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The Banting Research Foundation invests in the early careers of researchers who demonstrate excellence and creativity in health and biomedical sciences.

La Fondation de recherche Banting investit dans le début de carrière de chercheurs qui font preuve d’excellence et de créativité en sciences de la santé et en sciences biomédicales.
The Banting Research Foundation continues to fulfill its mission to invest in the early careers of Canadian researchers who demonstrate excellence and creativity in health and biomedical sciences. This year 53 applicants were assessed by our Grant Review Panel and 6 outstanding candidates were chosen to receive the Banting Research Foundation Discovery Award. Each year, the awardees report on their innovative research projects that led to successful competitive funding from prestigious sources such as our Canadian federal granting agencies, including the Canadian Institutes of Health Research. We frequently receive letters attesting to the importance of funding from the Banting Research Foundation as pivotal for these investigators to complete pilot and feasibility studies that enable them to be competitive for larger grants. Our Board is very proud of supporting over 1300 grants since 1925 with a total of $7.6 million.

This process reflects the experience of Dr Frederick Banting when he received support from the University of Toronto, Department of Physiology, to pilot his initial studies leading to the discovery of insulin. It is this legacy that the Banting Research Foundation promotes through its Discovery Award program by supporting some of Canada's most promising young investigators.

In the Fall of 2016, the Banting Research Foundation was pleased to sponsor a Roundtable held in Ottawa featuring Dr Janet Rossant, the 2016 Friesen Prize Awardee and also a former Banting Discovery Award recipient. A brief report of the event organized by the Friends of CIHR, led by Dr Aubie Angel (also our Trustee and Vice-Chair), is found in this annual report.

In September of this year our Board hosted an event “Investing in Our Future” to celebrate the accomplishments of our awardees and the volunteer contributions of our Grant Review Panel. At this event, held at the Faculty Club at the University of Toronto, we welcomed awardees, past and present, as well as members of the Panel, recognizing those who have served for many years volunteering their expertise. The Board is particularly grateful for the generous efforts of Dr Reinhart Reithmeier who organizes and chairs the Grant Review Panel. Dr Pat Brubaker, the vice-chair of the Panel, provides helpful feedback to
the applicants in the form of an analytic report following the review. A number of guests who support the good work of our Foundation joined us to meet our awardees.

Our guest speakers at this event included Dr Stephen Scherer, an internationally recognized scientist in medical genetics at The Hospital for Sick Children (HSC) in Toronto. He told the story of the early years following his PhD with appointment as an independent scientist at HSC and the valuable support he received for his novel ideas. This initial funding launched his path to the discovery of the genetic basis of many conditions. He was the first to identify autism risk genes. Stephen emphasized the critical importance of the Banting Research Foundation Discovery Awards in similarly assisting young Canadian scientists. Our other guest speaker was Dr Kaitlyn McLachlan, Assistant Professor in the Department of Psychology at the University of Guelph and recipient of a 2016 Discovery Award. She spoke to us of her exciting work developing neurotechnologies to identify markers of fetal alcohol syndrome in adults who are overrepresented in the criminal justice system. This innovative work heralds a new approach to diagnosis and therapy for some of our most vulnerable Canadians. We wish Kaitlyn, and all of our recent awardees, every success as they launch their most promising careers.

This year, thanks to the hard work of our Executive Director Ramona Rea and expert advice from our Board member Alexandra Harris, the Banting Research Foundation website has been updated. Evidence of the impact of our Foundation is now displayed in a more user-friendly venue. Effective communication is a critical success factor for sustaining our Foundation and growing our assets.

Many thanks to Trustees and Campaign Cabinet members for their volunteer engagement and support of the Banting Research Foundation. This year we doubled our donor support and signed agreements with other charitable foundations to share in our Discovery Award program to potentially increase the number of our awards. I look forward to the coming year when our Foundation will continue to “Inspire Health Science Discovery – Building on the Banting Legacy.”

