

## Bioscience Education Canada (BEC)

Formerly known as the Canadian Biotechnology Education Resource Centre (CBERC), BEC is a federally incorporated, charitable not-for-profit organization with the mandate to grow the biotechnology sector in Canada by:

- *Educating students, teachers, and the general public about the field of biotechnology; and*
- *Participating in outreach activities that increase public awareness of biotechnology*

Located in the heart of Toronto near the Discovery District at the MaRS Centre, BEC has developed a network of academic, government and industrial partners to help deliver a range of educational programs designed to excite and motivate Canadian students and the public about the promises and challenges of biotechnology.

## About Biotechnology

Biotechnology offers personalized medicine, new drugs, diagnostics and solutions to help the world community address challenges such as climate change.

<b>Health and Medicine</b>	<b>Agriculture and Food</b>	<b>Industrial Bioproducts</b>
Drugs	Nutraceuticals	Biofuels
Vaccines	Value-added plants and animals	Bioplastics
Diagnostics	Environmental remediation	Biolubricants
Regenerative medicine	Biopesticides	Biosensors
Gene therapy	Forest Products	Biocatalysts
Personalized Medicine		

The new global “BioEconomy” emerging from advances in biotechnology currently represents over 4,200 companies, US \$20 billion in research and development per year and earnings of over \$60 billion annually in product revenues.

From a national perspective, biotechnology helps Canada compete internationally and enables exportation of Canadian products to new markets by creating value-added industries in the health, pharmaceuticals, agriculture and natural resources sectors. The Government of Canada and a number of provincial governments continue to commit themselves to making Canada a world leader in biotechnology with funding levels approaching \$1 billion per annum on biotechnology scientific activities.

Critical Canadian successes in biotechnology have led to hundreds of products in the healthcare, agriculture, and environmental sectors.

## **Our Mission**

Our mission with our partners is to build a “Made in Canada” solution to the education of young people and to better inform the public about biotechnology.

By allowing science teachers to become better equipped to teach and promote biotechnology in the education system, BEC encourages more young people to enter this field. It is our hope that with this increased appreciation of biotechnology education, ministries of education, innovation and economic development across Canada will become better advocates on behalf of our industry and our future role in society.

## **Our Goals**

- *Educating every Canadian student about biotechnology and other biosciences;*
- *Increasing the number of these students entering biotechnology as graduates, employees and/or entrepreneurs;*
- *Enhancing the skills of teachers using our educational tools and curriculum; and*
- *Increasing public awareness of the benefits of biotechnology and biosciences in general*

## Our Vision

Our vision is simple. We want to build the biotechnology sector in Canada by educating every student, teacher and member of the public about the huge socioeconomic benefits of biotechnology: new drugs, novel foods, new fuels and environmental renewal.

We are working with our government and industrial partners across the country to ensure that we provide the most effective educational programs to students, teachers and organizations interested in learning more about biotechnology and its opportunities.

Our targeted markets:

- *3,400 High Schools in Canada*
- *10,000 High School Teachers*
- *200,000 High School Students Taught Per Year*

## Canadian Biotech Successes

**Insulin:** Frederick Banting, Charles Best, J. J. R. Macleod and J.B. Collip were the first to obtain insulin in a form consistently effective for treating diabetes mellitus. In 1923, Banting and Macleod receive the Nobel Prize.

**Barcodes:** Dr. Hebert at University of Guelph discovered that one gene gives scientists an easy-to-identify label to distinguish an animal from a closely related species.

**Stem cells:** James E. Till and Ernest A McCulloch at the University of Toronto discovered the hemopoietic stem cell. This is the basis for bone marrow transplantation, which is a highly successful clinical story today.

**BioDiesel:** Dr. David Boocock at University of Toronto developed a new process to produce biodiesel from any feedstock, vegetable oils, agricultural seed oils, animal waste greases/oils and recycled cooking oils/greases.

**Value-add Canola:** University of Guelph professor, Ken Kasha developed new varieties of canola.

**Heart pacemaker:** A Canadian surgeon developed the pacemaker.

**Human Genome Sequencing:** Scientists at the Hospital for Sick Children contributed to the Human Genome Project.

**Aids therapeutic:** 3TC- key ingredient in the AIDS cocktail was developed by BioChem Pharma, Quebec.

**Novel Production Systems:** SemBioSys Genetics Inc. developed high value protein in using its proprietary oil body/oleosin technology, enabling commercialization of purified protein products

**Vaccines:** ID Biomedical in Vancouver developed nasal Proteospme – based vaccines that protect against pneumonic plague caused by lethal aerosol infection with virulent plague bacteria.

