What Makes a Nobel Laureate?

Meet the IAS Faculty Whose Discovery Confirmed the Big Bang Theory
“We bring together the most brilliant minds to drive cutting-edge discovery and scholarship for the betterment of mankind.”
Words from the Director

Charles Darwin once said, “In the long history of humankind, those who learned to collaborate and improvise most effectively have prevailed.” This is particularly true in the realm of science, where many major breakthroughs are achieved through collaborations.

Two of the scientists featured in this issue of the newsletter, IAS Helmut and Anna Pao Sohmen Professor-at-Large George Smoot and IAS Visiting Professor Chih-Ming Ho, are vivid examples of the importance of collaboration. Prof Smoot and Dr John Mather of NASA shared the 2006 Nobel Prize in Physics for being the principal investigators of the COBE (Cosmic Background Explorer) team. Despite being an engineer, Prof Ho has dedicated himself to the field of medicine and runs a number of interdisciplinary research projects with engineers, life scientists and mathematicians to transform personalized medicine.

It has always been a core mission of IAS to connect top scientists and scholars so that new ideas and collaborations can blossom. This summer, we will again host the Gordon Research Conferences at HKUST, inviting experts from around the world to discuss frontier research topics in biology, chemistry, physics and engineering. Prof Chih-Ming Ho, Prof Henry Yan of Chemistry, and Prof Christopher Leung of Civil and Environmental Engineering at HKUST will also chair some of the conferences.

We are proud to see that IAS members continue to be recognized for their academic achievements. In March, the university conferred named professorships on our Executive Director Che Ting Chan, IAS Faculty George Smoot, and IAS Senior Fellow Kei May Lau. We also congratulate IAS Visiting Professor Eli Yablonovitch, who was awarded the 2016 Oliver E. Buckley Prize for his contribution to condensed matter physics.

By now, you have probably noticed the publication’s new look. To make it a more enjoyable read, we have revamped the design and also launched a brand new e-Newsletter that will make the content accessible from anywhere.

We hope you like the new IAS Newsletter. We are always open to suggestions and opportunities for different initiatives. Let us know if you have any ideas on how we can collaborate and make HKUST a premier intellectual center.

Henry Tye
Director
HKUST Jockey Club Institute for Advanced Study
What Makes a Nobel Laureate?

Meet the IAS faculty whose discovery confirmed the Big Bang Theory

With a PhD degree from MIT, Prof Smoot has been working at the University of California at Berkeley and the Lawrence Berkeley National Laboratory since 1970.
Prof George Smoot, winner of the 2006 Nobel Prize in Physics, has joined HKUST as the IAS Helmut and Anna Pao Sohmen Professor-at-Large. He was awarded the Nobel Prize, along with NASA’s John Mather, for groundbreaking discoveries that cemented the Big Bang Theory—a prevailing explanation about how the universe began as a small singularity, then inflated to the universe we know today after a cataclysmic blast some 13.7 billion years ago.

What kind of life does a Nobel Laureate lead? How different is he from the rest of us? We sat down with Prof Smoot to learn what drove him to become a physicist and how the Nobel Prize has changed his life.

“George Smoot, whose work was described by Stephen Hawking as ‘the discovery of the century, if not all time’.”

- The Guardian

A lot of people may wonder if it takes a certain upbringing to grow into a great scientist someday. Can you tell us what led you to the path of science when you were young?

From a very early time, my parents demonstrated the importance of education through their own examples. I remember my mother doing her master’s degree to get a teaching certificate, and my father kept studying engineering to learn what he needed for his work and research. They enrolled me in good schools and took a keen interest in my studies.

We later moved to Alaska because my father loved the outdoors, where he could apply science and engineering to studying water resources. For my sister and I, going to Alaska exposed us to a whole new world—we discovered a way of life more directly connected with nature and its juxtaposition with modern technology and the understanding of mankind.

So your parents’ focus on education and living in Alaska were two big influences on your decision to be a man of science. What is it about physics that ultimately drew your interest then?

