THE SHAW PRIZE
邵逸夫獎

The Shaw Prize

The Shaw Prize is an international award to honour individuals who are currently active in their respective fields and who have achieved distinguished and significant advances, who have made outstanding contributions in culture and the arts, or who in other domains have achieved excellence. The award is dedicated to furthering societal progress, enhancing quality of life, and enriching humanity's spiritual civilization. Preference will be given to individuals whose significant work was recently achieved.

Founder's Biographical Note

The Shaw Prize was established under the auspices of Mr Run Run Shaw. Mr Shaw, born in China in 1907, is a native of Ningbo County, Zhejiang Province. He joined his brother's film company in China in the 1920s. In the 1950s he founded the film company Shaw Brothers (Hong Kong) Limited in Hong Kong. He served as Executive Chairman of Television Broadcasts Limited in Hong Kong since the 1970s until earlier this year and is now Chairman of TVB and a Member of its Executive Committee. Mr Shaw has also founded two charities, The Sir Run Run Shaw Charitable Trust and The Shaw Foundation Hong Kong, both dedicated to the promotion of education, scientific and technological research, medical and welfare services, and culture and the arts.

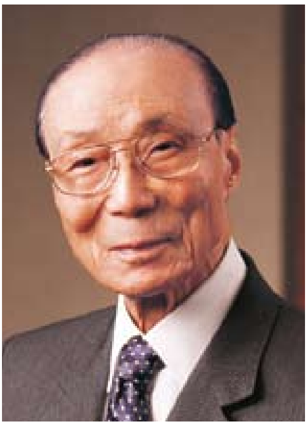
Message from the Chief Executive

This is the seventh year of the Shaw Prize. Since its inauguration in 2004, it has become one of the most prestigious international awards in recognition of academic excellence of distinguished scientists whose achievements have significantly benefited mankind.

This year, five eminent scientists will join the elite group of 31 prominent Shaw Laureates from around the world, whose work has been a lasting source of inspiration to fellow scientists and has advanced human understanding of astronomy, life science and medicine, and mathematical sciences. I sincerely congratulate this year's winners on their accomplishments, and wish them every success in their future scientific pursuits.

Donald Tsang
Chief Executive
Hong Kong Special Administrative Region

Message from the Founder



In every age there are turning points – new ways of seeing and understanding the world around us. New discoveries spring from old knowledge as the echoes of past achievements resound in the consciousness of perceptive individuals determined to unravel the marvelous mysteries of the sciences. Each success shared spurs a widening of the human imagination, and recognition of such success, acclaimed by the Shaw Prize as a compelling force, inspires a new generation to probe deeper into the unknown and make its contribution to progress.

Run Run Shaw

Message from Chairman of the Board of Adjudicators

The Shaw Prize Council is honoured to award three Shaw Prizes tonight.

Professors Charles Bennett, Lyman Page Jr and David Spergel will receive the 2010 Astronomy Prize for their leadership in the Wilkinson Microwave Anisotropy Probe experiment which has enabled precise determinations of the fundamental cosmological parameters, including the geometry, age and composition of the universe. For example, the age of the universe is now determined to be 13.75 billion years with the remarkable accuracy of plus or minus only one percent.

Professor David Julius will receive the 2010 Life Science and Medicine Prize for his seminal discoveries of molecular mechanisms of the senses of touch, of scalding, of spicy hotness, etc., through specialized ion channels at the tip of sensory nerves.

Professor Jean Bourgain will receive the 2010 Mathematical Sciences Prize for his profound work in mathematical analysis and its application to partial differential equations, mathematical physics, combinatorics, number theory, ergodic theory and theoretical computer science. It is difficult to explain his achievements in so many different areas of pure and applied mathematics. But in one area of computer sciences his work has led to great advances that the layman can appreciate: he elucidated the true meaning of randomness.

Chen Ning Yang

Chen-Ning Yang

The Shaw Prize Medal

The front of the medal displays a portrait of Run Run Shaw, next to which are the words and Chinese characters for the title of "The Shaw Prize". On the reverse, the medal shows the award category, the relevant year and the name of the prizewinner. A seal of imprint of the Chinese phrase "制天命而用之" (quoted from Xun Zi – a thinker in the warring states period of Chinese history in 313 – 238 B.C.) meaning "Grasp the law of nature and make use of it" appears in the upper right corner.

AGENDA

Arrival of Officiating Guest and Winners

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Welcome Speech by Professor Chen-Ning Yang
Member of the Council
Chairman of the Board of Adjudicators, The Shaw Prize

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Speech by Professor Jiansheng Chen
Member of the Board of Adjudicators
Chairman of the Selection Committee for the Prize in Astronomy

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Speech by Professor Yuet-Wai Kan
Member of the Board of Adjudicators
Chairman of the Selection Committee for
the Prize in Life Science and Medicine

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Speech by Sir Michael Atiyah
Member of the Board of Adjudicators
Chairman of the Selection Committee for
the Prize in Mathematical Sciences

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Award Presentation

Grand Hall
Hong Kong Convention and Exhibition Centre
28 September 2010

AWARD PRESENTATION

(Category listed in alphabetical order)

Astronomy

Professor Charles L Bennett,

Professor Lyman A Page Jr

and

Professor David N Spergel

Life Science and Medicine

Professor David Julius

Mathematical Sciences

Professor Jean Bourgain

THE SHAW PRIZE 邵逸夫獎

Professor Jiansheng Chen

Member of the Board of Adjudicators

Chairman of the Selection Committee for the Prize in Astronomy

Professor Jiansheng Chen is a reputed astrophysicist and Fellow of the Chinese Academy of Sciences. He is currently a Professorial Research Scientist and Director of Department of Astronomy at Peking University and Director of Beijing Astrophysical Center.

Professor Chen is also the former Deputy Director of the Academic Division of Mathematics and Physics of the Chinese Academy of Sciences (1998 – 2002), the Chairman of the Astronomical Advisory Board of Chinese Academy of Sciences, Member of the Academic Degree Committee of the State Council, Member of the Expert Group for Post-doctorates of the Personnel Ministry, and Member of Special Nominating Committee of International Astronomical Union.

He has been primarily engaged in research in the fields of QSO absorption line, QSO survey, Galactic Physics and large scale astronomy.

THE SHAW PRIZE 邵逸夫獎

The Prize in Astronomy 2010

Charles L Bennett,

Lyman A Page Jr

and

David N Spergel

**for their leadership of the
Wilkinson Microwave Anisotropy Probe (WMAP)
experiment, which has enabled precise determinations of
the fundamental cosmological parameters,
including the geometry,
age and composition of the universe.**

THE SHAW PRIZE 邵逸夫獎

An Essay on the Prize in Astronomy 2010

How did the universe begin? What makes up the universe? Why does the sky look the way it does? Humankind has been asking these kinds of questions for millennia, but these questions are now subject to direct observational measurements. Measurements have revealed that we live in an expanding universe and that the expansion is becoming faster and faster.

It is now firmly established that our universe has been expanding and cooling for billions of years, ever since the Big Bang. To be precise, the Wilkinson Microwave Anisotropy Probe (WMAP) space mission has determined that the age of the universe is thirteen billion, seven hundred million years. This has been recognized by the Guinness Book of World Records as the most accurate determination of the age of the universe.

WMAP has determined the age by capturing the oldest light in the universe and by measuring tiny variations in the temperature and polarization of this cosmic radiation all across the sky. The pattern seen in these tiny variations depends upon the universe's composition and geometry as well as on the physical processes in the early universe that generated these variations. The full sky picture of these variations in temperature from WMAP is a direct view of the early universe. It is a "baby picture" from when the universe was less than 0.03% of its current age.

In addition to the age of the universe, WMAP has measured the density of matter, the density of atoms, the amplitude of the initial fluctuations that grew to form galaxies, and how this amplitude varies with scale. These five basic numbers explain not only the WMAP full sky picture of tiny temperature fluctuations but also a host of other astronomical observations.

The WMAP data have confirmed that atoms or normal matter make up only 4.5% of the total density of the universe. Dark matter comprises the next 22%. Many cosmologists speculate that this dark matter is a new type of subatomic particle. Dark energy appears to comprise the remaining 73.5% of the universe. This dark energy is driving the accelerated expansion of the universe. Unlike normal matter, this dark energy acts as a form of "anti-gravity". This WMAP measurement confirms earlier observations of supernovae (recognized by the 2006 Shaw Prize in Astronomy) that implied the expansion of the universe is accelerating today.

