HIGHLIGHTS

Faculty of Science Newsletter 香港大學理學院通訊 http://www.scifac.hku.hk/newsletter Published in October, 2015

FROM THE EDITOR Dear readers,

The "lead water incident" is the most serious health issue in Hong Kong. In this issue of *science@HKU*, we report the toxicology of lead. We also discuss the possible ways of heavy metal contamination of our water sources.

Yours sincerely, Professor Hoi Fung CHAU Chief Editor

Statistics in the Era of Big Data

By Dr Philip L H Yu, Department of Statistics and Actuarial Science

Possibly you may not know that we are producing data every day, from birth to death. Starting from 2014, Google began collecting genetic and molecular information from thousands of healthy volunteers, in an attempt to allow medical experts to predict the onset of diseases such as heart disease and cancer. The company Evolv extracted millions of applicant data from job openings in hundreds of the world's largest companies such as Xerox and Starwood Hotels & Resorts, with an aim to find suitable talents for such organizations. Although you may not want to volunteer in the Google project or to find another job, you possibly have installed Facebook, a popular social media app in your smart mobile, and the daily data on your personal connections and sharing have actually been uploaded to the Facebook server. This offers Facebook a wealth of data to identify the "influencers" in each social group, so that advertisers can maximize their market spending by targeting these "influencers".

There is no doubt that the world is now experiencing a proliferation of big data whose volume, variety and velocity continue to reach unprecedented levels, capturing and analyzing data have tremendously influenced how decisions are made and how resources are allocated in various fields, as the accuracy of data processing can affect the results variably. However, the market is facing a shortage of talents who can employ techniques and theories drawn from mathematics, statistics and computer science to analyze big data, to formulate data-driven strategies and to communicate with stakeholders effectively. Someone call them "data scientists", the sexiest job of the

21st century called by Davenport and Patil (2012).

Statistics is the science of studying uncertainty and learning from data. Statistics is said to be the most mature of the data sciences as discussed in a whitepaper written by the Big Data R&D Initiative working group of the American Statistical Association (ASA) in July 2014. In the Royal Statistical Society's President Address delivered by Professor Peter J Diggle in 2015 (Diggle 2015), he argued that data science is not just a new name for statistics. In fact the title of the ASA whitepaper "Discovery with Data: Leveraging Statistics with Computer Science to Transform Science and Society" reveals that the data scientists should be able to integrate computer technologies and statistical techniques to help tackle the many big data challenges.

In this article, I will briefly introduce several recent research projects which demonstrate the essential contribution of statistics in big data research and applications.



The rapid developments of human genomics, medical imaging, cuttingedge statistical and computational methods, and mobile technology of wearable trackers in recent decades allow scientists to collect data on each person's clinical, genetic, and environmental information as well as the streaming data on biometric indicators such as body

temperature, heartbeat, hydration and even blood-glucose levels, to develop tools to monitor individual patterns of disease, potentially leading to better personalized health predictions and treatment. A field known as personalized medicine has emerged.

Given a huge volume of data on millions of genomic features collected in a single experiment, this poses many statistical and computational challenges that include multiple hypothesis testing, biomarker selection, and selection of significant genes for cancer classification. For instance, the graph on the right shows that a heat map of a small number (165) of genes selected from 12625 genes (rows) for 47 adult T-cell acute lymphocytic leukemia patients (columns) which are grouped according to two specific forms of chromosomal translocation (10 and 37 patients). The yellow/red "heat" colors represent the expression value of the genes across different samples. Can you identify the two groups of patients? Can you perform statistical inference to select the most important genes that can differentiate the two groups?





Personalized Recommendations

The application aims to incorporate knowledge of how people rate products such as movies, books, and healthcare services to help large companies like Netflix (movie-rental company), Amazon and government to create tailored made recommendations/services for individuals.