I have always been fascinated by a broad range of subjects. Eventually, I focused on physics because it fit my skills and also my temperament to understand things at a deep and fundamental level. I am still drawn to that now and have also taken to applying basic physics discoveries to improving peoples’ lives through technological innovation and products.
How did winning the Nobel Prize affect you, on a professional and personal level?

It is both a great honor and a responsibility to be awarded the Nobel Prize. For me, its timing and occurrence came as a very great surprise and it was actually quite disruptive to my life.

I was busy teaching a large section of freshman Physics at that time. When the announcement was made, the press and University administration all descended to invite me to interviews and events. I had to arrange for the last week of classes and the exam to be covered by another professor so I could go to receive the award and participate in all the action.

Winning the Nobel Prize was like getting a third job of interacting with the press, public, colleagues and universities after doing research and teaching. Almost every day, I got invitations to do things and this was especially true in the first year.

As a Nobel Laureate, you are tasked to participate in and comment on a much wider array of topics than a typical professor. Not only are you asked to give talks and attend events, but also to help raise funds, sit on boards and review public policy issues. In the last couple of years, that has included a lot of activities on climate change, which I consider to be a major issue for humans.

Life after winning the Nobel Prize

Being a Nobel Laureate is probably the highest honor a scientist can attain. Prof Smoot shows no sign of slowing down in his work and is an avid advocate for popularizing science. When talking to him, it is easy to be amazed by his youthful energy and passion about the subject. Viewers of the acclaimed American TV series, Big Bang Theory, might even recall his guest appearance on the show, bringing science to the general audience.

Prof George Smoot (right) starred as himself, a scientist, in the popular TV show, Big Bang Theory
Living in Alaska gave the young George a first-hand experience of Mother Nature.
You have said it is important to popularize science—can you tell us a little about how science can be demystified, and why it is important that this happens?

As my thesis advisor said, "If you cannot explain what you are doing in good plain English, then you do not understand it either." A scientist is not just required to understand his research, he also needs to explain it in a way that other people understand. I take this to heart and believe in always getting the essence of our work communicated.

More and more of the major issues of our time involve a significant amount of science, such as the Zika virus and Dengue fever outbreaks spread by mosquitoes, climate change, and food and water safety. Technological advances like gene editing may promise wonderful possibilities, yet also raise many ethical and cultural questions that people need to consider.

When making decisions related to these issues, it is critical to understand how science works, the cultural context and how much confidence we should have in it. Scientists therefore have a duty to share and let the public know what is happening and what their taxes are supporting.

The world definitely needs more scientists like you. Other than driving the popularization of science, what else are you focusing on?

For research, I am working on a project to analyze data from the residue of the Big Bang, known as cosmic microwave background radiation, to understand the early universe and its conditions. We are developing new detectors and techniques to conduct large-scale surveys and analyses, which can help us mark the locations and properties of millions of galaxies to learn more about the history of the universe, distribution of matters and formation of galaxies.

As an educator, I partnered with a colleague to offer a massive open online course on gravity. I am proud to say that we have a total of 75,000 students enrolled so far, which has set the record for the biggest class ever in a science course.

It is also a passion of mine to drive the application of basic science in the private sectors. I am working with partners in China and other regions on a number of technical products, including biomedical devices that can help people recuperate from injuries faster and affordable air quality monitors for the general public.
"Science, and in turn our understanding of the world, advances as existing theories and explanations are challenged, refined and possibly supplemented by new insights. Much like biological evolution, science has no end point, but rather a continual contestation in the pursuit of knowledge."

Prof Daniel Levinthal
IAS Visiting Professor, HKUST
Reginald H Jones Professor of Corporate Strategy
University of Pennsylvania
The Future of Healthcare: Personalized Medicine

This February, US President Barack Obama hosted a summit at the White House on his Precision Medicine Initiative, which aims to develop tailored treatment and prevention strategies based on individual differences in genetics, environment and lifestyle. This national initiative is proof that medicine is moving toward a new paradigm in which patients will receive customized therapy instead of the same treatment as everyone else.