In declaring the WMAP results the 2003 "Breakthrough of the Year", Science Magazine wrote, "Lingering doubts about the existence of dark energy and the composition of the universe dissolved when the WMAP satellite took the most detailed picture ever of the cosmic microwave background (CMB)". Also, "All the arguments of the last few decades about the basic properties of the universe—its age, its expansion rate, its composition, its density—have been settled in one fell swoop".

The subtle patterns in the WMAP baby picture of the universe are consistent with the idea that the expansion of the universe is not only accelerating today, but also underwent a period of even more rapid accelerated expansion in its first moments. Cosmologists call this early acceleration "inflation". Quantum fluctuations in the rate of this early acceleration generated variations that are observable imprints on the microwave sky. WMAP's observations are consistent with this inflationary paradigm and constrain models of this very early epoch. For example, a popular textbook example of inflation has been ruled out by WMAP while other inflation possibilities remain.

In short, the WMAP measurements have become the frame of reference for cosmological research. This has made the WMAP scientific papers the most cited research papers in all of science.

Charles Bennett is the overall leader of the WMAP mission. He led the writing of the original proposal, organized and led the engineering and management teams, and he oversaw the design, construction, testing, launch, and the production of scientific results of the mission. Lyman Page is the Instrument Scientist, concentrating on the design and testing of the instrument. David Spergel is the WMAP lead theorist who helped to establish what WMAP should measure and later determined how to extract cosmology from the data. Many others have made indispensable contributions; WMAP would not have been possible without the efforts of the entire team. In particular, the late David Wilkinson, in whose memory the WMAP mission is named, was the initial Instrument Scientist until he fell ill.

Charles L Bennett

Laureate in Astronomy

My father was a graduate student in physics at Rutgers University in New Jersey when I was born in 1956. I was two when my family moved to Bethesda, Maryland, where I grew up with an older sister and younger brother. During high school, I tinkered with electronic circuitry, which led to my "ham" radio hobby. I built my own transmitter and antennas. Then, using a small telescope gift from my grandmother, I explored the wonders of the night sky. During summers as a teen, I worked repairing broken radios, phonographs, and televisions at a local TV store. This experience helped me get a summer job at the Carnegie Institution of Washington, developing astronomical instrumentation.

I earned a Physics and Astronomy Bachelors degree in 1978 at the University of Maryland and I went on to graduate school under Bernie Burke at MIT. As I was nearing the end of my time at MIT, I went to a colloquium by MIT Professor Rai Weiss. He talked about a NASA project called the Cosmic Background Explorer (COBE), which was fascinating because it seemed fundamentally important. I asked Weiss if there was any way that I could participate on this project and he replied that one of the three instruments needed someone to guide its day-to-day development at the Goddard Space Flight Center in Maryland. Thanks to the COBE team and especially Mike Hauser and John Mather, I got the job.

I met Renée, the love of my life, while at MIT. Within a one month period in 1984, I completed my physics PhD in Boston, married Renée in Los Angeles, moved to an apartment in Maryland, and started work as an astrophysicist at the NASA Goddard Space Flight Center.

I concentrated my COBE efforts on the Differential Microwave Radiometers (DMR) instrument, and soon became the deputy principal investigator. I led an effort to improve the sensitivity of the DMR radiometers by re-working its mixers. Not only was this effort successful, it made a crucial difference in the discovery of cosmic microwave background temperature variations across the sky ("anisotropy"). I also led the DMR data analysis effort at Goddard; led one of the suite of four discovery papers of the anisotropy; and led the continued analysis of the COBE DMR data with major results in 1994 and in 1996.

Renée worked remotely to complete her MIT PhD in 1987 and then took a faculty position at American University. Our first son, Andrew, was born in August 1987 and Renée began teaching the following month. I took off from work to care for our new baby.

By 1992 the need to follow up on the COBE DMR results was clear. It was widely appreciated that a space mission observing at smaller angular scales would reveal a wealth of cosmological information. By 1993, I was the Principal Investigator on a NASA grant to study a space mission approach with Goddard and Princeton partnered together. The year 1993 marked the beginning of a new project and a new member of our family. Our second son, Ethan, was born in December.

In 1995 NASA issued a call for space mission proposals. I worked day, night, and weekends with Goddard super-engineer Cliff Jackson, the science team, and an engineering team to submit a major proposal to NASA for the Microwave Anisotropy Probe (MAP). Dave Spergel provided theory, while Norm Jarosik, Lyman Page, and Dave Wilkinson and others provided instrument design input.

In April 1996, NASA assigned me the role of Principal Investigator with full budget and authority to direct all aspects of the mission. I involved the Science Team heavily in the hands-on design and development process – an unusual step, but a key to our success. MAP launched on June 30, 2001 and then the instrument began to survey the full sky. The mission was later renamed WMAP, the "W" in memorial to Dave Wilkinson who passed away in 2002.

The Science Team analyzed the first year of high quality data and in February 2003 released major results, providing the age, composition, shape, and history of the universe. While the 13.7 billion year age of the universe dominated the press, many scientists commented to me that WMAP was what made them first believe in the existence of dark energy. Later, the WMAP data would reveal new aspects of the polarization of the cosmic microwave background and its implications for the history of the universe. Gary Hinshaw led the data analysis efforts and Dave Spergel led the theory efforts.

On January 1, 2005 I became a professor at Johns Hopkins University, where I continue my WMAP work, teach, train students, and initiate new research. My family moved from Bethesda to Baltimore in 2007.

I conducted, but WMAP has been a symphony, orchestrated and performed by many individual virtuoso contributions.

Lyman A Page Jr
Laureate in Astronomy

I was born in San Francisco, California in 1957 and grew up there and in Virginia, New Hampshire, and Maine. My father is a pediatrician and my mother an artist. I have a younger brother and sister.

Growing up, I played with radios, chemistry sets, collected rocks, studied wild edible plants, built things, and even helped start a bicycle repair shop. I enjoyed sailing and spent a lot of time around boats. Math was my best subject in school. While attending Bowdoin College, my interest in physics was sparked by an introductory physics class taught by Professor E O LaCasce. I have loved physics since then.

In an effort to get a sense for the breadth of physics I perused the college library. I ran across "Gravitation" by Misner, Thorn, and Wheeler and wanted to understand it. Bowdoin let me make up a special course in which I read and did problems from the book. One of my research reports was on an article Bob Dicke wrote about Mach's principle. Since then, cosmology has particularly interested me.

After college, in 1978, I took a job operating a cosmic ray station in McMurdo Sound, Antarctica. I monitored the data and fixed the electronics that would occasionally break. I read the Feynman Lecture Series. Two of my fifteen months "on the ice" were spent at the South Pole helping Martin Pomerantz make solar observations.

Upon returning from the Antarctic, I bought an old wooden thirty-seven foot ketch and rebuilt her. From 1980 through 1982 I sailed her along the east coast of the US and around the Caribbean. To support myself and my boat I worked as a painter, rigger, and boat carpenter in various ports of call. I continued to read physics while on my boat. After limping through a storm just north of Venezuela, and having lost my rudder for a second time, I thought I'd try to attend graduate school.

I sailed into Boston Harbor and within two days was standing at the door of the MIT graduate physics office. The office was closed but Professor Herbert Bridge, who stood behind me as I peered through the door, offered to have my CV typed up and circulated to the faculty to help me find a job. One of the first people I talked with was Rai Weiss.

He said I could work in his lab but that he could not pay me. I supported myself as a carpenter in Boston and worked in the lab at night and on weekends. It worked out. Rai subsequently got me into graduate school.

Steve Meyer became my thesis advisor and got me started in CMB work, and in thinking about physics in new ways. Steve had done his PhD with Dave Wilkinson. My thesis was on a balloon-borne 0.3K bolometric radiometer designed to measure the CMB anisotropy. The first flight ended prematurely because the balloon burst. The second flight was successful and, through cross-correlation, was used to confirm the COBE discovery.

Most importantly, at MIT I met my wife, Lisa Olson. We met in the lab over a liquid nitrogen transfer. She is now a biophysicist on the faculty at Columbia University. We have three boys.