Consider the Netflix data set containing 17,770 movies (columns) made by 480,189 customers (rows) who have rated the movies on a scale from 1 (worst) to 5 (best). See Table 1 for an excerpt of the Netfix movie rating data.

It can be seen that not all movies are rated by every customer. In fact, only 100 million (1%) of the ratings are available in the data. Such big data set poses several research problems including data visualization, dimensional reduction and clustering. Among all, the most important problem is to predict the ratings for unrated movies, so as to better recommend movies to customers, known as matrix completion problem. Such problem has been formulated in different approaches such as sparse matrix approximation, penalized singular value decomposition, probabilistic matrix factorization, rank aggregation, just to name a few.

Customer	Movie 1	Movie 2	Movie 3	Movie 4	Movie 5	Movie 6	Movie 7	Movie 8	Movie 9	Movie 10
1	×	×	×	×	4	×	×	×	×	×
2	×	×	3	×	×	×	3	×	×	3
3	×	2	×	4	×	×	×	×	2	×
4	3		×	×	×	×	×	×	×	×
5	5	5	×	×	4	×	×	×	×	×
6	×	×	×	×	×	2	4	×	×	×
7	×	×	5	×	×	×	×	3	×	×
8	×	×	×	×	×	2	×	×	×	3

Table 1. Excerpt of the Netfix data. The symbol \times represents that a movie was not rated by the customer.



Social Media and Network

Nowadays, various social media platforms such as Facebook, Twitter and Instagram are getting huge worldwide penetration. According to a study in 2013, people spent more than 27% of internet time on social networking (Experian 2013). The popular use of social media platforms attracts a lot of attention in many areas including product advertisement, sentiment analysis and election

prediction.

The communications among users in the social media platforms can then form a network graph with interconnected nodes where each node represents a user and a line connecting two nodes may indicate an interaction, a friendship or

a contact. Sometimes, an arrow will be drawn on the line to indicate the direction of contact or information flow.

Given the social communication activities made among the users, some users may be more influential in a social network in the sense that they tend to post more messages than the others. As these messages are mainly text documents, various text mining and computational linguistics tools such as statistical natural language processing, content categorization, etc., are essential methods of quantifying and analyzing textual data. See Yu and Tang (2015) for example.

A New Major – Decision Analytics

To meet the growing demand of talents in this area, the Faculty of Science of HKU has launched a new major 'Decision Analytics' since September 2015, the first and only Major in Decision Analytics in Hong Kong.

As one of the 16 Majors in the 6901 Bachelor of Science Programme, Decision Analytics is the most comprehensive major locally that integrates computer technologies and statistical techniques to analyze complex data so as to make better decisions.

Core courses in the new major emphasize the fundamental concepts and methodologies of decision analytics which include but not limited to statistical analysis, data mining and data visualization, programming, data structuring, mathematical and statistical modelling and implementation of database systems. Elective courses focus on diverse and applied techniques of decision analytics in multidisciplinary fields. The design of the curriculum acquaints students with dynamic analytical tools, enhances their proficiency in implementation of advanced modelling techniques and database management, and allows them to translate and communicate technical information with collaborators effectively.

Many companies and governments in the U.S. and Europe are recognizing the benefits of big data decision analytics and have committed a lot of funding to big data research and development. I believe that the future development of big data analytics in Hong Kong is promising. Even now, we can see some exciting big data projects in banks and telecommunications, and a number of organizations established recently in promoting the use of big data analytics. For example, the Hospital Authority of Hong Kong has developed a statistical model which can accurately predict the risk of elderly emergency medical admissions within a month following an index hospital visit based on a sample of over a million of episodes. As mentioned by Tsui, et al. (2015), this model has been computerized into an automated screening tool to recruit high-risk elderly patients discharged from all public hospitals in Hong Kong into the Community Health Call Centre service with an aim to prevent avoidable hospitalizations.