Chih-Ming Ho, IAS Visiting Professor and the Ben Rich-Lockheed Martin Chair Professor at the University of California at Los Angeles, has long been pursuing the systematic optimization of personalized treatment. With the public's attention on precision medicine, he foresees accelerated progress in developing personalized treatments for patients, and some of those not involving new drugs may even be available in a year's time.

The current landscape

Existing cancer and infectious disease therapies often use a combination of multiple compounds to improve treatment outcomes. A typical multi-drug design is usually achieved through additive dosing, where the maximum doses tolerated by the human body are combined based on past patients' average response rates.

"The patient response rates to chemotherapy can be as low as 25% and 10% for lung cancer and liver cancer, respectively, due to human diversity and cancer heterogeneity. Rational combinatorial treatment design must move beyond maximum tolerated dosing," said Prof. Ho.

Recent technological advancements have made it possible to divide patients into groups by measuring their genetic variants. Guided by

Prof. Ho studied microfluidics and aerodynamics before turning his attention to personalized medical treatments.
the patients’ sequence database, doctors can use genotypic personalized medicine (GPM) to improve response rates. However, GPM is undermined by varying genetic and environmental factors, which disrupt genotype-driven treatment. Drug resistance can also increase the difficulty of designing better or alternative GPM courses.

All of these challenges piqued Prof. Ho’s curiosity. He began to question whether a simple solution might exist amid the complexity of biological systems. He applied engineering concepts to develop the Feedback System Control (FSC) technology, which later evolved into a different concept that made phenotypic personalized medicine (PPM) possible. Unlike GPM, the revolutionary approach of PPM does not require complex and time-consuming analysis of a patient’s genetic information. Instead, it produces a personalized drug therapy based on a person’s phenotype—biological traits that produce a measurable physiological response to treatments. Another benefit of PPM is that the drug dosages can be recalibrated in real time to adapt to changes during treatment, such as when a person undergoes surgery or develops an infection.

"Rational combinatorial treatment design must move beyond maximum tolerated dosing."

"We may be able to accelerate the process of discovering cures in ways we’ve never seen before," the US President said (Official White House photo by Pete Souza).

Trial run in post-transplant care

Post-transplant immunosuppressive drugs such as tacrolimus are often prescribed to patients to prevent their bodies from rejecting the organ. As doctors need to find the right balance between effective dosage and minimal toxicity for these drugs, there is a clear need for personalized post-transplant treatments to prevent adverse events and ensure the long-term survival of the organ and the patient.

Building on the PPM approach, Prof. Ho and his team developed the parabolic personalized dosing (PPD) platform, which takes into account clinical data such as the blood concentrations of tacrolimus—the primary phenotypic information for immunosuppression efficacy.

PPD is so named because it can produce a personalized graph in the shape of a parabolic surface for individual patients, which represents precisely how each person responds to treatment. Doctors are then guided by the person’s unique curve to determine the optimal dose of medicine.

In a pilot trial, the team compared four patients who were treated with tacrolimus using PPD after liver transplants with another four control patients treated with the traditional therapy. Treatment success was evaluated based on how often the amount of tacrolimus in each patient's body remained in the ideal range. The results showed that those who were treated following PPD spent as much as 50 percent less time outside the ideal range than those who were treated using the standard approach.
“Our ability to calibrate how individual patients respond to treatment and to use that information to robustly guide their regimen based on the parabola-based approach has made personalized medicine a reality,” said Prof Ho.

What makes PPD even more groundbreaking is that it is independent of any disease mechanism and can be applied to cancer and other infectious and physiological diseases. In addition, a pool of 14 drugs was used to search for the optimal drug combination to treat tuberculosis. Less than 1,000 tests were performed and the best four-drug combinations could be identified from out of 6 billion possible drug-dose combinations, which is well beyond what any lab can currently achieve in a reasonable period of time.

An engineer in medicine

Originally trained as an aerospace engineer, Prof Ho moved his research focus to personalized therapy for specific patients through a pure coincidence. Since then, he has devoted himself to applying engineering principles to optimize treatment results in biological systems.