From MIT I went to Princeton where I have been since. I had the good fortune of getting to know Bob Dicke and John Wheeler, two whose ideas shaped my intellectual trajectory. I also got the opportunity to work with Dave Wilkinson, whose group I had gone to Princeton to join. In 1991, Dave, Norm Jarosik, Ed Wollack, who was then a graduate student, and I sketched out satellite mission possibilities. After later joining forces with Chuck Bennett, Gary Hinshaw, and John Mather at NASA GSFC, who had also been thinking about a satellite, and Steve Meyer (Chicago), David Spergel, and Ned Wright (UCLA), the mission that became WMAP gelled. The team grew as the mission evolved. It has been an experience of a lifetime.

Since MIT my primary research has continued to be on measurements and analyses of the CMB. With colleagues and students, I've measured the anisotropy with HEMT amplifiers, SIS mixers, and bolometers and have been a PI or Co-I on over half a dozen CMB experiments in addition to WMAP. I currently have the honour of directing the Atacama Cosmology Telescope project.

I have had the incredible good fortune to be part of a series of observations that measured the emergence of the anisotropy signal from when it was dominated by instrumental noise to its current clear manifestation in the all-sky WMAP maps. In the process I have worked with an extraordinary group of friends and colleagues. We all count ourselves fortunate to have been able to participate in the blossoming of modern cosmology.

David N Spergel

Laureate in Astronomy

I was born in 1961 in Rochester, New York, where my father was a graduate student studying particle physics. When I was 4, we moved to Huntington, New York where my parents, Martin and Rochelle Spergel, raised my brother, sister and me.

My interests in astronomy began at an early age and were amplified by my course work and research work as an undergraduate at Princeton. As a junior at Princeton, James Binney introduced me to galactic dynamics. As a senior, Jill Knapp took me to the Very Large Array, a radio telescope, where we observed proto-planetary nebulae, the last gasp of a dying star.

After graduating Princeton, I spent a year at Oxford working with James Binney on dynamics. After Oxford, I went to Harvard, where I did my thesis work with William Press. For my thesis work, I speculated about potential astronomical and experimental signatures of dark matter. Current underground experiments are still looking for the annual modulation effect that I predicted in my thesis.

John Bahcall brought me back to Princeton as a long-term member at the Institute for Advanced Study. While I was at the IAS, supernova 1987A exploded in the Large Magellanic Cloud and I spent much of my first year at the IAS thinking about the first detection of extra-solar neutrinos. Leo Blitz introduced me to galactic structure. I began my first study of the millimeter sky, but with a focus on modeling our Galaxy rather than the cosmic background radiation. Our work showed that the Milky Way is a barred Galaxy.

While I was a fellow at the IAS, I met Laura Kahn, my wife, at a bar in New York City. Laura has been my source of love and support. We have three wonderful children, Julian, Sarah and Joshua.

In 1987, I joined the Princeton faculty. In my early years at Princeton, I explored the idea that phase transitions in the early universe could generate density fluctuations that grew to form galaxies. When COBE reported its results in 1992, I realized that these models were ruled out. While these models were not successful, exploring alternative ideas is an essential part of science and provided my own introduction to the cosmic microwave background.

Stimulated by claims that COBE proved that the universe was flat, I began studying curved universe models. While the COBE data did not rule out negatively or positively curved geometries, I recognized that higher resolution measurements could determine the shape of the universe.

In 1994, I was offered the greatest scientific opportunity of my career. I was invited to join a team of scientists who were proposing to build a next generation satellite to observe the microwave background. Prior to joining this team, almost all of my work was done with small groups of theorists or as a single author. Working with the WMAP team has been my greatest scientific experience. Without the unique contributions of the many very talented team members, WMAP would not have been a success.

When I learned of the capabilities of the proposed mission, I recognized that these sensitive measurements would have the potential to test our basic cosmological model. If the model fit the data, then these observations would be able to measure the geometry and composition of the universe as well as study the physical mechanisms that seeded galaxy formation. The all-sky measurements would also be able to determine the large-scale topology of the universe.

For me, the most intense and exciting part of the WMAP mission was the analysis of the first year WMAP data. During this intense period, I worked closely with Gary Hinshaw, our data analysis lead, Chuck Bennett and their group at GSFC, Lyman Page and Norm Jarosik at Princeton and my other WMAP colleagues. I was very fortunate to work with a superb group of graduate students and postdocs, who made important contributions to the multi-year WMAP analyses.

The most demanding part of the analysis was the detection of a pattern of large-scale polarization fluctuations in the three-year analysis, one of WMAP's signature accomplishments. The polarization signal was nearly 100 times smaller than the temperature signal that WMAP was designed to measure. A combination of clever design and careful analysis enabled the detection of the signal. By measuring this weak signal, WMAP was able to make the first detection of the earliest stars and also rule out the simplest model of inflation in the early universe.

I feel very fortunate to have been able to look back into the first moments of the history of our universe.

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Professor Yuet-Wai Kan

Member of the Board of Adjudicators

Chairman of the Selection Committee for the Prize in Life Science and Medicine

Professor Yuet-Wai Kan is currently the Louis K Diamond Professor of Hematology at the University of California, San Francisco and he focuses his research on the use of gene and cell therapy to treat sickle cell anemia and thalassemia. Professor Kan was born in Hong Kong, graduated from the Faculty of Medicine at The University of Hong Kong and trained at Queen Mary Hospital, Hong Kong, before going to the United States for further studies.

Professor Kan's contributions led to the innovation of DNA diagnosis that found wide application in genetics and human diseases. For his work, he has received many national and international awards including the Albert Lasker Clinical Medical Research Award, the Gairdner Foundation International Award and the Shaw Prize. He is the first Chinese elected to the Royal Society, London, and is a Member of the US National Academy of Sciences, Academia Sinica, the Third World Academy of Sciences and the Chinese Academy of Sciences. He has received honorary degrees from the University of Caglieri, Italy, The Chinese University of Hong Kong, The University of Hong Kong and The Open University of Hong Kong.

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The Prize in Life Science and Medicine 2010

David Julius

for his seminal discoveries of molecular mechanisms by which the skin senses painful stimuli and temperature and produces pain hypersensitivity.

An Essay on the Prize in Life Science and Medicine 2010

The five senses we use to perceive our environment are hearing, sight, smell, taste and touch. David Julius discovered molecular mechanisms by which the sense of touch allows us to perceive pain and temperature.

The ability to detect painful stimuli is essential to our health and survival as it allows us to avoid direct contact with agents that can produce injury. Following injury, the skin becomes hypersensitive and even light touches or warm temperatures can be painful. This hypersensitivity has the positive function of protecting the skin from further injury. However, it sometimes has a negative outcome, causing the development of chronic pain syndromes that can be physiologically and psychologically devastating. In pioneering studies conducted over the past fifteen years, David Julius and his coworkers have uncovered mechanisms by which we sense pain and temperature as well as mechanisms that underlie pain hypersensitivity. His work has provided insights into fundamental mechanisms underlying the sense of touch and opened the door to rational drug design for the treatment of chronic pain syndromes.

The sense of touch is initiated by sensory neurons that have nerve endings in the skin to detect tactile and painful stimuli and temperature. The sensory neurons transmit signals to the spinal cord, which then relays these signals to the brain. In groundbreaking work published in 1997, David Julius discovered how sensory neurons detect capsaicin, a component of chili peppers that induces burning pain sensations when applied to the skin. He showed that capsaicin is detected by an ion channel on a subset of sensory neurons. Binding of capsaicin to the channel causes the channel to open, leading to an influx of cations that causes the neuron to transmit signals to the spinal cord. This channel, now called TRPV1, belongs to the TRP family of ion channels, whose members are structurally related but serve different functions. Surprisingly, Julius found that TRPV1 is activated not only by capsaicin, but also by temperatures above 43 °C, which are perceived as painful. By recording currents from single TRPV1 channels in isolated membrane patches, he further showed that both capsaicin and high temperatures directly open TRPV1 channels. Interestingly, he found that birds have a TRPV1 with a slightly different structure so that they are insensitive to the capsaicin in chili pepper seeds and therefore capable of carrying these seeds to spread chili pepper and similar plants. Tarantula bites can cause severe pain as their venom also targets this channel. Together, these discoveries provided the first insights into the molecular mechanisms by which we detect environmental stimuli through the sense of touch.