## **Our Programs (Educating Students)**

### *Sanofi-Aventis BioTalent Challenge*

BEC's "crown jewel" program is the Sanofi BioGENEius Challenge Canada (SBCC). This award-winning science competition is offered in nice regions- Greater Toronto, Quebec, Eastern Ontario, Southwestern Ontario, Halifax, Saskatchewan , British Columbia, Manitoba, Alberta, and Atlantic Canada.

The number of participants in the SBCC has dramatically increased by 400 per cent over the last ten years. More than 4,000 have benefited from the experience, many of them going on to pursue careers or further studies in biology-related fields.

The competition mirrors the real world of scientific research by:

- *Requiring research proposals that are evaluated by a scientific evaluation committee;*
- *Providing financial support of up to \$200 to the approved student projects;*
- *Assigning mentors to each team to provide expert advice and access to equipment and supplies; and*
- *Judging of projects by fellow students (peer review) and by judges representing government, business, academia and the education community.*

BEC is the national coordinating organization for the 9 SBCC programs across Canada that are sponsored by more than 100 national and regional organizations.

Regional winners of the SBCC programs travel to Ottawa to present their projects to a panel of prestigious judges at the National Research Council headquarters.

We are proud of the SABC's successes listed below:

- *85% of our students say their participation in the SBCC program gave them a positive understanding of Canada's biotechnology industry.*
- *76% have received at least one scholarship, bursary or other academic achievement.*
- *74% agree that their participation in the SBCC program was helpful in assisting them to career planning and choice of field of study.*

For more information on SBCC please refer to the website:

**<http://sanofibiogeneiuschallenge.ca/>**

### ***Students Testimonials***

*"The Challenge was the best, genuine learning experience that I've had." - **Joe Barfett\****

\*Joe was the first student to take University of Western Ontario's concurrent degree program in Biochemical Engineering and Medicine.

*"It really opened my mind to what goes on in real research labs and became a big influence in my career choice." - **Sophie Desbiens\****

\*The Montreal Jewish Hospital hired Sophie for 2 summers!

*"The Challenge started me on this road to a career in science and I've just run with it." - **Adele Nguyen\****

\* Awards have been showered on Ottawa's Adele Nguyen ever since she began participating in the Challenge

## ***Press Release***

### ***Cancer battle hits home***

The loss of a childhood friend to leukemia helped set Ted Paranjothy on his course for a career in medicine.

While in high school, he spent more than 2,000 hours doing volunteer research in a University of Manitoba laboratory. A project he designed led to the discovery of an anticancer agent, for which the university has filed a provisional patent application.

He is also the first student to win first place at the provincial, national and international levels of the Sanofi-Aventis Biotechnology Challenge. Last month, he became the first Canadian to win the \$7,500 top prize at the Sanofi-Aventis International BioGENEius Challenge in Boston.

In September, he begins his studies at the University of Manitoba, buoyed by the 2007 TD Canada Trust Scholarship for Outstanding Community Leadership, worth \$60,000 over four years.

Globe and Mail June 5, 2007

## ***Biotechnology Modules***

Regrettably, a standardized biotechnology curriculum does not exist for Canadian high schools. BEC's biotechnology modules are designed to provide fun and interesting ways to make biotechnology relevant to students at the intermediate and secondary levels. Students use various experiential media to discover the history and potential of biotechnology with an emphasis on communication of their findings both orally and visually.

At the national level BEC developed and distributed ENGAGE: STEM CELLS, a resource on the ethical and regulatory debate over stem cell research. This resource was developed for the Centre for Bioethics at the University of Toronto and Genome Canada. The resource has been distributed to all the high schools in Canada and since its distribution has received interest from educators around the world.

BEC has developed curriculum modules on Biotechnology that are linked to the senior elementary and high school curricula. One module uses the Pleistocene age to look at ecological balance, species diversity and the use of DNA technology for species preservation. A second module uses a crime scene to teach the students the technology behind the use of recombinant DNA to solve crimes. The third module uses sea urchins to look at the effect of climate on reproduction and allows students to use biotechnology to investigate global climate change.

## **Our Programs (Educating the Educator)**

### ***Biotech Teacher Training and Toolbox Program***

BEC offers teachers programs on biotechnology, such as lab courses, teacher workshops, toolboxes and conferences<sup>1</sup>. This is one of the few programs to address the needs of Canadian secondary school teachers in terms of biotech educational outreach. BEC has partnered with Seneca College, Centennial College, York University, the University of Guelph, the University of Ottawa and McMaster University to offer courses to teachers focused on the grade 12 biology curriculum.