Catharine Whiteside, CM MD PhD FRCP(C) FCAHS
Chair, Board of Trustees
The Banting Research Foundation
Board of Trustees 2016-17

Dr Catharine Whiteside
Chair of the Board
Emerita Professor and former Dean of Medicine
University of Toronto

Ms Alexandra Harris
PhD Candidate, Lawrence S Bloomberg Faculty of Nursing
Junior Fellow, Massey College
University of Toronto

Dr Aubie Angel
Vice-Chair
Professor Emeritus
Senior Fellow, Massey College
University of Toronto
President, Friends of CIHR

Mr William E Hewitt
Chair, Audit, Finance & Investment Committee
Independent Financial and Investment Consultant

Mr William Pashby
Secretary Treasurer
Retired Partner
Borden Ladner Gervais

Ms Elizabeth Vosburgh
Former Governor
Governing Council
University of Toronto

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Distinguished Fellow in Global Innovation
Munk School of Global Affairs/Faculty of Applied Science and Engineering
University of Toronto

Dr Avrum I Gotlieb
Professor, Department of Laboratory Medicine and Pathobiology
University of Toronto

Recent Chairs of the Board of Trustees

John S Floras (2009-2015)
John M Burnes (2000-2009)
Dorothy M Hellebust (1990-1994)

Elizabeth H Pearce (1981-1987)
John K Macdonald (1960-1977)
Grant Review Panel 2017

Dr Reinhart Reithmeier, Chair
Professor
Department of Biochemistry
University of Toronto

Dr Patricia Brubaker, Vice-Chair
and Scientific Officer
Professor
Departments of Physiology and Medicine
University of Toronto

Dr Dawn Bowdish
Associate Professor
Department of Pathology and Molecular Medicine
McMaster University

Dr Robert Chen
Professor, Department of Medicine
University of Toronto

Dr Karen Davis
Professor, Department of Surgery
University of Toronto

Dr Rodrigo Fernandez-Gonzalez
Associate Professor, Institute of Biomaterials & Biomedical Engineering
University of Toronto

Dr Anthony Gramolini
Professor, Department of Physiology
University of Toronto

Dr Susan Jaglal
Professor, Department of Physical Therapy
University of Toronto

Dr Robert Maunder
Professor, Department of Psychiatry
University of Toronto

Dr Arthur Mortha
Assistant Professor, Department of Immunology
University of Toronto

Dr Jonathan Rocheleau
Associate Professor, Institute of Biomaterials & Biomedical Engineering
University of Toronto

Dr Robert Tsushima
Associate Professor and Chair, Department of Biology
York University

Dr Christopher Yip
Professor, Department of Chemical Engineering and Applied Chemistry
Director, Institute of Biomaterials & Biomedical Engineering
University of Toronto
Jeanette Boudreau, PhD, Dalhousie University

Directing natural killer cell cytotoxicity to the tumour’s susceptibilities

Natural killer (NK) cells are white blood cells that kill tumours. The potential of each NK cell to kill tumours is counterbalanced by its ability to be inhibited by healthy cells through its inhibitory receptors. Dr Boudreau aims to tip the balance in favour of NK cells killing, rather than inhibition, when they encounter a tumour cell. Each NK cell has a unique sensitivity to the “on” and “off” signals given by a tumour. She is using different cancer types to understand how they act to turn NK cells on or off. She will test whether it is possible to predict and optimize tumour killing by screening and selecting NK cells based on their expression of certain receptors. She expects that in time this will allow clinicians to use NK cells as cancer therapies.

Christopher Dennison, PhD, University of Alberta

Impact severity metric for focal head and diffuse brain injury

Whether or not today’s helmets protect the wearer from concussions is a topic of intense debate, especially in the helmet standards and certification community. Typically, debate centers on how helmet test methods might change in response to the emerging knowledge on the biomechanical forces associated with head impact and resulting brain injury. How will helmet certification and test methods change, and what impact-severity measures best assess a helmet’s ability to mitigate severity and likelihood of brain injury? Dr Dennison is using data from over 1000 hockey and cycling helmet impacts to develop new metrics suitable for helmet testing relative to brain injury. These metrics may eventually be adopted by standards communities, resulting in testing protocols that assess helmet protection against both severe and mild brain injury.