Notice that big data is simply big, but not necessarily complete or accurate! Talents who are able to make effective use of statistical and computational tools in processing and analyzing big data are in great demand. Are you ready to tackle the big data challenge?

For list of references and writer's profile, please visit www.scifac.hku.hk/bigdata





Statistics Workshop on the World Statistics Day. October 20, 2015 marked the World Statistics Day, which was proclaimed by the United Nations to recognize the importance of statistics in shaping our societies. In celebration of the special day, the Faculty of Science and Department of Statistics and Actuarial Science co-organized a half-day workshop entitled "**Statistics in the Era of Big Data**" for secondary school teachers, students and undergraduate students. The workshop, which aimed at arousing the young generation's interest in statistics and raising their awareness of wide-ranging applications of both statistics and big data in daily life through talks and fun-filled games, was well received by over 200 participants from 14 secondary schools.



The workshop was well received by more than 200 secondary school teachers and students.

Speakers of the workshop. From the left: Dr Philip Yu and representatives from the Census and Statistics Department, HKSAR.



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Participants were playing a game on statistics and decision making.



Head of Department of Statistics and Actuarial Science Professor W K Li welcomed participants from secondary schools.

Lead in Drinking Water

by Dr Chan Wing Tat, Department of Chemistry

Access to safe drinking water is essential to the health of the population [1]. The recent incidents of lead contamination of drinking water in public housing estates and schools have heightened our awareness of water safety [2]. Lead contamination of drinking water is a health hazard because the metal can interfere with red blood cell chemistry, delay physical and mental development in babies and young children, cause deficits in attention span, hearing and learning abilities of children. Chronic exposure to lead may also cause cerebrovascular and kidney diseases and cancers [3].

> The drinking water in Hong Kong is considered to be safe [4]. Drinking water quality is maintained by Water Supplies Department (WSD) and is in compliance with the WHO Guidelines for Drinking-Water Quality [4]. The quality of our raw water, the Dongjiang water at the Muk Wu

> > Pumping Station, Ta Kwu Ling (打鼓嶺), also meets the national Environmental Quality Standards for Surface Water (GB3838-2002) [4]. The average concentration of lead in the waters within the period of 4/2014 to 3/2015 was < 1 µg/L (microgram per liter of water), well below the WHO Guideline value of 10 µg/L. It turns out that the elevated lead contents in drinking water in the public housing estates come from leaded solder joints and copper alloy fittings installed in the inside service of the buildings [5,6].

It is well-documented that lead (Pb) occurs in drinking water mainly due to corrosion of plumbing materials, such as lead pipes and brass faucets in the water distribution system [7]. In Hong Kong, lead pipes are not used. The potential sources of lead are copper pipes joined by lead solder (50:50 tin:lead solder) and brass faucets, fittings and valves. Corrosion of the surfaces of the devices produces divalent lead, Pb(II), which is soluble in water. The extent of corrosion depends on the pH, alkalinity (bicarbonate content), and temperature of the water as well as the time of contact with water. For example, acidic water increases the solubility of Pb substantially. The solubility of Pb is 10 μ g/L at pH 8 and exceeds 100 μ g/L at pH 6.5 [3]. Galvanic corrosion is also a possible mechanism to leach Pb into water from lead-soldered copper pipes, although the mechanism is considered to be relatively minor [7]. The standard reduction potentials of copper and lead are +0.337 V and -0.126 V, respectively. The difference in the electrochemical potentials of the two metals may facilitate corrosion of lead. Electrical grounding through the plumbing may also aggravate galvanic corrosion. To control corrosion of the plumbing materials, phosphate can be added in water to form insoluble lead phosphate which effectively passivates the inner surface of the plumbing and reduces the corrosion rate [7]. In Hong Kong, residual chlorine is maintained in the water to prevent bacterial growth. The residual chlorine also facilitates the formation of insoluble

