food chain, providing food to many other marine species. At least seven different species of seaweeds are consumed in Fiji and Rotuma, the most common ones being the genera *Caulerpa*, *Gracilaria*, *Hypnea* and *Meristotheca*.

During the workshop, participants were shown some of these seaweed species and trained how to identify

them including many more that are commonly found on coral reefs around the Pacific region.

The training instructor, Dr Antoine De Ramon N'Yeurt, an expert on algal taxonomy in the Pacific region, discussed the importance of seaweeds as indicators of the health of marine ecosystems where a predominance of seaweeds is an indicator of poor reef health in the tropics.



He explained on the other major disturbances that lead to algal dominance such as increase in nutrients, over fishing of herbivores, tropical cyclones and warmer climate.

"Seaweed dominance can also act as indicators of climate change, their sensitivity to seawater temperature and migration southwards as the climate becomes warmer, are early warning signs of global warming," he added.

Participants also had an opportunity to get some hands-on experience in identifying algae samples collected from the Nasese foreshore in Suva and samples from the Solomon Islands collected from a field expedition in March earlier this year.

One of the participants, Professor Mark Hay thanked the instructor and organisers for arranging the workshop, adding that, he enjoyed it and learned a lot.

Professor Hay and his team are working with IAS to find new drugs from marine algae and a red alga from Fiji has shown very strong antimalarial potency.

The workshop concluded with Dr N'Yeurt thanking the participants for their enthusiasm and keen interest in learning about algae and their identification, followed by presentations of certificates to the participants.



Alivereti Naikatini

Meet A Staff Member

1. Explain your role at IAS?

My role involves assisting the SPRH Curator of the in the maintenance of the Herbarium facility and this includes preparation and storage of plant specimens in the herbarium facility and databasing of specimens. It also involves conducting baseline biodiversity surveys around the country and the region and assisting students and researchers with work on plants and terrestrial biodiversity in Fiji.

2. What do you enjoy best about your work?

I enjoy going out on the field with researchers and learning interesting things about our local biodiversity, some of which are very unique and only found in Fiji. With my work I also get to visit a lot of places in Fiji, the South Pacific region and internationally and apart from the biodiversity surveys, I get to meet and interact with people of diverse backgrounds. Learning about various places' historical facts, cultures and lifestyle practices and the different dialects spoken in Fiji has given me a better understanding and allowed me to be more appreciative of the diversity of life in Fiji and the region.

IAS Staff Construct HART Village Footpath

**IAS GIVES
BACK TO THE
COMMUNITY**



IAS team at worksite.

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The Institute of Applied Science Staff as part of their "social responsibility" and team bonding exercise has over the years visited places such as the Old People's Home in Samabula and the School of the Blind in Vatuwaqa. The visits included presentation of items such as singing and handing over of gifts in cash and kind. These alms were donated by staff members. The construction of a concrete foot path in the Valelevu HART Village was identified as this year's activity and staff members fundraised for the cost of materials.

On Saturday 30th June, IAS staff worked from early morning to afternoon as well as after work on the 3rd of July to complete the new footpath.

The Valelevu HART Village is home to thirty families who are either very low income earners or not employed at all. A good number of the residents are elderly and/or physically disabled. The new footpath has greatly helped those on wheel and walkers and the other residents alike. Previously a dirt footpath with bits and pieces of broken concrete thrown in was being used. Residents especially those on walking aid found it a daily challenge to use the footpath. Wet weather makes the path slippery and muddy. The new concrete foot path has seen these difficulties a thing of the past.

Spokesperson for the village Mr. Livai Ceva expressed the community's gratitude to the IAS team on the work that was done. He said that the footpath is something the residents use daily and the new one will make life a bit better for them.

IAS Congratulates the following who Graduated in 2012

MSc



Rusiate Ratuniata
GA,
Environment Unit



Klauss Feussner
Assistant Project
Manager ,
Drug Discovery
Unit



Joape Ginigini
GA, Drug
Discovery Unit

BSc



Anjila Nand
Raghunaiya
Technician,
Micro Lab



Mohammed Riaz Ali
Scientific Officer,
Analytical Lab

Congratulations and Welcome to the IAS Family!



Philip Gabriel
on his marriage
to Pritika Dayal

Tima Waqainabete, Kavita Ragini, Leigh-anne Buliruarua, Hilda Sakiti Waqa,
Joape Ginigini & Ron Simpson who welcomed new additions to their families.