Julius subsequently discovered that TRPV1 also plays a central role in the hypersensitivity to pain resulting from tissue injury. Tissue injury results in a local increase in protons and the release of inflammatory mediators, such as bradykinin, that cause inflammation and pain hypersensitivity. Julius found that both protons and bradykinin lower the threshold for activating TRPV1, thereby stimulating the transmission of pain signals in response to innocuous and much milder stimuli, such as warm temperatures. Thus, TRPV1 not only detects painful heat and environmental chemicals, but is also capable of enhancing pain sensitivity in the setting of injury and inflammation. In addition to providing insight into a basic biological system, these discoveries open the way to the development of drugs to treat pain hypersensitivity and chronic pain syndromes.

Julius also studied a second ion channel on sensory neurons that detects other painful stimuli. This channel, called TRPA1, is activated by wasabi and other mustard oils that cause pain, irritation, and inflammation. Importantly, TRPA1 is also the target of environmental irritants, such as acrolein, that account for the toxic and inflammatory actions of tear gas, vehicle exhaust, and metabolic byproducts of chemotherapeutic agents.

Julius has also provided important insights into the molecular mechanisms by which we perceive other stimuli by his discovery of other TRP-related channels. Thus, he discovered TRPV2, a related but distinct TRP-type channel that is activated at a higher temperature than TRPV1. This suggested that thermosensation might involve different TRP channels that are activated by different temperatures. Another channel discovered by Julius and another group led by Ardem Patapoutian was TRPM8 that detects painful cold temperatures as well as menthol, a chemical that causes cool sensations when applied to the skin.

Together, the discoveries of David Julius and his colleagues constitute a major contribution to our knowledge of a fundamental biological function and its medical implications. His work has revealed molecular mechanisms that explain how one of our five senses, the sense of touch, detects changes in temperature and environmental stimuli that we perceive as painful. In addition, he has elucidated molecular mechanisms that underlie hypersensitivity to pain, thereby providing new targets for the design of drugs to treat chronic pain syndromes that affect many in our society.

David Julius

Laureate in Life Science and Medicine

I was born in 1955 and grew up in Brighton Beach, a section of Brooklyn best known for its proximity to Coney Island. My grandparents were among a wave of immigrants who left Eastern Europe in the early 1900s to make a better life for themselves in this residential seaside neighborhood of New York City. My father, an electrical engineer, and my mother, an elementary school teacher, obtained their college degrees from the City University of New York, and all three of their sons knew from an early age that learning and higher education were part of our life plan.

I attended Abraham Lincoln High, which boasts a number of illustrious alums in the arts and sciences, including Arthur Miller, Mel Brooks, Arthur Kornberg, and Paul Berg, to name a few. There, I had a superb and entertaining teacher named Herb Isaacson, a former minor league baseball player, who showed us how math and physics could be put to good use by solving 'relevant' problems, such as determining the equation of motion of a baseball. It was at this point that I considered a career in science.

After high school, I shipped off to MIT, where I grew to appreciate its quirky intellectual atmosphere and abundant opportunities for hands-on laboratory experience. In my junior year, I was fortunate to find an apprenticeship with Alexander Rich, one of the great figures in the study of biological macromolecules. Alex's lab was a creative, freewheeling, and messy place, dispelling any ideas I might have had about labs being stark and sterile environments reserved for quiet personalities and dispassionate experimentation. Rather, I learned that curiosity, persistence, hard work, luck, humour, and vigorous discussion are essential elements of the scientific process. I contributed to a project in which chemically modified transfer RNAs were used to probe mechanisms of amino acid attachment during ribosomal protein synthesis. I realized that I was driven to solve problems, and that I derived great satisfaction from bench work. I also published my first paper, providing tangible evidence that I might actually succeed in this profession.

The next bit of good luck came with my acceptance to the graduate program at UC Berkeley. My thesis advisors, Jeremy Thorner and Randy Schekman, were young, intense, and imaginative, and I couldn't have chosen better mentors or a more exciting time to join their labs. Jeremy and Randy exploited yeast genetics to study cell signaling and protein secretion, respectively. I worked on a project at the interface, namely, determining how a peptide mating pheromone called alpha-factor is produced and secreted by yeast. This culminated in the discovery of the KEX2 pro-protein convertase, the defining member of a family of subtilisin-like proteases that cleave polypeptide precursors at paired basic amino acids to liberate bioactive hormones. This was an exhilarating phase of my career, during which time I learned to appreciate the synergistic power of molecular genetics and biochemistry in pursuit of molecules and mechanisms governing metazoan physiology.

Having studied peptide hormone biosynthesis, I became interested in understanding how hormones and neurotransmitters mediate their actions. Reflecting Berkeley history, I was also curious to know how ergots and related hallucinogens alter sensory and cognitive states. Thus began my fascination with neuropharmacology, natural products, and membrane receptors. To explore these questions, I joined Richard Axel's laboratory at Columbia University in the winter of 1984. Richard, already a tall figure in molecular biology circles, had begun to train his sights on the nervous system. Projects in the lab were biologically diverse, but technically related in that they sought to clone genes defining a cell type or physiological process – an approach that fit my goal to a tee. I set my sights on identifying a gene encoding a serotonin receptor, hoping that this would clarify the genetic basis of receptor subtype diversity and enhance our understanding of neuropsychiatric disorders. After many false starts, I finally achieved my goal by cloning the 5-HT1c receptor from rat brain using a function-based screening strategy. My experience in Richard's lab continues to influence my work, as evidenced by our extensive application of expression cloning and other somatic cell genetic methods.

In 1989, I joined UC San Francisco as an Assistant Professor, where my group continues to address basic questions in neuropharmacology and neurophysiology. We are especially interested in sensory signaling and pain mechanisms. The Eureka moment came when we cloned the receptor for capsaicin (the pungent agent in 'hot' chili peppers) and demonstrated that this same receptor is also a thermosensitive ion channel that enables sensory nerve fibers to detect noxious heat. These and subsequent discoveries have highlighted roles for TRP ion channels in acute and chronic pain.

Joining the UCSF community has had many wonderful outcomes, not least of which was meeting my wife, Holly Ingraham, also a scientist and member of the faculty. Together with our son, Philip, we enjoy living in the beautiful Bay Area.

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Sir Michael Atiyah

Member of the Board of Adjudicators

Chairman of the Selection Committee for the Prize in Mathematical Sciences

Sir Michael Atiyah is an Honorary Professor at Edinburgh University. He was previously a professor at Oxford and at the Institute for Advanced Study in Princeton. In the 1990's he was Master of Trinity Cambridge, Director of the Isaac Newton Institute and President of the Royal Society of London. From 2005 – 2008, he was the President of the Royal Society of Edinburgh. He was knighted in 1983 and made a member of the Order of Merit in 1992.

Sir Michael was awarded the Fields Medal in1966 and the Abel Prize in 2004. He is a foreign member of around 20 national academies and has over 30 honorary degrees.

His main work has been in geometry and topology and their relation to analysis. This involved, in particular, the development of K-theory and index theory and their connections with physics. In recent years, he has been a strong advocate of collaboration between mathematicians and physicists.

THE SHAW PRIZE
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The Prize in Mathematical Sciences 2010

Jean Bourgain

for his profound work in mathematical analysis and its application to partial differential equations, mathematical physics, combinatorics, number theory, ergodic theory and theoretical computer science.

An Essay on the Prize in
Mathematical Sciences 2010

Mathematical analysis is concerned with the study of infinite processes, and the differential calculus of Newton and Leibniz lies at its heart. It provided the foundation and the language for Newtonian mechanics and the whole of mathematical physics. Over the past three centuries it has permeated much of mathematics and science.

Associated with the limiting process there are many technically difficult "estimates" or inequalities, of a combinatorial or algebraic nature, which prepare the ground and justify passing to the limit. Such estimates are often extremely hard since they address some subtle and important aspect of the problem at hand. Establishing this becomes a key step, opening the door to a wide variety of applications.

Over the past thirty years this study has undergone a mini-revolution in which a succession of hard problems of this nature have been solved, using a variety of novel techniques and ideas which often cross disciplinary boundaries and stimulate cross-fertilization.