### ***National Bioscience Educators' Conference***

This two-day conference is an exciting professional development opportunity for high school science teachers to hear from some of leading bioscience researchers and academics. The conference is designed to offer knowledge and awareness, enabling teachers to inspire and guide their students towards playing a significant role in the increasingly important field of biotechnology. National Bioscience Educators' Conferences have been held in Winnipeg in 2006 and 2009 and in Toronto in 2007, 2010, and 2011.

### ***Teachers Testimonials***

*“Excellent course: Fills the niche that is not being filled by any other organization in a meaningful way.”*

*“Wonderful experience. I felt like a researcher. You have tremendous energy and enthusiasm. I hope I can carry your enthusiasm into my classes.”*

*“Thank you for an enriching and informative experience. We appreciate your dedication and efforts to bringing this course to our area. This was a very good experience for me in order to implement DNA technology into the classroom and to also learn recent technology/techniques used in research.”*

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<sup>1</sup> Similar programs have been created by US biotech associations in Iowa, North Carolina, Pennsylvania, New York and Massachusetts

## **Our Programs (Public Outreach)**

### *Public Biotech Lectures and Workshops*

BEC coordinates lectures, workshops and other events with partners such as BIOTECanada, LifeSciences Ontario, Merck Frosst, the Ontario Genomics Institute and MaRS on hot topics in biotechnology such as species diversity, stem cells, genetically modified plants and biofuels.

## **Our Team**

***Our team of experienced professionals with backgrounds in education, business, research, teaching and networking allow BEC to provide students and teachers with the highest quality of biotechnology programs in the Canada.***

### ***The Founders***

***Dr. William W. Mak, Past President.*** Dr. Mak taught as a professor for 16 years in the Biotechnology and Applied Chemistry Department at Seneca College of Applied Arts and Technology. He is currently based in Hong Kong where he has created the Hong Kong Biotechnology Education Resource Centre.

***Rick Levick, Senior Advisor.*** Formerly the executive director of BEC, Rick is a public relations consultant and writer who, has provided public relations counsel and services to various federal and Ontario government departments and to major corporations such as Bell Canada and Aventis Pasteur. In addition, Rick has provided senior leadership to the SABC since its inception.

### ***Administrative Team***

***Tony Legault, Coordinator, SABC Greater Toronto Region*** Tony is a retired high school biology teacher with a background in kinesiology, neuroscience and developmental biology. Tony is a member of the National Association of Biology Teachers and holds a B.Sc. from the University of Guelph, an M.Sc. from Simon Fraser University and a B.Ed. from the University of Toronto.

***Christy Hockley, Administrative Coordinator*** A Seneca College graduate, Christy has over 7 years of experience in the pharmaceutical industry as a pharmaceutical lab/chemical technologist.

## ***Board of Directors***

***Jeffrey S. Graham, Chair and President.*** Jeff is a partner in the Toronto office of Borden Ladner Gervais LLP where he chairs the firm's national biotech and pharmaceutical practice group.

***Don McKibbin, Secretary.*** Don is a retired business executive who spent 20 years as head of public affairs at Sanofi Pasteur, Canada's leading vaccine manufacturer.

***John R. Goudey, Treasurer.*** John is a senior Partner for Ernst & Young in Toronto in the firm's Technology, Communication and Entertainment practice.

***William A. Mills.*** Bill is the former Executive Director of BioNova, the Nova Scotia Biotechnology and Life Sciences Industry Association. He is currently the Executive Director, Main Street Dartmouth & Area Business Improvement Association.

***Dr. David Logan.*** David is currently a Professor Emeritus at York University having retired in 2002 as the Associate Dean of Applied Science. David has previously worked at McMaster University and the US National Institutes of Health.

***Sue Brooks.*** Sue is a senior consultant with Eclecthink International in Saskatoon and was regional coordinator of the SABC program there for the past 10 years. She is a former teacher with 18 years experience in the academically gifted program of the Saskatoon Public Schools at both the middle years and secondary level.

## Our Program Needs

Here is what you can do:

- *Help support our Biotechnology Youth Forums!*
- *Educating the Educator courses need funding support!*
- *Fund our National Bioscience Teacher award this year. The national Bioscience Educator Conference is a unique partnering opportunity.*
- *Sponsor a lecture series to educate the public about critical developments and ethical issues in biotechnology.*
- *Lab space and materials are essential to the Sanofi BioGENEius Challenge and present an excellent opportunity for an organization to partner with BEC by supplying either, or both.*
- *Cash prizes, scholarships and summer jobs can also be funded by a partner.*

BEC is eager to partner with organizations that want to participate in the development of biotechnology course for high school and post-secondary students.

## Our Sponsors

BEC programs, projects and activities are sponsored by the following organizations. Become a partner in this illustrious group of organizations.



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## Some of our Collaborators

We rely on our collaborators for in-kind support of our programs which includes provision of staff time and appropriate business venues.



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