IAS, USP Staff Member Awarded Prestigious Greg Urwin Award



Mr. Rohitesh Kumar, a Scientific Officer in the Center for Drug Discovery and Conservation (CDDC) at the Institute of Applied Sciences, The University of the South Pacific (USP) has been awarded the prestigious Greg Urwin Award. The Award, established in 2008 in memory of the late Secretary General, Pacific Islands Forum, supports the Pacific Leadership Program on behalf of AusAID and is awarded annually to emerging Pacific Island leaders in a range of disciplines.

Mr. Kumar's primary research is focused on marine sponges, algae and micro-organisms for the discovery of new bioactive compounds at USP. He will continue his research interest at the ESKITIS Institute for Cell and Molecular Therapies at Griffith University, QLD, Australia from May – November 2012. The ESKITIS Institute is dedicated to novel drug discovery and cell-based therapies for the development of new strategies to prevent and treat diseases. Through his placement, Mr. Kumar intends to improve his research knowledge with wide range of techniques in natural product discovery and expertise in the various instruments handling for drug discovery. Further he aims to gain exposure to the state of the art facilities for the purpose of drug discovery that are potential cure to deadly diseases such as cancer.

Professor Bill Aalbersberg, Director, IAS in congratulating Mr Kumar, stated that Mr Kumar's achievement will encourage scientists and professionals in the Pacific region to make better use of the region's abundant natural resources and attract more researchers and students from the Pacific to work in the area of drug discovery and conservation.

A disappearing underwater world

Mark Hay
Saturday, December 31, 2011

Despite my growing up in Kentucky, not having a passport until my early 20s and not seeing a tropical coral reef until I was in graduate school, whenever I step off a plane in the tropics, I feel like I've come home.

The organic, fungal smell of heavy tropical humidity is somehow comforting and "right" for me; I also associate it with coral reefs, and a wonderful, but disappearing, underwater world that has become a major focus of my life's work.

After 28 hours of flying, layovers, slow immigration and customs lines and a long in-country bus ride, I finally arrive in Votua Village on the coral coast of Viti Levu, Fiji, where my group has established a small lab to work on the ecology of coral reefs.

We chose Votua Village because the villagers here have been especially proactive in establishing and protecting an area of their reef (a Marine Protected Area). They welcomed us, wanting to know more about how to best conserve their reef and associated resources.

Reef preservation, much less recovery, is a daunting challenge. In the 30 years I've worked on reefs in the Caribbean, Indian Ocean and tropical Pacific, we have learned more about reef function and the processes that keep them healthy, but these processes are degrading rapidly and reefs worldwide seem to be in a biotic death spiral.

I have two sons in their 20s and cannot show them an average Caribbean reef like the ones I worked on when they were born, much less a "good" one. Healthy Caribbean reefs have disappeared in that short time.

When my sons were born, an average Caribbean reef was covered by 50 to 60 percent live coral; today it is 5 to 10 percent. This is the equivalent of losing pine forests from Georgia or aspens from the Rocky Mountains in less than 30 years. During this same period, the Great Barrier Reef in Australia lost about 50 percent of its coral cover.

Worldwide, coral reefs are being converted to seaweed-covered meadows that do not support the biodiverse assemblage of species that allow a reef to function.

With reef loss, the villagers of Fiji lose food security (fish from the sea), the protection from storm surge that the reef provides, income from tourists who come to Fiji for its beautiful reefs, and many other critical ecosystem services that are the lifeblood of tropical island nations and peoples.

Reef loss results from a host of synergistic and growing environmental insults: overfishing, global change, ocean acidification, pollution, coral disease.

What can local villagers do to preserve reefs when so many of the stresses are global? Will local efforts to manage fishing and pollution be enough, or will global-scale ocean warming and acidification kill the reefs anyway? The long-term answer is unclear, but the short-term results are promising. When fishing is prohibited, the intact food web on a reef helps it recover from even large-scale climate stresses, disease outbreaks, etc.

Our present work in Fiji focuses on determining how seaweeds affect corals (some seaweeds poison corals when they come into contact); which fishes best control the most damaging seaweeds (by eating them despite the bioactive chemicals they produce); and how villagers might limit or focus fishing practices to leave critical components of the food web intact, allowing corals, fishes, seaweeds, and villagers to sustainably coexist in a way that preserves reef presence and function.