Jeffrey Gagnon, PhD, Laurentian University

Investigating the role of $H_2S$ in the regulation of ghrelin secretion

Ghrelin, a hormone produced in the stomach, regulates several aspects of metabolic health, including appetite and energy storage. Meals high in the amino acid cysteine have been shown to reduce ghrelin secretion. Foods rich in cysteine also lead to increased production of the bioactive gas hydrogen sulfide ($H_2S$). $H_2S$ has been shown to regulate many aspects of health, including inflammation, cardiovascular health, and endocrine control. Dr Gagnon believes that ghrelin cells can metabolize cysteine to produce $H_2S$, and that this $H_2S$ reduces ghrelin secretion and reduces appetite. He will show how $H_2S$ and cysteine regulate ghrelin secretion, and will then examine how they can suppress food intake through the suppression of ghrelin. Results will provide important information on how ghrelin and appetite are regulated by $H_2S$, which may lead to new strategies in weight management.
Kaitlyn McLachlan, PhD, University of Guelph
*Evaluating novel neurobiomarkers in the identification of adults with FASD using portable eye tracking and EEG technology*

Individuals with fetal alcohol spectrum disorder (FASD) are overrepresented in the criminal justice system. To reduce recidivism and the resulting high social, health, and economic costs, there is an urgent need to identify neurobiomarkers of FASD and individuals at risk. Novel use of neurotechnologies, such as portable eye movement control tracking and EEG, may aid in identifying patterns of brain-based deficits in offenders with FASD. Dr McLachlan aims to use these neurotechnologies to evaluate whether they can reliably identify adult offenders at risk of having FASD. She will also evaluate relationships between performance on eye movement control tasks and patterns of EEG activation. Findings will be used to develop and implement fast, non-invasive, and affordable screening protocols to aid in large-scale screening for FASD in order to better support those with the disability.

Noam Miller, PhD, Wilfrid Laurier University
*Exploring neural mechanisms of social behavior using zebrafish (Danio rerio)*

This research study uses zebrafish to explore mechanisms of social behaviour. Zebrafish, a small freshwater species of fish commonly used in genetic and developmental research, spend most of their time in groups. They have complex social interactions, including learning from each other, making collective decisions about where to search for food, and communicating about the presence of predators. Using a series of behavioural tests of zebrafish social behavior, Dr Miller explores how social behaviour is controlled in the brain by exposing individual members of the group to drugs that affect specific brain systems. This helps to identify novel drugs that may have beneficial effects on human social disorders.

Roxane Paulin, PhD, Université Laval
*Targeting ErbB2 by TAK-165 reverses pulmonary hypertension in vitro and in vivo*

In pulmonary hypertension (PHT; high blood pressure in the lungs), cells forming the walls of arteries in the lungs proliferate like cancer cells, narrowing the arteries and making it difficult for blood to pass through. There is also evidence of inflammation, similar to that in infections, and evidence of insulin resistance, as in diabetes. Dr Paulin hypothesized that circulating factors could be responsible for these problems occurring in organs otherwise unconnected. She found that levels of a factor called prohibitin (PHB) are increased in the blood of humans and animals with PHT, and that PHB binds to a receptor to enhance cell proliferation and induce PHT. In this project, she is studying and testing the potential of a therapy targeting this PHB receptor, aiming to reveal new ways to treat PHT.
Discovery Awards 2017-18

These projects were approved for funding in the 2017-18 year.