“Nowadays, major research breakthroughs almost always happen in the interdisciplinary areas. Collaboration with experts in other fields is a must for scientific progress, and all of my projects in the past were accomplished by working with others,” he said.

Prof Ho is no stranger to HKUST. As an IAS Visiting Professor since 2011, he was awarded an HKUST honorary degree in 2014. He has been working for the past few years with Prof Karl Tsim of Life Science and Prof Yi-Kuen Lee of Mechanical and Aerospace Engineering at HKUST on the optimization of an ancient traditional Chinese medicine, Danshui Dang gui Bu xue Tang (當歸補血湯). Using feedback system control, they have so far reduced the required doses by one tenth and increased the efficacy by three times.

Prof Ho is also collaborating with Prof Nancy Ip of Life Science to optimize the combination of active components in traditional Chinese medicine for neural protection and stroke treatment. Along another line of study, he is working with Prof Yang Wang of Mathematics on a novel method that can substantially reduce the required time and cost of testing the toxicity and effectiveness of drug combinations, demonstrating how “a small step in mathematics can lead to a giant leap in medicine.” This exciting project has already attracted the participation of research teams from UCLA, HKUST, National University of Singapore and Shanghai Jiaotong University. This summer, Prof Ho will return to HKUST as one of the chairpersons for the prestigious Gordon Research Conference on personalized medicine. For more info: ias.ust.hk/grc

...a small step in mathematics can lead to a giant leap in medicine...
We convey our heartiest congratulations to the following three faculty members, who were bestowed with named professorships at the University’s Third Inauguration Ceremony of Named Professorships on March 9, 2016.

/ George Smoot (2nd row, 4th from left) 
IAS Helmut and Anna Pao Sohmen Professor-at-Large; Nobel Laureate in Physics

/ Che Ting Chan (2nd row, 2nd from left) 
Daniel C K Yu Professor of Science, 
IAS Executive Director and Chair Professor of Physics

/ Kei May Lau (2nd row, 3rd from right) 
Fang Professor of Engineering, 
IAS Senior Fellow and Chair Professor of Electronic and Computer Engineering

The ceremony honored eight outstanding faculty members in total. President Tony F Chan expressed his gratitude toward the donors’ generous support, which helps to fortify HKUST’s position as a world-class research university.

On behalf of the Sohmen family, Dr Helmut Sohmen applauded the University’s successful work since its inauguration and warmly welcomed Prof George Smoot to the distinguished faculty of IAS. Prof Smoot is the fourth faculty member of the league, together with Sir Christopher Pissarides, Prof Ching Tang and Prof Gunther Uhlmann, who were conferred named professorships at the ceremony in November 2013.

Both raised in Hong Kong, Prof Che Ting Chan and Prof Kei May Lau pursued their PhDs in the US and returned home to join HKUST in 1995 and 2000 respectively. They were promoted to the rank of Chair Professor in 2005, and were awarded prestigious Senior Research Fellowships by the Croucher Foundation in recognition of their achievements in engineering and science. Nine out of the 16 serving IAS Senior Fellows have been conferred named professorships by the University.
Climate Change, Creativity and Quantum Computing: What the World’s Best Minds Think

To celebrate its 25th anniversary, HKUST invited Nobel Laureates Prof Steven Chu and Prof Alan J Heeger, and winner of the Turing Award, Prof Andrew Yao, to share their wisdom and insights on climate change, creativity and quantum computing in the HKUST 25th Anniversary Distinguished Speakers Series.

All three professors serve on the IAS International Advisory Board, which offers strategic advice and guidance on the development of IAS. Here are some quotes from their inspiring speeches at HKUST.

Prof Steven Chu
1997 Nobel Laureate in Physics and former US Secretary of Energy
HKUST IAS International Advisory Board Member
On Energy, Climate Change and the Transition to a Sustainable World:
“Climate of the earth is indeed changing, and we have very compelling evidence that said it is largely caused by greenhouse gases by humans.”