Jean Bourgain is one of the leading analysts in the world today and he has played a major role in this revolution. He is much admired especially by those who make regular use of the multitude of powerful techniques that he has provided. He has written over 350 papers, each of which is first rate, and a number of which contain solutions of central long-standing problems.

The fields in which he has made such fundamental contributions include harmonic analysis, functional analysis, ergodic theory, partial differential equations, mathematical physics, combinatorics and theoretical computer science. Some of the well-known problems that he has solved include the embedding, with least distortion, of finite metric spaces in Hilbert space; extending the validity of Birkhoff's ergodic theorem to very general sparse arithmetic sequences; and the boundedness in L^p of the circular maximum function in two dimensions.

He has also made a fundamental breakthrough in the study of the non-linear Schrödinger equation for the critical exponent defocusing case, introducing new tools which have led to significant progress on this difficult problem.

A whole area where Bourgain has led the way, and which deserves special mention, is the field of arithmetic combinatorics and its applications. A notable example is his solution of the "local" version of the Erdös-Volkmann conjecture. The original conjecture asserts that any measurable subring of the real line has dimension either 0 or 1. This was proved by Edgar and Miller in 2003 and, around the same time, Bourgain established the local version. This provides a sharp and powerful quantification of this phenomenon and is technically a tour de force.

In 2004 Bourgain, Katz and Tao proved their celebrated finite field analogue, known as the "Sum Product theorem". This is an elementary and fundamental quantification of the fact that finite fields have no subrings, and it measures a basic disjunction between the operations of addition and multiplication in a finite field. Bourgain has developed and extended this phenomenon making it into a theory. A first application is to estimating algebro-geometric character sums. For this the standard tool has been the famous solution of the Weil conjectures, established by Deligne using Grothendieck's cohomology theory. However for these methods to give non-trivial information one needs the Betti numbers of the corresponding varieties to be small compared to the size of the finite field. What is remarkable about Bourgain's results is that they give results even when the Betti numbers are big.

Another application of Bourgain's theory, developed in collaboration with Gamburd is a proof of the expander conjecture of Lubotsky for the group $SL_2(F_p)$ and the spectral gap conjecture for elements in the group $SU(2)$. These are concerned with the spectra of the images, in high dimensional representations of these groups, of elements of their group rings. They yield exponentially sharp equidistribution rates for random walks in these groups and are central to problems such as classical sieving in number theory and to aperiodic tilings of 3-dimensional space.

Bourgain has also developed some striking applications of his theory to theoretical computer science by giving a much sought after explicit construction of pseudorandom objects called extractors. These, as well as the expanders, are basic building blocks used in fast derandomization algorithms.

Bourgain's spectacular contributions to modern mathematics make him a very deserving winner of the 2010 Shaw Prize in the Mathematical Sciences.

Jean Bourgain
Laureate in Mathematical Sciences

I was born in 1954 in Oostende (Belgium) from a family of medical doctors. My mother was a pediatrician and father a professor of physiology. This is where I completed elementary and high school until enrolling in 1971 at the Free University of Brussels as a student in mathematics. My interests in mathematics had started a few years earlier, perhaps mostly from browsing through calculus books we had at home.

Classes at the Free University were relatively small which allowed for more individualized attention than what happens at most larger institutions. I obtained the degree of 'Licentiaat' in 1975 and started working in areas such as descriptive set theory and functional analysis. In 1977 I got my PhD degree and a 'Habilitation' in 1979 for work on the structural theory of Banach Spaces and the relation between their local and infinite dimensional properties.

From 1975 on (until 1984) I was fortunate to have a position at the Belgian science foundation, which allowed me to do research and travel without other duties. Frequent visits to French institutions (such as the Centre de mathématiques of the École Polytechnique) and Israel (Jerusalem and Tel Aviv) enlarged my professional contacts and interests. The year 1984 – 85 was particularly important for me. I was a visiting member at the Institut des Hautes Études Scientifiques at Bures-sur-Yvette, participating in a special year on high dimensional convexity. In joint work with V Milman, using these methods we resolved an old problem of K Mahler on the volume of convex bodies and their polar, proving a converse to Santalo's inequality. One of the original motivations lies in the geometry of numbers, but our work became later also important to theoretical computer science.

In 1985, I was appointed to the IHÉS faculty and the same year also started a half time position at the University of Illinois as J L Doob Professor. My research interests had evolved towards harmonic analysis, ergodic theory and partial differential equations; in France, there were active groups in Orsay, the IHP institute and the University of Paris 7. Besides my IHÉS colleagues, I enjoyed frequent discussions with people like M Herman and J-P Thouvenot.

Starting from the early nineties, I have spent a great deal of time working on various aspects of Hamiltonian evolution equations. Putting aside the integrable cases, which are special, the available conserved quantities may not suffice to establish solutions or can be inadequate to deal with important classes of initial data. They also do not shed much light on how the solutions behave for large time. By bringing into play methods from probability and smooth dynamical systems, further information can sometimes be obtained. In this context, I succeeded using my work on 'Fourier restriction phenomena' to establish a well-defined dynamics on the support of the Gibbs-measure, which plays the role of an invariant measure for the flow. Some special cases had been studied earlier by J Lebowitz and his collaborators and qualitative results in this direction had also been obtained by P Malliavin. But understanding the full extent to which Gibbs measures are a substitute for a conserved quantity, from a more classical perspective, was a challenge.

1994 is the year I joined the Institute for Advanced Study in Princeton as part of the faculty of the School of Mathematics. Scientific life there was (and is) particularly intense for me, due to the many seminars at the institute and also Princeton University and the exposure to an infinite stream of visiting members. Initially, I continued working on differential equations and problems in mathematical physics, developing a theory of quasi-periodic solutions for evolution equations in higher dimension and contributing to the spectral theory of lattice Schrodinger operators modeling transport in inhomogenous media.

A few years after my arrival at IAS, we started a new direction at the institute, which is theoretical computer science. It became part of the math school. At the start, no one could predict how exactly the interaction with the core mathematical activities would evolve in the longer run. In my view, it has been amazing. And I greatly benefited from it. One sample of this has to do with my earlier work in harmonic analysis of Euclidean space and the so-called 'Kakeya-set' problem, which plays a crucial role. Understanding the structure of 3-dimensional Kakeya sets (these are simply sets containing a line segment in every direction) turned out to have an unexpected realm of connections that have occupied me over the last decade. Among them are developments in the combinatorial aspects of finite fields (the so-called 'sum-product' phenomena), the theory of exponential sums, pseudo-randomness in computer science and the expansion properties of Cayley graphs of linear groups.

Collaboration and discussions with some of my colleagues in and outside the institute have been very important to me and I am very grateful to them.

Organization

Preparatory Committee (Until July 2003)

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The Chinese University of Hong Kong

Professor Yue-Man Yeung (Chairman of the Committee)
Emeritus Professor of Geography and Resource Management
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Mr Raymond Wai-Man Chan
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The Chinese University of Hong Kong

Mrs Mona Shaw
Chairperson
The Shaw Prize Foundation

Professor Samuel Sai-Ming Sun
Master
S H Ho College
The Chinese University of Hong Kong

Professor Kwok-Kan Tam
Dean & Chair Professor
School of Arts and Social Sciences
The Open University of Hong Kong

* **Preparatory Committee (Until July 2003)**

Front row, from right to left

* Professor Kwok-Pui Fung

* Professor Lin Ma

Professor Chen-Ning Yang

Mr Run Run Shaw

* Professor Yue-Man Yeung

* Mrs Mona Shaw

Back row, from right to left

* Mr Raymond Wai-Man Chan

* Professor Pak-Chung Ching

* Professor Samuel Sai-Ming Sun

* Professor Kwok-Kan Tam

* Professor Sunny Kai-Sun Kwong

Mr Charles Cheuk-Kai Cheung

Mr Koon-Fai Chor

The Shaw Prize 2004

From right to left:

The Late Sir Richard Doll (1912-2005),
Laureate in Life Science and Medicine;

Professor James Peebles,
Laureate in Astronomy;

Professor Stanley Cohen,
Laureate in Life Science and Medicine;

Mr Run Run Shaw,
Founder of The Shaw Prize;

Mr Chee-Hwa Tung,
The then Chief Executive of HKSAR;

Professor Herbert W Boyer,
Laureate in Life Science and Medicine;

Professor Yuet-Wai Kan,
Laureate in Life Science and Medicine and

The Late Professor Shiing-Shen Chern (1911-2004),
Laureate in Mathematical Sciences.