deposit of Pb, the tetravalent lead oxide (PbO₂) [7]. As a result, the leaching of Pb from the lead-containing components of the plumbing will reduce with time. However, the deposit may break loose upon sudden change in water pressure and flow rate and build up in the faucet aerators as Pb-containing particulates. (Faucet aerators are circular water-saving devices installed at the outlet of the water tap that introduce air into the water flow to increase the apparent water flow rate). The Pb-containing particulates are in the form of PbO₂, Pb₃(OH)₂(CO₃)₂ (hydrocerussite), and PbCO₃ (cerussite), depending on the oxidation reduction potential or chlorine contents of the water. The aerators, therefore, should be disassembled and cleaned periodically to remove any deposits. To remove Pb in water, the Center of Health Protection (CHP) recommends installation of water filters certified to meet the American National Sanitation Foundation NSF 53 Standard [8]. The certified filters are capable of reducing the concentration of Pb in water from 150 μ g/L to 10 μ g/L or below.

It should be noted that although the WHO guideline value of Pb is 10 μ g/L, the Maximum Contaminant Level Goal (MCLG) of Pb is zero because there appears to be no threshold of adverse effects of the metal. On the other hand, Pb in water is often not the major source of lead intake, especially for children. Major intake of lead is from ingestion of food, dirt, and dust [9]. In fact, CHP advises cleaning of house dust regularly and keeping Pb-containing products from children [8]. As for water contamination, the primary concern in the WHO Guidelines is microbial contamination of drinking water in both developing and developed countries [1]. In this perspective, Hong Kong drinking water is indeed relatively safe.

Students' Corner

SciChef Cooking Challenge 2015

by Dr Benny NG, Faculty of Science

The Faculty has actively engaged secondary school students to apply scientific principles in their daily lives. In 2013 and 2014, the Faculty organized **The Science and Art Crossover Project**. This year, the Faculty organized **The SciChef Cooking Challenge**, which aimed to foster food science, chemistry and nutrition knowledge to junior secondary school students, and arouse their interest towards science and healthy eating habits. It also provided students with opportunities to have hands-on food experiments and analysis outside the classroom.

The event was organized in two parts. Eighty-eight applications were received from 28 schools and the top 15 were invited to the semi-finals on January 17, 2015, where they had to present their scientific results of their proposed recipe and the science behind it. Then, 12 teams of finalists spent 60 intense minutes to compete for championship on May 9. The challengers were judged based on four criteria: recipe

execution, sensory attributes, accuracy of scientific content, and Innovativeness. Good Hope School took home the first prize and the Most Innovative Award with their dish "Amazing Dessert from Seaweed," while Holy Trinity College's "Chicken Breast Salad" garnered second place and the Best Participating School Award. The YWCA Hioe Tjo Yoeng College's soufflé dish "Change of Protein Role" placed third.

At the closing ceremony, HKSAR Secretary for Food and Health Dr Ko Wing-man BBS, JP acknowledged the relationship between science and culinary art and shared his experience about molecular gastronomy. Dr Ko also commended finalists for their efforts and thoughtful recipes that ranged from fruit juice caviar to traditional Chinese smiley balls. Apart from the cooking competition, the event featured a 3D latte art demonstration and workshop and a live molecular gastronomy demonstration. Both demonstrations showcased sensational culinary innovations that were made possible by incorporating scientific concepts into cooking.

Next year, the Faculty is organizing SMArt (Science, Mathematics, and Art) programme, which will be held in January 2016. Visit www.scifac.hku.hk/smart/ for more information and registration.

Dr KO Wing-man BBS, JP (left) and Dr Benny NG (right) presented the Championship to Miss SO Hoi Lam, Fiona and Miss YEUNG Wan Yan, Priscilla from Good Hope School.

SciChef Cooking Challenge 09 05 201

The SciChef Cooking Challenge 2015 Champion

HK Duillars Three Thousand Only

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HK 3000 !!!

Judges, organizers, helpers, guest performers and challengers enjoyed the cooking challenge.