Prof Alan J Heeger
2000 Nobel Laureate in Chemistry
HKUST IAS International Advisory Board Member
On Creativity, Discovery and Risk—Nobel Prizes Past and Future:
“In science, creativity and discovery are related, but they are not the same. Scientific breakthroughs typically result from a combination of creativity and discovery.”

Prof Andrew Yao
2000 Turing Award Winner
HKUST IAS International Advisory Board Member
On Quantum Computing: A Great Science in the Making:
“Quantum computer comes at a fortuitous time when the Moore’s law for computing is starting to reach its physical limit imposed by quantum mechanics. The design of quantum computer offers a daring approach: to take advantage of the quantum problem instead of fighting it.”

The Father of “Photonic Crystals” Receives the 2016 Buckley Prize

IAS Visiting Professor Eli Yablonovitch won the 2016 Oliver E Buckley Condensed Matter Physics Prize for his seminal achievements in solar cells and strained quantum well lasers, and for creating the field of photonic crystals, spanning both fundamental science and its practical applications.

Awarded by the American Physical Society, this prize is presented to those who make outstanding theoretical or experimental contributions to condensed matter physics. Prof Yablonovitch is the third IAS Visiting Professor to win the Buckley Prize, following Prof Marvin Cohen and Prof Patrick Lee.

Other than his research accomplishments, Prof Yablonovitch has co-founded startups to translate scientific discoveries into daily applications to improve human life. His businesses include an antenna company that has shipped over one billion cellphone antennas, and a clean energy startup that has held the world record for dual-junction solar cell efficiency at 31.6%.

Prof Yablonovitch is regarded as the Father of the Photonic Band Gap concept, and he coined the term “Photonic Crystal.”
Man vs Machine: What AlphaGo’s Triumph Tells Us

The epic battle between Google DeepMind’s AlphaGo and Go grandmaster Lee Se-dol has kept many people at the edge of their seats. It marked a historical milestone for artificial intelligence (AI) when AlphaGo sealed a 4-1 victory over Lee, which leads to the big question: will AI surpass and even replace humans soon?

In the same week as AI’s success, IAS invited Prof Qiang Yang, New Bright Professor of Engineering and Chair Professor of Computer Science and Engineering at HKUST, to share his knowledge of and insights into AI and AlphaGo in an IAS Commons session. Here are some of the more exciting areas covered in the talk.
Why is AlphaGo a significant step forward for AI?

In 1997, IBM’s Deep Blue beat the best human chess player at that time. Go, however, is a game of profound complexity. There are $10^{47}$ possible games in chess. But with 150 moves in each game, Go has $10^{70}$ possible games—even more than the total number of atoms in the universe.

What also makes AlphaGo special is that it teaches itself to play. DeepMind first trained AlphaGo by feeding it 160,000 actual gameplays between humans, then the team allowed it to play against itself to generate 30 million extra samples and master the game through reinforcement learning.

AlphaGo only defeated the 2-dan European champion last November. How did it improve so much in five months to be able to crush a 9-dan grandmaster?

AlphaGo was designed to be just a little better than its opponent. Its primary objective is to win. Even winning by one point is good enough for AI, unlike humans who tend to maximize their success. When AlphaGo was pitted against the European champion, it only performed slightly better than a 2-dan player. Playing against stronger opponents made it stronger as well.

Why did AlphaGo lose the fourth game?

Lee made a brilliant decision in the 78th move, which other human players described as “the hand of God.” Yet AlphaGo evaluated it as an amateur move—a mistake that no human would make. AlphaGo was trained through data input and by playing against itself. Whether the opponent was Lee or itself made no difference to AlphaGo. Ultimately, its lack of awareness of the reality led to its downfall in the fourth game.

Will AlphaGo or other AI systems replace humans soon?

There is still a long way to go before computers can do what we can. Take games for example—even though AI has managed to beat top human players in chess and Go, it has only tied with human poker champions so far. Chess and Go are games with perfect information, meaning that all of the pieces are out in the open. Poker is a game of imperfect information. To win, one must also be able to see through opponents’ bluff, which is no mean feat for computers. Unless computers can set their objectives on their own, they will not completely replace humans. Whoever manages the objectives will therefore control the AI systems and what they do. In the future, people who have the best job security are likely to be programmers and those at the top of their fields.