**Florian Bentzinger, PhD, Université de Sherbrooke**  
*Niche regulation of muscle stem cell specification*

**Jennifer Gordon, PhD, University of Regina**  
*HPA axis dysregulation in the etiology of perimenopausal depression*

**Catherine Larochelle, MD PhD, CRCHUM, Université de Montréal**  
*Molecular mechanisms underlying T lymphocytes interactions with oligodendrocytes in neuroinflammation*

**Gareth Lim, PhD, CRCHUM, Université de Montréal**  
*Evaluating the therapeutic potential of 14-3-3ζ for the treatment of obesity*

**Adena Scheer, MD, St Michael’s Hospital, University of Toronto**  
*Cross-cultural communications in breast cancer treatment*

**Julien van Grevenynghe, PhD, INRS – Institut Armand-Frappier, Université du Québec**  
*Autophagy regulates CD8 T-cell killing activity during chronic HIV-1 infection*

**CSCI-CITAC Young Investigators Forum**

For the last four years, the Banting Research Foundation has sponsored the oral abstract and poster presentation awards in the Young Investigators Forum at the annual meeting of the Canadian Society for Clinical Investigation and the Clinician Investigator Trainee Association of Canada. Young clinician investigators presented research posters in several categories, and some were invited to present their research orally. Prizes were awarded to the highest-ranked presenters. These young clinician investigators in training represent the future of clinical research in Canada, and we’re pleased to offer our support.
Some research results from our 2016 Discovery Award recipients

Jeanette Boudreau’s research group (Dr Helmi Alfarra, Nardeen Grace) has established a bank of samples from healthy human donors that enables study of the effect of genetic variation in immune response on the function of natural killer (NK) cells. Their work to match NK cells with individual cancers continues towards the project’s aims of tailoring NK-cell-based immunotherapies for precise control of cancer.

“I am extremely grateful to the Banting Research Foundation for this funding, which helped to establish my laboratory and provided a springboard from which to apply for further funding. Already, preliminary data from this project has been used to secure funding from [other agencies].”

Christopher Dennison reported that his PhD student Brooklynn Knowles completed over 1500 impact experiments to hockey and football helmets. This research estimated mechanical deformation of the brain, a measure of injury risk. Early analysis showed that simple mechanical measures in impact experiments can be efficient predictors of brain deformation and resulting injury risk. This is an important step in developing an assessment metric for helmets. This metric addresses the need for new helmet assessment measures relating to brain injury, something that many helmet certification organizations have highlighted as necessary.

“The Banting Research Foundation Discovery Award has benefited our research group’s productivity and research profile. Please accept our sincere thanks and trust that these funds were central in advancing our work on head protection.”

Noam Miller described his research group’s (Ramy Ayoub, Eric Armstrong) study on social learning in zebrafish that helps us understand how conformity and other forms of social influence operate in the vertebrate brain. They are exploring how these types of social influence function in the brain and are now exposing the test fish to pharmacological agents that may alter their choices. There is a high degree of similarity between zebrafish and human brains, and if we can tease apart the neural mechanisms of conformity in the fish, we will know more about the drivers of social interaction in ourselves.

“Thank you for supporting this research and my career.”
Events

The Banting Research Foundation sponsored the Henry G Friesen International Prize in Health Research awarded to Sir Paul Nurse in 2015 and Janet Rossant in 2016. Dr Nurse spoke of the value of discovery science in the creative process. Dr Rossant described her research career and the ethical challenges in her field of developmental biology. She has acknowledged that funding by the Banting Research Foundation was very helpful in her early career. Dr Henry Friesen was also funded by the Banting Research Foundation early in his career.

Noam Miller, Kaitlyn McLachlan (2016 Discovery Awardees) and Michael Suits (2015 Discovery Awardee) spoke about their research at a public science lecture organized by the Royal Canadian Institute for Science.

Kaitlyn McLachlan spoke about her research on fetal alcohol spectrum disorder at our September 2017 recognition event, Investing in Our Future. Dr Stephen Scherer provided the keynote address where he spoke of the importance of supporting researchers early in their careers.
# BALANCE SHEET

As at June 30

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASSETS</strong></td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>28,788</td>
<td>27,012</td>
</tr>
<tr>
<td>HST recoverable</td>
<td>6,292</td>
<td>5,922</td>
</tr>
<tr>
<td>Investments, at fair value</td>
<td>4,402,920</td>
<td>4,184,741</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4,438,000</td>
<td>4,217,675</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>LIABILITIES AND FUND BALANCES</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Liabilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounts payable and accrued liabilities</td>
<td>17,327</td>
<td>14,776</td>
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</table>

