## 2018 CANADA GAIRDNER AWARDS RECOGNIZE WORLD-RENOWNED SCIENTISTS FOR TRANSFORMATIVE CONTRIBUTIONS TO RESEARCH THAT IMPACT HUMAN HEALTH

TORONTO, ON (March 27, 2018) – The Gairdner Foundation is pleased to announce the 2018 Canada Gairdner Award laureates, recognizing some of the world's most significant research and biomedical discoveries. Laureates receive a $100,000 cash honorarium and are formally presented with their awards on October 25, 2018 at the annual Canada Gairdner Awards Gala in Toronto.

**2018 Canada Gairdner International Award**
The 2018 Canada Gairdner International Award laureates are recognized for seminal discoveries or contributions to biomedical science:

**Davor Solter, MD, PhD**
*Emeritus Member and Director, Max Planck Institute of Immunobiology and Epigenetics; Visiting International Professor, Siriraj Center for Excellence in Stem Cell Research, Mahidol University; Visiting Professor, University of Zagreb Medical School*

**Professor Azim Surani, PhD, FMedSci, FRS**
*Director of Germline and Epigenetics Research, Wellcome Trust Cancer Research UK Gurdon Institute; Marshall-Walton Professor, University of Cambridge*

**Awarded "for their discovery of mammalian genomic imprinting that causes parent-of-origin specific gene expression and its consequences for development and disease"**

**The Work:** Together, the work of Dr. Solter and Dr. Surani contributed to the understanding of the developmental consequences and molecular mechanisms of genomic imprinting. In 1984, they released parallel studies that demonstrated the concept of genomic imprinting. All cells in the animal contain two copies of every autosomal gene, one from the mother and one from the father, and in most cases both copies are expressed. However, "imprinted" genes are expressed only from either the maternally or the paternally inherited copy. Genomic imprinting has widespread roles in mammals, affecting embryonic and placental development and transmission of nutrients to the fetus, and regulating critical aspects of mammalian physiology, such as metabolism, neuronal development and adult behaviour. Extensive research based on this discovery led to the identification of numerous imprinted genes whose alleles are differentially expressed depending on the parent of origin.

**The Impact:** Faulty imprints can lead to developmental, physiological and behavioural anomalies in mice, and result in diseases in humans. There is growing evidence for the importance of imprinting in disease susceptibility from developmental syndromes like Beckwith-Wiedemann, Angelman and Prader-Willi, to a variety of cancers and neurological disorders and obesity. It also has effects on diverse aspects of mammalian development and physiology, such as stem cells, core body temperature, nutrition and behaviour. Their work is one of the key discoveries that started the field of epigenetics, the study of heritable changes in gene function without changes in the DNA sequence.

**2018 Canada Gairdner International Award**

**Peter Hegemann, MD, PhD**

*Hertie Professor for Neurosciences, Experimental Biophysics, Department of Biology, Humboldt-Universität zu Berlin*

**Karl Deisseroth, MD, PhD**
*D.H. Chen Professor of Bioengineering and Psychiatry, Stanford University; Investigator, Howard Hughes Medical Institute*

**Edward S. Boyden, PhD**
*Y. Eva Tan Professor in Neurotechnology, Professor, Departments of Biological Engineering and Brain and Cognitive Sciences, Media Lab and McGovern Institute, MIT*

**Awarded "for the discovery of light-gated ion channel mechanisms, and for the discovery of optogenetics, a technology that has revolutionized neuroscience"**

**Dr. Hegemann:**

**The Work:** Dr. Hegemann's research focused almost entirely on the characterization of natural sensory photoreceptors, mainly from microalgae. Hegemann has characterized behavioral and photoelectric responses of the unicellular alga, Chlamydomonas, which cumulated in the claim that the photoreceptors for these responses was a rhodopsin that unified the sensor and ion channel in one protein. He finally proved this hypothesis by identifying the light-gated channel, channelrhodopsin and by demonstrating its functionality in animal cells.