Where is AI going next?

AI systems like AlphaGo are designed for specific purposes. If taken outside of their pre-determined domains, they will fail miserably. What developers like DeepMind want to achieve next is generality in AI, which means developing systems that will excel not just in Go or chess, but also in other areas such as financial markets, online education and recommendation systems.

How are HKUST’s pursuits in AI development?

HKUST launched a joint AI lab with WeChat last November. More than 10 professors and students are developing AI systems that can do a variety of things: tell stories in photos and videos, recognize human speech, process emotions, and undergo transferred learning, the last of which can hopefully fix the reality bias in AlphaGo’s fourth game. Another interesting project is an AI that can predict the financial market, which is already doing quite well in its investment decisions.

In the future, people who have the best job security are likely to be programmers and those at the top of their fields.\"
IAS organizes various activities throughout the year to foster collaboration among local and international researchers. Here are some of the major events held this spring.

**A Milestone for Wave Functional Materials**

Wave functional materials include artificial materials such as photonic / phononic crystals, metamaterials and plasmonic structures which can alter light and sound waves. To explore new opportunities on research collaboration, a bilateral workshop covering the above topics was co-hosted by IAS, the HKUST Department of Physics and Nanjing University.

During the two-day event, the senior scientists from Hong Kong and Nanjing discussed cutting edge advancements in both fundamental research such as topological concepts and parity-time symmetry, and practical applications of immediate impact such as sensors. A meeting between the HKUST research team and Nanjing delegates was held afterwards to further explore the above areas and identify mutual research interests.

**The Fractal Geometry of Nature**

The father of fractal geometry, Benoit Mandelbrot, famously wrote: "Clouds are not spheres, mountains are not cones, coastlines are not circles, and bark is not smooth, nor does lightning travel in a straight line." Fractal geometry is a branch of mathematics born in the 1970s that can model natural phenomena like trees, clouds or river systems. It is revolutionary in the sense that it can describe the chaos and irregularity of nature and objects, which classical geometry fails to do.

However, fractal geometry goes far beyond the mathematical art. Fractals appear universally in nonlinear dynamical systems, biological systems, stock market, geology and even astronomy. While the history of fractal geometry study is relatively short, our understanding of fractals has gone significantly deeper than when Mandelbrot first studied them.

This March, HKUST joined hands with Kyoto University and The Chinese University of Hong Kong to organize the 1st Hong Kong / Kyoto workshop on Fractal Geometry and Related Areas. This two-day event, spearheaded by Prof Yang Wang of Mathematics at HKUST, brought researchers in Asia together to discuss the latest developments ranging from classical problems in fractal geometry on properties of fractal sets, applications in nonlinear dynamical systems, tiling and multifractal analysis to applications of fractal techniques partial differential equations and signal processing. The workshop aimed to strengthen the ties between HKUST and other Asian universities, and further collaboration with Kyoto University in mathematics has already been lined up.
Fixing the World’s Energy Crisis

It is estimated that we will need 40% more energy as the world population hits 9 billion by the 2040s. To alleviate the energy burden, both academia and industry have been actively working on sustainable energy alternatives, one of which is the organic photovoltaic (OPV) cells.

OPV is a solar cell technology using low-cost printing techniques, without the need for high-temperature processes or hazardous materials that compromise our precious environment. The successful development of OPV technology, however, relies on collaborations among researchers in synthetic chemistry, device physics, and process engineering. This was exactly what the 2016 International Conference on Organic Photovoltaic Materials and Devices, led by IAS Bank of East Asia Professor Ching Tang and Prof Henry Yan of Chemistry at HKUST, aimed to achieve.

The three-day event gathered an interdisciplinary group of scientists and engineers to report recent research findings, and to identify technical obstacles and possible solutions to improve OPV as a practical solar cell technology so that it can greatly benefit mankind in the near future.

“...probably the most productive meeting that I have participated in recent years. The speakers were well chosen. The level of science was fantastic. The interaction between the participants was great.”