<table>
<thead>
<tr>
<th>Fund balances</th>
<th>2017</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Fund</td>
<td>664,555</td>
<td>577,825</td>
</tr>
<tr>
<td>Endowment Fund</td>
<td>3,756,118</td>
<td>3,625,074</td>
</tr>
<tr>
<td><strong>Total fund balances</strong></td>
<td>4,420,673</td>
<td>4,202,899</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4,438,000</td>
<td>4,217,675</td>
</tr>
</tbody>
</table>
## CONDENSED STATEMENT OF REVENUE AND EXPENSES AND CHANGES IN FUND BALANCES

Year ended June 30

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REVENUE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investment income, net</td>
<td>430,920</td>
<td>107,217</td>
</tr>
<tr>
<td>Donations</td>
<td>38,964</td>
<td>19,670</td>
</tr>
<tr>
<td><strong>Total Revenue</strong></td>
<td><strong>469,884</strong></td>
<td><strong>126,887</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EXPENSES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grants awarded to new investigators</td>
<td>146,000</td>
<td>175,000</td>
</tr>
<tr>
<td>Other grants</td>
<td>14,500</td>
<td>14,500</td>
</tr>
<tr>
<td>Professional fees</td>
<td>70,493</td>
<td>55,013</td>
</tr>
<tr>
<td>Accounting and audit fees</td>
<td>10,964</td>
<td>10,964</td>
</tr>
<tr>
<td>Office, general and administrative</td>
<td>10,153</td>
<td>9,305</td>
</tr>
<tr>
<td><strong>Total Expenses</strong></td>
<td><strong>252,110</strong></td>
<td><strong>264,782</strong></td>
</tr>
</tbody>
</table>

**Excess (deficiency) of revenue over expenses for the year**

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Excess (deficiency)</strong></td>
<td><strong>217,774</strong></td>
<td><strong>(137,895)</strong></td>
</tr>
</tbody>
</table>

**Fund balances, beginning of year**

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fund balances</strong></td>
<td><strong>4,202,899</strong></td>
<td><strong>4,340,794</strong></td>
</tr>
</tbody>
</table>

**Fund balances, end of year**

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fund balances</strong></td>
<td><strong>4,420,673</strong></td>
<td><strong>4,202,899</strong></td>
</tr>
</tbody>
</table>

This summarized financial information is derived from financial statements that were audited by Ernst & Young LLP, Chartered Professional Accountants. Complete financial statements are available upon request.
Donors, Partners and Sponsors

The Banting Research Foundation was established in 1925 to fund biomedical research innovation. From its endowment, interest and new donations the Foundation has now funded more than 1300 awards. Currently, only 10-12% of Discovery Award applicants from across Canada are funded due to our limited resources. We aspire to ensure that every opportunity to support excellent new investigators is achieved. To this end we aim to double the number of awards over the next 5 years.

Your contribution will go a long way to help launch the careers of our young scientists whose research promises to have major impact on improving health. We are interested in providing opportunities for sponsors who wish to partner with the Foundation targeting research in a specific health or biomedical field.

The Banting Research Foundation gratefully acknowledges donations from the following individuals and corporations during the 2017 fiscal year:

- Mr John Burnes
- Ms Sheila Jarvis
- Dr Stephen Scherer
- Dr Catharine Whiteside
- Mr Griffith R Lloyd
- Anonymous
- The Henry White Kinnear Foundation
- The William and Nona Heaslip Foundation
- Donors through CanadaHelps
- Donations in memory of Florence Banting

Thank you!
Your donations have supported innovative health and biomedical research projects by outstanding early-career investigators.

Many thanks to the University of Toronto Faculty of Medicine for the in-kind contribution of our office space.

Charitable registration number 108072927 RR 0001
"The Banting Research Foundation commemorates the discovery of insulin, and the hope is that through its opportunities other discoveries will be made, which, like insulin, will bring alleviation to human suffering."

Sir Robert Falconer, KCMG LLD
First Chairman of The Banting Research Foundation
President of the University of Toronto
June 23, 1925