Challengers from HKMA David Li Kwok Po College were happily making pumpkin pies.



Chef Perry LAU illustrated the glow-in-the-dark sugar before turning it into a sugar crystal ball.

Challengers from Holy Trinity College received the 1st runner-up.





Michelin Star Celebrity Chef, Master CHAN Kwok Keung (陳國強) presented his signature dish "Golden Prawn" with Dr Jessica LEUNG (right) and Dr Benny NG (left) at the Semi-Final.

How Transport Occurs in a Strongly Interacting System? by Dr ZHANG Shizhong, Department of Physics

In this sequence of images, the magnetization of ultracold as "spin states", are pulled apart during time-of-flight with a field gradient. Since atoms can be transferred from one state cloud is completely magnetized in this particular measurement. The colors indicate density, with red for the highest density. About thirty thousand potassium atoms are shown, at an initial temperature of three hundred nanokelvin above absolute zero.

How do materials conduct heat or electricity? Where does resistance come from and is there any intrinsic limit on its magnitude? These questions are of enormous technological importance as well as fundamental theoretical significance. For a particular class of material, which is dubbed as strongly correlated materials, understanding their transport properties remains an unsolved problem because of the strong correlations that exist between the electrons.

Over the past decades, new systems with strong interaction appeared with ultracold alkali atoms (sodium, potassium etc.) playing the role of electrons. Unlike electrons, these much larger entities move with a velocity that is much smaller than electrons, and offer new ways of manipulation and diagnosis. In common with electrons, these atoms can be made to interact very strongly, using a technique called Feshbach resonance, and as a result, can be used to simulate real materials and offer new ways of understanding transport in strongly interacting systems.

Classically, transport of electricity can be viewed as movement of electrons from one end of the wire towards the other, while suffer many collisions in between, which give rise to resistance. A fundamental modification brought about by quantum mechanically is that electron also behaves as wave, and hence the associated properties of diffraction and interference. It is these quantum mechanical properties that set the fundamental limit on how fast an electron can move. In solids, however, this picture is complicated by other factors, such as the existence of ion lattice, in addition to the effects of strong interaction. In the pristine cold atom system, however, strong interaction is solely responsible for resistance.

We show that for the spin diffusion process, in which tiny magnetic moments are moving about while subjected to strong scattering, a fundamental limit exists on how fast it can diffuse. In collaboration with experimental group at University of Toronto, this has been verified in the potassium gases.

Brainteaser Prize: \$50 book coupon December 31, 2015

supported?

give the correct answer.





Birds are a group of theropod dinosaurs that share their closest common ancestor with deinonychosaurian theropods, a group of animals that include the famous Velociraptor (a type of 'raptor' dinosaur). Some deinonychosaurs have been suggested to have had gliding abilities, but as of yet none of these have been shown to be true powered flyers. How do we know that some deinonychosaurs

your name and school (for students), to

scinews@hku.hk. FIVE winners will be

drawn randomly from the contestants who



glided? Is this hypothesis still well

Please email your answer together with

to conduct different kinds of experiments. Even laymen can recognize some commonly used glasswares such as beaker, test tube, and conical flask. However, there are many other specially

It is necessary for chemists to use a variety of glasswares

designed glasswares that are intended to special experiment. Can you name the glassware shown in the figure? What is the use of this piece of glassware and how does it work?

Answer

Ouestion of last issue

The glassware shown is called Soxhlet Extractor. It is commonly used for the continuous extraction of a solid by a hot/warm solvent. It may be used to extract the desired chemical or to remove the impurities from a sample.

To perform the extraction, the Soxhlet Extractor is fitted with a condenser at the top and a round bottom flask filled with solvent at the bottom. The sample is placed inside a solvent permeable thimble, which is placed in the central tube of the extractor. When the solvent boils, the vapor passes up through the side tube and condenses at the condenser. The solvent will gradually fill up the central tube and the substance inside the sample will be dissolved slowly. When the solvent level reaches the top of the side tube (the one with an inverted glass tubing inside), all the solvent stored inside the central tube will be brought down to the round bottom flask by siphon action. Such condensation-wash down process will repeated automatically until the extraction process is completed.