The Shaw Prize 2005

From right to left:

Professor Michel Mayor,
Laureate in Astronomy;

Professor Geoffrey Marcy,
Laureate in Astronomy;

Mr Run Run Shaw,
Founder of The Shaw Prize;

Mr Rafael Hui,
Acting Chief Executive of HKSAR (2005);

Sir Michael Berridge,
Laureate in Life Science and Medicine and

Professor Andrew Wiles,
Laureate in Mathematical Sciences.

The Shaw Prize 2006

From right to left:

Professor Brian Schmidt,
Laureate in Astronomy;

Professor Adam Riess,
Laureate in Astronomy;

Professor Saul Perlmutter,
Laureate in Astronomy;

Mr Donald Tsang,
Chief Executive of HKSAR;

Mr Run Run Shaw,
Founder of The Shaw Prize;

Professor Xiaodong Wang,
Laureate in Life Science and Medicine;

Professor David Mumford,
Laureate in Mathematical Sciences and

Professor Wentsun Wu,
Laureate in Mathematical Sciences.

The Shaw Prize 2007

From right to left:

Professor Peter Goldreich,
Laureate in Astronomy;

Professor Robert Lefkowitz,
Laureate in Life Science and Medicine;

Mr Run Run Shaw,
Founder of The Shaw Prize;

Mr Henry Tang,
Acting Chief Executive of HKSAR (2007);

Professor Robert Langlands,
Laureate in Mathematical Sciences and

Professor Richard Taylor,
Laureate in Mathematical Sciences.

The Shaw Prize 2008

From right to left:

Professor Reinhard Genzel,
Laureate in Astronomy;

Sir Ian Wilmut,
Laureate in Life Science and Medicine;

Professor Keith H S Campbell,
Laureate in Life Science and Medicine;

Mr Run Run Shaw,
Founder of The Shaw Prize;

Mr Donald Tsang,
Chief Executive of HKSAR;

Professor Shinya Yamanaka,
Laureate in Life Science and Medicine;

The Late Professor Vladimir Arnold (1937-2010),
Laureate in Mathematical Sciences and

Professor Ludwig Faddeev,
Laureate in Mathematical Sciences.

The Shaw Prize 2009

From right to left:

Professor Frank H Shu,
Laureate in Astronomy;

Professor Douglas L Coleman,
Laureate in Life Science and Medicine;

Mr Run Run Shaw,
Founder of The Shaw Prize;

Mr Donald Tsang,
Chief Executive of HKSAR;

Professor Jeffrey M Friedman,
Laureate in Life Science and Medicine;

Professor Simon K Donaldson,
Laureate in Mathematical Sciences and

Professor Clifford H Taubes,
Laureate in Mathematical Sciences

THE SHAW PRIZE 邵逸夫獎

The Shaw Prize Foundation

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Council Member

Mrs
Mona Shaw

Mona Shaw, wife of Sir Run Run Shaw, is Chairperson of The Sir Run Run Shaw Charitable Trust, The Shaw Foundation Hong Kong Limited and The Shaw Prize Foundation. A native of Shanghai, China, she is an established figure in the Hong Kong media and entertainment industry, currently serving as Deputy Chairperson and Managing Director of Shaw Brothers (Hong Kong) Limited and Deputy Chairperson and Managing Director of Television Broadcasts Limited.

Council Member

Professor Lin Ma

Professor Lin Ma was Professor of Biochemistry (1972 – 78) and Vice-Chancellor (1978 – 87) of The Chinese University of Hong Kong; he is Emeritus Professor of Biochemistry and has published largely on protein chemistry. Professor Ma has served as Chairman of the Board of Trustees of Shaw College, The Chinese University of Hong Kong since its inauguration. He has received honours from Great Britain, Japan and Germany, and honorary degrees from several international universities as well as from universities in Hong Kong, Macau and China.

Professor Ma was the Convenor of two sub-groups of the Hong Kong Basic Law Drafting Committee: (1) Education, Science and Arts, and (2) Hong Kong Flag and Emblem.

Council Member

Professor
Chen-Ning Yang

Professor Chen-Ning Yang, an eminent contemporary physicist, was Albert Einstein Professor of Physics at the State University of New York at Stony Brook until his retirement in 1999. He has been Distinguished Professor-at-large at The Chinese University of Hong Kong since 1986 and Professor at Tsinghua University, Beijing, since 1998.

Professor Yang received many awards: Nobel Prize in Physics (1957), Rumford Prize (1980), US National Medal of Science (1986), Benjamin Franklin Medal (1993), Bower Award (1994) and King Faisal Prize (2001). He is a member of the Chinese Academy of Sciences, the Academia Sinica in Taiwan, the US Academy of Sciences, Royal Society of London and the Russian Academy of Sciences.

Since receiving his PhD from the University of Chicago in 1948, he has made great impacts in both abstract theory and phenomenological analysis in modern physics.

Council Member

Professor Kenneth Young

Professor Kenneth Young is a theoretical physicist, and is Professor of Physics and Pro-Vice-Chancellor at The Chinese University of Hong Kong. He pursued studies at the California Institute of Technology, USA, 1965 – 1972, and obtained a BS in Physics (1969) and a PhD in Physics and Mathematics (1972). He joined The Chinese University of Hong Kong in 1973, where he held the position of Chairman, Department of Physics and later Dean, Faculty of Science and Dean of the Graduate School. He was elected a Fellow of the American Physical Society in 1999 and a Member of the International Eurasian Academy of Sciences in 2004. He was also a member of the University Grants Committee, HKSAR and Chairman of its Research Grants Council. He served as Secretary and then Vice-President of the Association of Asia Pacific Physical Societies. His research interests include elementary particles, field theory, high energy phenomenology, dissipative systems and especially their eigenfunction representation and application to optics, gravitational waves and other open systems.

Council Member

Professor Sheung-Wai Tam

Professor Sheung-Wai Tam is the President Emeritus of The Open University of Hong Kong (OUHK). With more than 30 years experience in teaching, research and university administration at The Chinese University of Hong Kong (1965 – 1995), Professor Tam has attained many achievements in higher education and demonstrated excellence in teaching and research in natural products, mass spectrometry and organometallic chemistry.

Professor Tam served as the President of the OUHK for 8 years (1995 – 2003). During this period the OUHK was heading towards the goal of becoming a regional Centre of Excellence in Distance and Adult Learning. As a result, the OUHK has won a number of accolades, including the '*Prize of Excellence for Institutions*' (International Council for Open and Distance Education) and the '*Award of Excellence for Institutional Achievement in Distance Education*' (Commonwealth of Learning) in 1999 as well as the '*Stockholm Challenge Award*' (City of Stockholm and European Commission) in 2000.

For his significant contributions to open and distance education, Professor Tam was awarded the '*Prize of Excellence for Individuals*' (International Council for Open and Distance Education) in 2001 and the '*Meritorious Service Award*' (Asian Association of Open Universities) in 2002, and honorary degrees: Hon D Univ (UKOU) 2002; Hon D Sc (OUHK) 2006; and Hon D Sc (Nottingham U) 2008.

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THE SHAW PRIZE 邵逸夫獎

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Professor Michel Mayor
Emeritus Professor, Department of Astronomy, University of Geneva, Switzerland

Professor Richard McCray
George Gamow Distinguished Professor of Astrophysics, Emeritus, JILA, University of Colorado, USA

Professor Brian P Schmidt
The Research School of Astronomy and Astrophysics, Mount Stromlo Observatory, The Australian National University, Australia

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HHMI Investigator and Professor of Cell and Developmental Biology, Department of Molecular and Cell Biology, UC Berkeley, USA

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Professor David Kazhdan
Professor of Mathematics, The Einstein Institute of Mathematics, Faculty of Science, The Hebrew University of Jerusalem, Israel

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Eugene Higgins Professor of Mathematics, Department of Mathematics, Princeton University, USA

Professor Yum-Tong Siu
William E Byerly Professor of Mathematics, Department of Mathematics, Harvard University, USA

Professor Margaret H Wright
Silver Professor of Computer Science, Computer Science Department, Courant Institute of Mathematical Sciences, New York University, USA

Selection Committee Member

Professor Peter Goldreich

Astronomy Committee

Professor Peter Goldreich is the Lee A DuBridge Professor of Astrophysics & Planetary Physics Emeritus at the California Institute of Technology in Pasadena California.