- Feedback from a professor who participated in the conference

Joining Forces for a New Research Era

Casimir forces have the same physical origin as van der Waals forces as they all arise from quantum fluctuations. Traditionally, the two forces have been studied in two active but separate communities. Despite the close scientific connections, researchers in these two areas rarely have opportunities to work together. The four-day focused program on Casimir and van der Waals Physics led by Prof Ho Bun Chan of Physics was the first to bridge the two communities and initiate a new dialogue.

Over 60 theorists and experimentalists in physics, chemistry and engineering across five continents shared their research findings through talks, tutorials and poster presentation. The resulting discussions on theoretical studies and experimental techniques have thus planted the seed for a new generation of research and experiments.
Let the Music Speak

Hailed as "the city’s most innovative musical experience" by the *Financial Times*, the Intimacy of Creativity returned to HKUST for its sixth season this spring. IAS was once again proud to host this annual musical event together with the School of Humanities and Social Science.

With Prof Bright Sheng, Y K Pao Distinguished Visiting Professor of Cultural Studies and IAS Visiting Professor at HKUST, as its Artistic Director, this acclaimed festival explores the creative process as selected composers present and revise their chamber music compositions following in-depth discussions between composers and performers.

Prof Sheng was joined by the entire Hong Kong Philharmonic Orchestra for an unprecedented three-day residency of Open Discussions and a Preview Concert at HKUST, capped off by a World Premiere Concert in the Hong Kong Cultural Centre Concert Hall. The new Five Season Retrospective Concert, which included Prof Sheng’s *Deep Red*, was presented at the Hong Kong City Hall Theatre as part of the 44th Hong Kong Arts Festival.

Over 140 composers from 30 countries submitted their orchestral works in response to the call for scores this year, three of which were selected for the unique opportunity to be featured at the special events.

An IAS Visiting Professor since 2010, Prof Sheng has been widely commissioned by virtually all important musical institutions in North America, Europe and Asia, including the White House, the 2008 Beijing International Olympic Games, the New York Philharmonic and Boston Symphony orchestras.

"...the city’s most innovative musical experience..."

- *Financial Times*
"Innovation and persistence are two sides of the same coin—one feeds the other. Innovation is the bread and butter of every profession, and persistence is the means to execute."

Prof Bright Sheng
Y K Pao Distinguished Visiting Professor of Cultural Studies and IAS Visiting Professor, HKUST
Leonard Bernstein Distinguished University Professor of Composition, University of Michigan
**Join Our Events**

**What’s Next at IAS?**

View our upcoming events this summer.

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**IAS Distinguished Lectures**

Usually lasting for 1-2 hours, these lectures focus on topics of wider interests for a general audience.

- **Energy Transduction in Biomolecular Machines (May 27)**
  Speaker: Gerhard Hummer Max Planck Institute of Biophysics

- **Origins and the Future of Microfluidics (May 30)**
  Speaker: Patrick Tabeling Ecole Superieure de Physique et de Chimie Industrielles de la Ville de Paris

- **Bumblebees, Cracks and Nonlocal Modeling (Jun 3)**
  Speaker: Qiang Du Columbia University

- **The Intersection of Operations Research, Kinetic Theory, and Genetics (Jun 20)**
  Speaker: David Sieg mund Stanford University

- **From Organic to Bioorganic Devices (Jun 24)**
  Speaker: Niyazi Serdar Sariciftci Johannes Kepler University of Linz

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**Joint School Lectures**

In collaboration with various Schools, these events cover a specific topic that is of interest to those from a particular discipline.

- **Mining Social Ties Beyond Homophily (Jun 23)**
  Speaker: Ke Wang Simon Fraser University

- **CO₂ Conversion via Catalysis and Electrocatalysis (Jul 11)**
  Speaker: Jingguang Chen Columbia University
Gordon Research Conferences (GRC)

As one of the world's premier conferences, GRC gathers prominent scientists in biological, chemical and physical science disciplines at IAS for a weeklong conference, which provides an interactive platform for hundreds of researchers, scholars and postgraduate students to exchange new research ideas and broaden their network in the global academic community.