Professor Tony W K FUNG, Chair of Statistics, Department of Statistics and Actuarial Science, has been elected President-Elect (2015-2017) of the International Association for Statistical Computing (IASC). Professor Fung is the first Chinese being elected President-Elect of IASC since its foundation in 1977. He has also served as Vice President of IASC in 2007-2009, and Chairman of the Asian Regional Section (ARS) of IASC in 2005-2008.

Professor Sun KWOK, Dean of Science and Chair **Professor of Physics**, was elected as **President of the International Astronomical Union (IAU) Commission on Astrobiology** during the General Assembly of IAU in Honolulu in August. He will help the Union to organize world-wide research and education activities in astrobiology. The commissions of the IAU represent research domains at the frontier of astronomical science.





Professor Vivian Wing-wah YAM, Philip Wong Wilson Wong Professor in Chemistry and Energy and Chair Professor at the Department of Chemistry, received the **Ludwig Mond Award 2015** from the Royal Society of Chemistry (RSC), U.K. Professor Yam was recognized for her work on the innovative design of new strategies utilizing non-covalent metal-metal interactions as spectroscopic reporters for host-guest interactions and microenvironment changes, and for chemosensing and biological assays.

Professor Yam was also elected as the **Foreign Member of Academia Europaea** (The Academy of Europe). Membership of Academia Europaea is by invitation after peer group nomination, scrutiny and confirmation as to the scholarship and eminence of the individual in their chosen field. Professor Yam is the only Foreign Member elected under Chemical Sciences Section of the Academy for her distinguished achievements in the discipline.

Professor Yam was also a recipient of the Bronze Bauhinia Star (BBS), HKSAR recently.

Dr Shizhong ZHANG, Department of Physics, received the 2015 Croucher Innovation Award on his work on the minimal spin diffusivity in the socalled unitary Fermi gas, a system that interacts as strongly as quantum mechanics allows. In collaboration with his experimental colleagues in University of Toronto, he offered theoretical predictions and explanations of the experimental results that have deepened our understanding of transport properties of strongly interacting Fermi system.

Students

Three PhD students of School of Biological Sciences won best presentation awards at the International Conference on Biodiversity, Ecology and Conservation of Marine Ecosystems 2015 (BECoME 2015), jointly hosted by the School and The Swire Institute of Marine Science (SWIMS) at HKU in June.

Mr Juan ASTUDILLO won "The Marine Biological Association of Hong Kong Award for the Best Student Oral Presentation". His presentation title was "Seasonality can lower biotic resistance to ascidian invasion in subtropical marine fouling communities". He is a PhD student jointly supervised by Professor Kenneth Leung and Dr Timothy Bonebrake at the School.





In Thomson Reuters' recent publication of ESI highly cited scientific researchers in 2015, based on the number of highly cited papers produced over the 11 year period 2003-2013, The University of Hong Kong has an incredible 9 of the world's top cited scientific researchers, of which 3 of them are from the Faculty of Science. They are **Professor Nagendra SHAH** from School of Biological Sciences, and **Professors Min SUN and Guochun ZHAO** from Department of Earth Sciences.

The list comprises some 3,000 highly cited scientific researchers in 21 fields of the sciences and social sciences disciplines, and HKU is the first locally attaining this number of highly cited scientific researchers in 2015. The encouraging results reveal our aspiration to

For details, please visit http://highlycited.com



Dr Zhang Shizhong (left) and Financial Secretary Mr John Tsang

global greatness.



the School. She is also the winner of the **"Online People's Choice Award"** in the Three Minute Thesis Competition 2015 at HKU.