Much of this work is focused on understanding chemical signals in the sea and how transmission of these chemicals among organisms constitutes the language of life on a reef, altering organism behaviors in ways that can facilitate reef health and recovery or, if interfered with, cause reef decline and initiate the biotic death spiral that modern reefs seem to be experiencing.

* Mark Hay, a biology professor at Georgia Tech, writes from Fiji, where he is investigating coral-seaweed competition in the coral reefs.



Corals in the Votua marine protected area. Picture: E Hunter Hay

[+ Enlarge this image](#)

From marine ecology to drug discovery

Mark Hay
Friday, January 06, 2012

I OFTEN hear someone lament that the era of great adventures is over: "I was born too late."

In terms of finding new lands, agreed; but in terms of finding new intellectual adventures, this is dead wrong. For discovery of new biological and ecological understanding, we live in the most adventurous time ever. Our field expeditions are often conducted much like those of 100 years ago, but this expedition research ends up producing compounds that can be identified only through the use of today's most cutting-edge technology.

In Fiji, one sees clearly that human health and the environment are linked. We have experienced ciguatera poisoning from being served fish that fed on the toxic dinoflagellates that produce this poison, and we have experienced the considerable discomfort of dengue fever (called bone-break fever for how it makes you feel), which is spread by mosquitoes under certain environmental conditions.

Here, we use ecological research financed largely by the National Science Foundation to inform a search for useful drugs from marine organisms that is financed largely by the National Institutes of Health.

In these investigations, the "white coat" findings of our lab studies result in compounds being patented as possible anti-malarial, antibiotic, or anti-cancer drugs, but the "wet suit" parts of these studies begin on isolated islands and in rudimentary boats where we live in Fijian culture, sleep on a ship deck where a goat was just slaughtered for dinner, and have to dodge sharks while collecting chemically rich seaweeds that produce bioactive compounds with potential for drug development.

The connection between ecology and drug discovery started for us when we realised that prey species were turning production of defensive traits off and on as needed for different enemies.

As an example, the simple phytoplankton *Phaeocystis* could, via chemical senses alone, "smell" its neighbours being attacked, identify the attacking enemy and alter its traits in opposite directions (becoming larger or smaller, solitary or colonial) depending on the traits that deterred feeding by that particular enemy. This alteration caused the phytoplankton's palatability to decrease by as much as 95 per cent within three days of smelling an attack.

Seaweeds and some marine invertebrates show similar changes. Thus, many prey are more variable biochemically than was initially realised.

By using our ecological insights to "turn on" prey defences, we have increased our rates of discovery of possible medicines from marine organisms. As an example, our collaborating chemists and ecologists (from Georgia Tech, the Scripps Institute of Oceanography and the University of the South Pacific) have discovered 33 previously unknown bioactive molecules from the red seaweed *Callophycus*.

Some of these compounds show potent activities in antibacterial, anti-cancer, or anti-malaria assays, and patents have been filed for developing *Callophycus* compounds as anti-malarial drugs.

Although the final stages of the drug development research occur in technologically advanced laboratory settings, the initial stages of finding new species, learning to turn on increased compound production and so forth, are dependent on field scientists accessing remote and unexplored natural habitats, and often doing so under trying conditions of heavy seas, little communication and few of the comforts of the modern world.

For us that is coral reefs in remote regions like the Lau Group in Fiji where in most of these regions there are no beds, no electricity, no dependable drinking water.

On a recent trip, there were more than 30 people on a "ship" that could sleep about 10. This necessitated a space on the deck serving as a butcher shop for disassembling a goat at 4pm, a lab bench for processing samples at 5pm, a dining table at 7pm, and a bed at 10 pm, with each event separated by a "cleaning" consisting of five gallons of seawater dumped across the deck.

By combining air travel, molecular sciences and careful chemistry with a hunt for the wild that still exists in some places, an adventurous ecologist today can get to more places than ever before, and explore them in greater depth than our colleagues of long ago could ever imagine.

Three centuries ago, Sir Isaac Newton noted that he was just a child picking up shells on the seashore, while the great ocean of undiscovered truth lay all before him.

Our world for discovery is no less vast; today scientists can set sail on a sea of discovery that dwarfs those of previous adventurers.

* Mark Hay, a biology professor at Georgia Tech, USA, is investigating coral-seaweed competition in Fiji's coral reefs. His article was published in The New York Times.



[+ Enlarge this image](#)

Collecting marine organisms for drug discovery or ecological experiments involves meeting with other "curious" creatures, like this three-meter-long bull shark. Picture: MARK HAY