He received a PhD from Cornell University in 1963. After spending one year as a postdoc at Cambridge University and two as an Assistant Professor at the University of California, Los Angeles, he joined the Caltech faculty as an Associate Professor in 1966. He was promoted to Full Professor in 1969 and remained at Caltech until he retired in 2002. Subsequently, he was appointed Professor in the School of Natural Sciences at the Institute for Advanced Study in Princeton from which he retired in 2009. Professor Goldreich is a Member of the US National Academy of Sciences and a Foreign Member of the Royal Society of London. His awards include the Henry Norris Russell Lectureship of the American Astronomical Society, the US National Medal of Science, the Gold Medal of the Royal Astronomical Society, the Grande Medaille of the French Academy of Sciences, and the Shaw Prize. Professor Goldreich's research involves the application of physics to the understanding of natural phenomena, in particular those revealed by astronomical observations.

Selection Committee Member

**Professor
Michel Mayor**

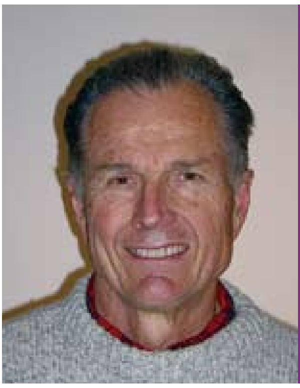
Astronomy Committee

Professor Michel Mayor, an Emeritus Professor, Department of Astronomy, University of Geneva and past Director of Geneva Observatory has been the founding President of the new Commission of Extrasolar Planets of the International Astronomical Union (IAU).

Among his recognitions, mention must be made of the E Balzan International Prize awarded in 2002, the Einstein Medal in 2004 and last but not least, the 2005 Shaw Prize for Astronomy. He is a Foreign Member of the French Academy of Sciences, the British Royal Astronomical Society and the US National Academy of Sciences.

Professor Mayor pioneered in the nineties the search for exoplanets through precise radial velocity measurements. Together with his team he has a substantial share in the number of exoplanets detected so far. They detected in particular the first giant planet orbiting a solar-type star, 51 Pegasi. These discoveries have opened an entirely new exciting research area, both on the observational side and in theoretical studies. They are leading as well to major instrumental developments, in which the Geneva Observatory is deeply involved and plays a key-role.

Selection Committee Member



Professor Richard McCray

Astronomy Committee

Professor Richard McCray is the George Gamow Distinguished Professor of Astrophysics, Emeritus, at the University of Colorado in Boulder.

Professor McCray received a BS from Stanford University in 1959 and a PhD from the University of California at Los Angeles in 1967. He was a postdoc at Caltech (1967 – 68), an Assistant Professor at the Harvard College Observatory (1968 – 71), and a Professor at the University of Colorado since then.

His research includes the theory of the heating, cooling, chemistry and dynamics of interstellar gas; the physics of compact cosmic X-ray sources; and the physics of supernovae and supernova remnants. He also uses the Hubble Space Telescope and the Chandra Observatory to observe these phenomena.

He is a Member of the American Astronomical Society, the International Astronomical Union, the American Association for the Advancement of Sciences and the US National Academy of Sciences. He was awarded a Guggenheim Fellowship and the Dannie S Heinemann Prize for Astrophysics.

Selection Committee Member

Professor Brian P Schmidt

Astronomy Committee

Professor Brian P Schmidt is a Laureate Fellow at The Australian National University's Mount Stromlo Observatory.

He received undergraduate degrees in Physics and Astronomy from the University of Arizona in 1989, and completed his Astronomy PhD from Harvard University in 1993. In 1994 he formed the High-Z SN Search Team, a group of 20 astronomers on 5 continents who used distant exploding stars to trace the expansion of the Universe back in time. This group's discovery of an accelerating Universe was named Science Magazine's Breakthrough of the Year for 1998. In 2006 Professor Schmidt was jointly awarded the Shaw Prize for Astronomy, and shared the 2007 Gruber Prize for Cosmology with his High-Z SN Search Team colleagues. In 2008 he was elected a Fellow of the Australian Academy of Sciences, and the United States National Academy, and Foreign Member of the Spanish Royal Academy of Sciences. Professor Schmidt is currently leading Mt Stromlo's SkyMapper telescope, a new facility that will provide a comprehensive digital map of the southern sky.

Selection Committee Member

Professor
Peter C Agre

Life Science and Medicine Committee

Professor Peter C Agre studied chemistry at Augsburg College (BA 1970) and medicine at Johns Hopkins (MD 1974). He completed his residency at Case Western Reserve University in Cleveland and an Oncology Fellowship at the University of North Carolina at Chapel Hill. A Johns Hopkins faculty member since 1984, Professor Agre was Professor of Biological Chemistry and Professor of Medicine. In 2003, Professor Agre shared the Nobel Prize in Chemistry for discovering aquaporins, a family of water channel proteins found throughout nature, responsible for numerous physiological processes in humans and implicated in multiple clinical disorders.

In 2005, Professor Agre moved to the Duke University School of Medicine to become Vice Chancellor for Science and Technology and James B Duke Professor of Cell Biology. Professor Agre is a Member of the US National Academy of Sciences and chairs their Committee for Human Rights. On 1 January 2008 Professor Agre has moved to Johns Hopkins Bloomberg School of Public Health where he became Director of the Malaria Research Institute.

Selection Committee Member

Professor Linda B Buck

Life Science and Medicine Committee

Professor Linda B Buck is a Howard Hughes Medical Institute Investigator at Fred Hutchinson Cancer Research Center and Affiliate Professor of Physiology and Biophysics at the University of Washington. She received a BS from the University of Washington in 1975, a PhD from the University of Texas Southwestern Medical Center, Dallas in 1980, and was previously Professor of Neurobiology at Harvard Medical School. Professor Buck is a Fellow of the American Association for the Advancement of Science and a Member of the US National Academy of Sciences, the Institute of Medicine of the National Academies, and the American Academy of Arts and Sciences.

Professor Buck's research has provided key insights into the mechanisms underlying the sense of smell. In recognition of her contributions, she has received numerous awards, including The Lewis S Rosenstiel Award for Distinguished Work in Medical Research (1997), The Gairdner Foundation International Award (2003), and The Nobel Prize in Physiology or Medicine (2004).

Selection Committee Member

**Sir
Tim Hunt**

*Life Science and
Medicine Committee*

Sir Tim Hunt works at Cancer Research UK, Clare Hall Laboratories, in South Mimms, Hertfordshire. Sir Tim was born in 1943 and grew up in Oxford, moving to Cambridge in 1961 to read Natural Sciences. In 1968, he obtained his PhD in the Department of Biochemistry. He spent almost 30 years in Cambridge, working on the control of protein synthesis, with spells in the USA; he was a postdoctoral Fellow with Irving London at the Albert Einstein College of Medicine in 1968-70 and spent summers at the Marine Biological Laboratory, Woods Hole from 1977 until 1985, both teaching and doing research.

In 1982, he discovered cyclins, which turned out to be components of "Key regulators of the Cell Cycle", and led to a share of the Nobel Prize in Physiology or Medicine in 2001, together with Lee Hartwell and Paul Nurse.

Sir Tim Hunt was elected as Fellow of the Royal Society in 1991 and became a Foreign Associate of the US National Academy of Sciences in 1999. He was knighted in the Queen's Birthday Honours List of 2006 and was the Chair of the Council of European Molecular Biology Organization (EMBO).

Selection Committee Member

Professor
David M Livingston

Life Science and Medicine Committee

Professor David M Livingston is Deputy Director of the Dana-Farber/Harvard Cancer Center; Chief of the Charles A Dana Division of Human Cancer Genetics, the Emil Frei Professor of Genetics and Medicine at Harvard Medical School, and the Chairman of the Executive Committee for Research at the Dana-Farber Cancer Institute, the senior faculty group that oversees all aspects of the Institute's research program. His research focuses on the genetic and molecular mechanisms by which normal human cells emerge as cancer cells.