Of equal importance, his group discovered the fundamental principles of the unique channelrhodopsin proteins in molecular detail by a wide range of genomic, biophysical, electrophysiological and structural techniques with many mutants in close collaboration with Karl Deisseroth. This led to their deciphering of the unprecedented light-gated ion channel mechanism, including its pore gating by photons and its ion selectivity. This basic work also fundamentally enabled optogenetics (the technology wherein light-activated proteins– first and foremost channelrhodopsin- allow control of selected cells within systems as complex as the mammalian brain, with unprecedented precision in space and time by delivery of light).

**The Impact:** Optogenetics has been successfully employed to enhance our understanding of neural circuit function mediating normal behavior and dysfunction underlying neurological and psychiatric disorders. Optogenetics is a technology that has revolutionized the field of neuroscience and has enabled a new generation of experiments that probe the causal roles of specific neural circuit components.

**Dr. Deisseroth:**

**The Work:** A challenge for both basic and clinical neuroscience is the complexity of brain structure and function which makes it difficult to determine how electrical activity within individual cells causes behavior. Deisseroth adapted light-activated proteins from microbes (including the channelrhodopsins) to allow individual types of cells to be controlled with light in real time during behavior. The initial paper from Deisseroth's lab, along with graduate students Feng Zhang (who received a Canada Gairdner International Award in 2016) and Edward Boyden, identified a key piece of the puzzle: channelrhodopsin-based control of neurons with light. Subsequently Deisseroth's group designed the necessary tools for targeting opsins and light to circuit elements of interest and applied the final resulting method (optogenetics) to discover principles of brain function in health and disease.

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**Dr. Boyden:**

**The Work:** Dr. Boyden's research has focused on optical technologies for understanding how neurons work together to generate behavior and how their activity changes in disease states or can be changed to treat such diseases. Boyden, along with fellow laureate Karl Deisseroth, brainstormed about how microbial opsins could be used to mediate optical control of neural activity while both were students in 2000. Together, they collaborated to demonstrate the first optical control of neural activity using microbial opsins in the summer of 2004, with Deisseroth, and Boyden, performing the gene transfection and the optical stimulation respectively. At MIT, Boyden's team developed the first optogenetic silencing (2007), the first effective optogenetic silencing in live mammals (2010), noninvasive optogenetic silencing (2014), multicolor optogenetic control (2014), and temporally precise single-cell optogenetic control (2017).

**The Impact:** Boyden's work has given neuroscientists the ability to precisely activate or silence brain cells to see how they contribute to pathological states or the remedy thereof. By optogenetically controlling brain cells, it has become possible to understand how specific patterns of brain activity might be used to quiet seizures, cancel out Parkinsonian tremors, activate the brain's immune system to overcome Alzheimer's and make other health-promoting alterations to the brain.

**2018 John Dirks Canada Gairdner Global Health Award**
The 2018 John Dirks Canada Gairdner Global Health Award laureates are recognized for outstanding achievements in global health research:

**Alan D. Lopez, AC, PhD, FAHMS**
*Melbourne Laureate Professor, Rowden-White Chair of Global Health and Burden of Disease Measurement, University of Melbourne*

**Christopher J.L. Murray, MD, DPhil**
*Director of the Institute for Health Metrics and Evaluation (IHME); Professor of Global Health, University of Washington*

**Awarded "for their ground-breaking work in conceptualizing and quantifying the Global Burden of Disease"**

**The Work:** Murray and Lopez are co-founders of the Global Burden of Disease study, a systematic, scientific effort to quantify the comparative magnitude of health loss from all major diseases, injuries, and risk factors by age, sex, and location over time. Their first collaboration in the early 1990s calculated estimates for eight regions, 107 diseases, and 10 risk factors. More than two decades later, the latest edition of the study, now published annually in the international medical journal, *The Lancet*, covers more than 300 diseases and injuries in nearly 200 countries by age and sex from 1990 to the present, allowing comparisons over time across age groups and among populations. Approximately 3,200 collaborators in 140 nations contribute to what has been recognized as the world's largest publishing collaboration in science. In recent years, the GBD enterprise has expanded into quantifying sociodemographic inequalities in health and measuring health on the local level by mapping nations in 5x5 kilometer increments. It is coordinated by the Institute for Health Metrics and Evaluation at the University of Washington where Murray serves as Director.