Ms Yanny MAK won "The Marine Biological Association of Hong Kong Award for the Best Student Poster Presentation". The title of her poster was "Spatial variation in trophic structure of demersal fish communities in the marine environment of Hong Kong, South China". She is also a PhD student of Professor Kenneth Leung in the School.



Launch of Calculus E-learning Platform



Teaching

One of the educational aims for undergraduate education in HKU is to develop students' capabilities in tackling novel situations and ill-defined problems. The science foundation course SCNC1111 aims to achieve this by introducing mathematical modelling, with Calculus as one of the tools, to the first-year science students. However, effectiveness of teaching Calculus is hindered due to the diverse student background. Funded by the Teaching Development Grant, a Calculus e-learning platform is developed and further transformed into a mobile app for our students as well as the general public. More information can be found in our Faculty webpage.





Chase (front) and Dr Guénard's lab crew in field

by WANG Liuwei Chase, Year 2 BSc (Ecology & Biodiversity) student

Are insects worth studying? How important are they for ecosystems? Is insect biodiversity facing the same threat as larger vertebrates? I had so many questions in my mind before I offered to volunteer in the Insect Biodiversity and Biogeography Laboratory of Dr Benoit Guénard, School of Biological Sciences.

In our very first meeting, Dr Guénard explained why he chose insects as his focus in ecology research. Insects stand for the majority of biodiversity in our planet, with over one million species described and potentially several other millions to be described, compared to just a few thousand of birds and mammals species. Their abundance is as spectacular, with an estimate of 10¹⁸ living individuals, or about 145 million insects per human. Such a large number places insects at the ecological foundation of terrestrial ecosystems, undertaking ecological roles such as the decomposition and cycling of nutrients in soil, pollination and seed dispersal, modifying soil structure and aeration, and representing a major food source in the food chain, etc.

Later on, Dr Guénard showed me his collection of ants that completely enhanced my understanding of their diversity and astonishing morphology. Under a microscope, ants looked incredibly different from what I could perceive solely with my eyes, every part of their body showing the complexity of their evolution. "Ants are relatively old, about 140 million years old, and extremely successful for the past 50 million years during which they have dominated most terrestrial ecosystems", said Dr Guénard.

Last spring, I joined Dr Guénard and his lab crew in several field excursions. In the forests of Hong Kong, insects were everywhere when we turned the rocks or logs around or flipped tree leaves. We observed long trails of ants, one following another in the search of a nest or cooperating with others carrying larger preys. Dr Guénard explained that ants, along with bees, some wasps and termites, have reached eusociality, the highest level of social organization in animals. Worker ants forage for food sources, take care of brood and actively defend their nest against any predators or intruders (including biology students), while queens undertake reproductive functions. This high division of labor through specialized castes in social insects' societies allows these colonies to achieve every function necessary for survival and to rule on the gigantic world of arthropods.

Tropical and subtropical regions like Hong Kong present some of the highest richness of insects in the world but are also paradoxically some of the least studied and therefore more effort in the exploration of insects is needed. Dr Guénard's team has already discovered nearly 30 newly recorded ant species in Hong Kong and there are definitely many more to be discovered. Last summer my journey with insects just started here in HKU and also expanded to my hometown, Hainan Island. It's with no doubt that plenty of fascinating discoveries will be encountered along the way and potentially I could contribute to the GABI (the Global Ant Biodiversity Informatics) project, a 1.7 million records database on ant distribution led by Dr Guénard, and see my contribution displayed on its visualization interface antmaps.org launched last summer.

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Student reporter profile

Wang Liuwei, Chase year 2 Ecology & Biodiversity student from Hainan Island, volunteering in the Insect Biodiversity and Biogeography Laboratory, currently working on a project on the ants in Hainan.



It has been so much fun learning about ecology and insects, especially the diversity and complexity of their behaviours. The beautiful nature in Hong Kong and the effort that the people spend in protecting it really inspired me.

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