Professor Livingston has received numerous awards and honours, including the Clowes Award of the American Association for Cancer Research and the Boveri Award of the German Cancer Society. He has been elected to the US National Academy of Sciences, the Institute of Medicine of the US National Academy of Sciences and the American Academy of Arts and Sciences. He sits on multiple editorial boards and science advisory boards of other research institutions. Professor Livingston has authored more than 195 scientific publications.

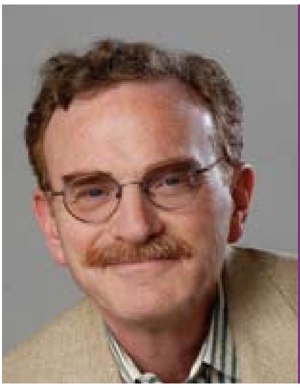
Selection Committee Member

**Dr
William E Paul**

*Life Science and
Medicine Committee*

Dr William E Paul discovered interleukin-4, demonstrated that it is the central regulator of allergic inflammation and is known for work on cytokine biology, lymphocyte dynamics, T-cell antigen-recognition and B-cell development. He is Chief of the Laboratory of Immunology of the National Institute of Allergy and Infectious Diseases and a National Institutes of Health Distinguished Investigator. From 1994 to 1997, he was Director of the NIH Office of AIDS Research and was responsible for a new emphasis on HIV vaccine development. Dr Paul is a Member of the US National Academy of Sciences, its Institute of Medicine and the American Academy of Arts and Sciences. He received the Founder's Prize of the Texas Instruments Foundation, the 3M Life Sciences Award and the Max Delbruck Medal. Dr Paul was President of the American Society for Clinical Investigation and the American Association of Immunologists (AAI) and is a recipient of Lifetime Achievement Awards from the AAI and the International Cytokine Society.

Selection Committee Member



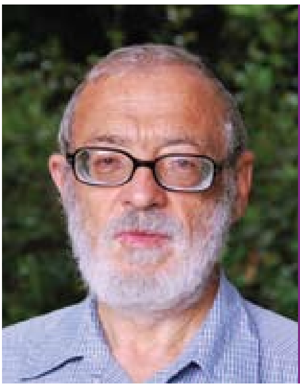
Professor Randy W Schekman

Life Science and Medicine Committee

Professor Randy W Schekman is a professor in the Department of Molecular and Cell Biology at the University of California, Berkeley and an Investigator of the Howard Hughes Medical Institute. Schekman's lab elucidated key components and events of the secretory pathway in *Saccharomyces cerevisiae*. His group discovered that protein transport in yeast is mediated by the same organelles and proteins that operate in mammalian cells.

Among his honours are the Eli Lilly Award in microbiology, the Lewis S Rosenstiel Award in basic biomedical science, the Gairdner International Award, the Amgen Award from the Protein Society, the Albert Lasker Award for Basic Medical Research, the Louisa Gross Horwitz Prize of Columbia University and the Dickson Prize from the University of Pittsburgh. Professor Schekman is a Member of the US National Academy of Sciences, the American Academy of Arts and Sciences and the American Philosophical Society. He is Past President of the American Society of Cell Biology and currently serves as Scientific Director of the Jane Coffin Childs Memorial Fund for Medical Research and Editor-in-Chief of the Proceedings of the National Academy of Sciences USA.

Selection Committee Member



Professor David Kazhdan

Mathematical Sciences Committee

Professor David Kazhdan was born in 1946 in Moscow, Russia. His father Alexander Kazhdan was a known historian. Professor Kazhdan studied mathematics under Israel Gelfand from an early age. He earned a doctorate under Alexandre Kirillov in 1969 and was a leading member of Israel Gelfand's School of Mathematics. Professor Kazhdan emigrated from Russia to take a position at Harvard University in 1975.

In 2002, he emigrated to Israel and is a Professor at The Hebrew University of Jerusalem and a Professor Emeritus at Harvard University.

Professor Kazhdan held a MacArthur Fellowship from 1990 to 1995. He is a Member of the US National Academy of Sciences and Israel Academy of Sciences (2006), and was elected to the American Academy of Arts and Sciences in 2008.

Selection Committee Member

Professor
Peter C Sarnak

Mathematical Sciences Committee

Professor Peter C Sarnak is currently the Eugene Higgins Professor of Mathematics at Princeton University and Professor of the Institute for Advanced Study.

He has made major contributions to number theory, and to questions in analysis motivated by number theory. His interest in mathematics is wide-ranging, and his research focuses on the theory of zeta functions and automorphic forms with applications to number theory, combinatorics, and mathematical physics.

Professor Sarnak received his PhD from Stanford University in 1980. In the same year, he became Assistant Professor of Courant Institute of Mathematical Sciences of New York University and an Associate Professor in 1983. In 1987 he moved to Stanford University. He joined Princeton University as Professor in 1991, became the Henry Burchard Fine Professor of Mathematics in 1995 and the Chair of the Department of Mathematics from 1996 – 1999. From 2001 – 2005, he was Professor of Courant Institute of Mathematical Sciences of New York University.

He has received many awards, including the Frank Nelson Cole Prize, American Mathematical Society (2005) and Levi L Conant Prize, AMS (2003). He was elected as a Member of the US National Academy of Sciences and Fellow of the Royal Society of London in 2002.

Selection Committee Member

Professor
Yum-Tong Siu

Mathematical Sciences Committee

Professor Yum-Tong Siu was born in 1943 in Guangzhou, China. He received a BA from The University of Hong Kong in 1963 and a PhD from Princeton University in 1966. Currently, he is the William Elwood Byerly Professor of Mathematics at Harvard University, where he has been teaching since 1982. He is a Member of the American Academy of Arts and Sciences, US National Academy of Sciences, Chinese Academy of Sciences (Foreign Member), Academia Sinica (Taiwan), and Goettingen Academy of Sciences (Corresponding Member). His research interests lie in several complex variables, complex algebraic geometry, and complex differential geometry.

Selection Committee Member

**Professor
Margaret H Wright**

*Mathematical Sciences
Committee*

Professor Margaret H Wright is Silver Professor of Computer Science and Mathematics in the Courant Institute of Mathematical Sciences, New York University. She received her BS (Mathematics) and MS and PhD (Computer Science) from Stanford University.

Her research interests include optimization, scientific computing, and optimization in real-world applications. Prior to joining NYU, she worked at Bell Laboratories (Lucent Technologies), where she was named as a Bell Labs Fellow.

She was elected to the National Academy of Engineering (1997), the American Academy of Arts and Sciences (2001), and the US National Academy of Sciences (2005). During 1995 – 1996 she served as President of the Society for Industrial and Applied Mathematics (SIAM), and has chaired advisory committees for several mathematical sciences institutes and government agencies.

In 2000, she received an honorary doctorate in Mathematics from the University of Waterloo, Ontario, Canada and she was named an Honorary Doctor of Technology by the Swedish Royal Institute of Technology in 2008.

THE SHAW PRIZE 邵逸夫獎

Presenter

Ms Do Do Cheng

Award Winning Actress and Versatile TV Performer / Programme Host

Award winning actress and versatile TV performer / programme host Ms Do Do Cheng has starred in many TVB classic dramas and won film awards, local and international. Her hosting of the Hong Kong version of "The Weakest Link" and starring in Television Broadcasts Limited's (TVB) sit-com "War of the Genders" became talk-of-the-town. Ms Cheng's success in hosting the TVB gameshow on legal knowledge "Justice for All" has brought her career to a new height. She also hosted the 2008 Beijing Olympics for TVB and has been one of the presenters for the Shaw Prize Award Presentation Ceremony since its inception in 2004.

THE SHAW PRIZE 邵逸夫獎

Presenter

Mr
Leon Ko

Theatre and Film Composer

Mr Leon Ko received a Richard Rodgers Development Award in the US for his musical “Heading East”. His music for the movie “Perhaps Love” won him a Golden Horse Award and a Hong Kong Film Award. For the stage, he received four Best Score awards for his musicals in Hong Kong. He was the musical director of Jacky Cheung’s 2004 world tour of “Snow, Wolf, Lake”. Recent works include “The Liaisons” which was presented at the Expo 2010 Shanghai. Besides music, Mr Ko launched “Time In A Bottle”, the first-ever perfume bottle exhibition in Hong Kong in 2010, showcasing the artistry of vintage bottles in the context of theatre.

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