**Molecular and Cellular Neurobiology**
(Jun 11 - 17)

*Chair & Vice-Chairs:*
Yi E Sun University of California at Los Angeles
John J Ngai University of California at Berkeley

**Hybrid Electronic and Photonic Materials and Phenomena**
(Jun 19 - 24)

Chair: Tobin J Marks Northwestern University
Henry Yan HKUST
Deqing Zhang Institute of Chemistry, Chinese Academy of Sciences
Licheng Sun KTH Royal Institute of Technology

**Nasopharyngeal Carcinoma**
(Jun 26 - Jul 1)

Chair: Maria Lung The University of Hong Kong
Lawrence Young University of Warwick
George S Tsao The University of Hong Kong
Fei-Fei Liu Princess Margaret Hospital

**Personalized Medicine**
(Jul 10 - 15)

Chair: Chih-Ming Ho University of California at Los Angeles
Edward McCabe March of Dimes Foundation
Yen Yun Taipei Medical University
Edward J Benz Dana-Farber Cancer Institute

**Solar Energy Conversion**
(Jul 17 - 22)

Chair: Edward Sargent University of Toronto
Wei Huang Nanjing Tech University
Ali Javey University of California at Berkeley
Jia Zhu Nanjing University

**Genomic Instability**
(Jul 23 - 29)

Chair: Robert S Weiss Cornell University
Junjie Chen The University of Texas MD Anderson Cancer Center
Anja Groth Biotech Research and Innovation Center, University of Copenhagen
Anindya Dutta University of Virginia

**Advanced Materials for Sustainable Infrastructure Development**
(Jul 31 - Aug 5)

Chair: Christopher Leung HKUST
David A Lange University of Illinois
Changwen Miao Jiangsu Research Institute of Building Science
Pedro Castro Borges CINVESTAV del IPN Unidad Mérida, Mexico

**Tissue Niches and Resident Stem Cells in Adult Epithelia**
(Aug 7 - 12)

Chair: Tudorita Doina Tumbar Cornell University
Rongwen Xi National Institute of Biological Sciences, Beijing
Carla Kim Boston Children’s Hospital / Harvard Medical School
Jane E Visvader The Walter and Eliza Hall Institute of Medical Research

**IAS Programs**

These advanced programs feature in-depth discussions on specific research topics in such formats as seminars, workshops and student-led discussions, often spanning multiple days.

**Molecular Machines of Life: Simulation Meets Experiment**
(May 23 - 27)

Organizers: Qiang Cui University of Wisconsin-Madison
Xuhui Huang HKUST
Haw Yang Princeton University

*These two conferences start with a Gordon Research Seminar on the first day. For more details: ias.ust.hk/grc

The above activities were last updated on May 10, 2016. For the latest list of events, please visit ias.ust.hk/events
What Can IAS Do for You?

We provide a platform for prominent scholars to inspire new thinking and share the latest fruits of their research with HKUST and the wider community through IAS Distinguished Lectures or Joint School Lectures / Seminars.

We host IAS Visitor Programs to attract internationally renowned scholars to IAS for extended visits and collaboration with HKUST faculty to drive cutting-edge discovery and advance academic excellence.

We propel the development of research activities and initiatives at HKUST and seek solutions to the most challenging problems in high-impact areas in the form of IAS Programs, international conferences, symposiums or workshops.

We encourage you to submit proposals of the various formats above mentioned. Please visit our website for details: ias.ust.hk/proposal

You may also contact our Director, Prof Henry Tye, and Executive Director, Prof Che Ting Chan, to discuss further (E: ias@ust.hk | T: 2358-6968).
With a spectacular view of the Clear Water Bay and HKUST campus, the IAS Lo Ka Chung Building offers a range of facilities that are perfect for events of different scales and face-to-face intellectual interactions.
HKUST Jockey Club Institute for Advanced Study
Lo Ka Chung Building, Lee Shau Kee Campus,
The Hong Kong University of Science and Technology,
Clear Water Bay, Kowloon, Hong Kong

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