**The Impact:** The GBD has led to policy changes and improvements in health systems in numerous countries including China, the United Kingdom, India, Rwanda, Colombia, Saudi Arabia, Indonesia and the Philippines. The U.S. National Institutes of Health, the World Health Organization, the World Bank, and the Bill & Melinda Gates Foundation all use GBD results to guide their priority setting and spending decisions. The study has generated nearly 20,000 peer-reviewed publications and has received more than 700,000 citations in scientific studies and reports.

**2018 Canada Gairdner Wightman Award**
The 2018 Canada Gairdner Wightman Award laureate is a Canadian scientist recognized for outstanding leadership in medicine and medical science throughout their career:

**Frances A. Shepherd, OC, OOnt, MD, FRCPC, FASCO**
*Medical oncologist, Princess Margaret Cancer Centre, University Health Network; Professor of Medicine, University of Toronto*

**Awarded "for her global leadership in oncology which has contributed significantly to improving survival outcomes of lung cancer patients worldwide"**

**The Work:** Dr. Shepherd's major area of research is in the field of clinical trials for lung cancer. She has been instrumental in developing and evaluating new treatment modalities at the local, national and international level for patients with both small cell and non-small cell lung cancer. Under her leadership, the Canadian Clinical Trials Group Lung Cancer Site conducted many international practice-changing studies. These landmark studies have shown that post-operative chemotherapy can change the cure rate for resected lung cancer and that molecularly targeted treatments can improve survival even in the most advanced stages of the disease. In collaboration with her basic science colleagues, she has established lung cancer tumour banks that have proved to be an invaluable resource to study the biology of lung cancer at a molecular level and to link the laboratory to the clinic.

**The Impact:** Dr. Shepherd has designed and led paradigm-shifting clinical trials over the past three decades that have changed treatment and outcomes for patients with lung cancer at a global level. She has mentored more than 40 post-doctoral research fellows from around the world, many of whom now hold senior academic positions in their home countries. She has authored or co-authored more than 500 peer-reviewed publications and 35 book chapters.

**QUOTES:**

"Each year the Gairdner Foundation recognizes the best and brightest researchers from around the world and 2018 is no exception. From genomic imprinting to clinical trials for cancer and optogenetics, this year's cohort of laureates are a fitting addition to the Gairdner's track record of exemplary international awardees." said Dr. Lorne Tyrrell, Chair, Board of Directors, Gairdner Foundation.

"2018 will be another extraordinary year for the Gairdner Foundation and for Canadians across the country interested in science. Each of the 2018 Canada Gairdner Award laureates will participate in a pan-Canadian outreach program to share their research with graduate students, trainees, post-docs, faculty members and high school students," said Dr. Janet Rossant, President & Scientific Director, Gairdner Foundation. "Gairdner is proud to recognize our 2018 laureates for their cutting-edge research and to be raising the calibre of scientific conversation in Canada through access to leading international researchers".

**About the Canada Gairdner Awards:**

Each year seven Canada Gairdner Awards are presented to honour the world's most significant biomedical and global health researchers. The Canada Gairdner International Award is given to five individuals for outstanding international biomedical research, while the Canada Gairdner Wightman Award is given to an individual leader in Canadian medicine. The John Dirks Canada Gairdner Global Health Award recognizes a contribution to health in the developing world. These seven awards both distinguish Canada as a leader in science and elevate the profile of science in Canada. They are Canada's only globally known and respected international science awards. All laureates are chosen by international adjudication committees.

**About the Gairdner Foundation:**

The Gairdner Foundation was established in 1957 by Toronto stockbroker, James Gairdner to award annual prizes to scientists whose discoveries have had major impact on scientific progress and on human health. Since 1959 when the first awards were granted, 373 scientists have received a Canada Gairdner Award and 87 to date have gone on to receive the Nobel Prize. The Canada Gairdner Awards promote a stronger culture of research and innovation across the country through our Outreach Programs including lectures and research symposia. The programs bring current and past laureates to a minimum of 15 universities across Canada to speak with faculty, trainees and high school students to inspire the next generation of researchers. Annual research symposia and public lectures are organized across Canada to provide Canadians access to leading science through Gairdner's convening power.

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