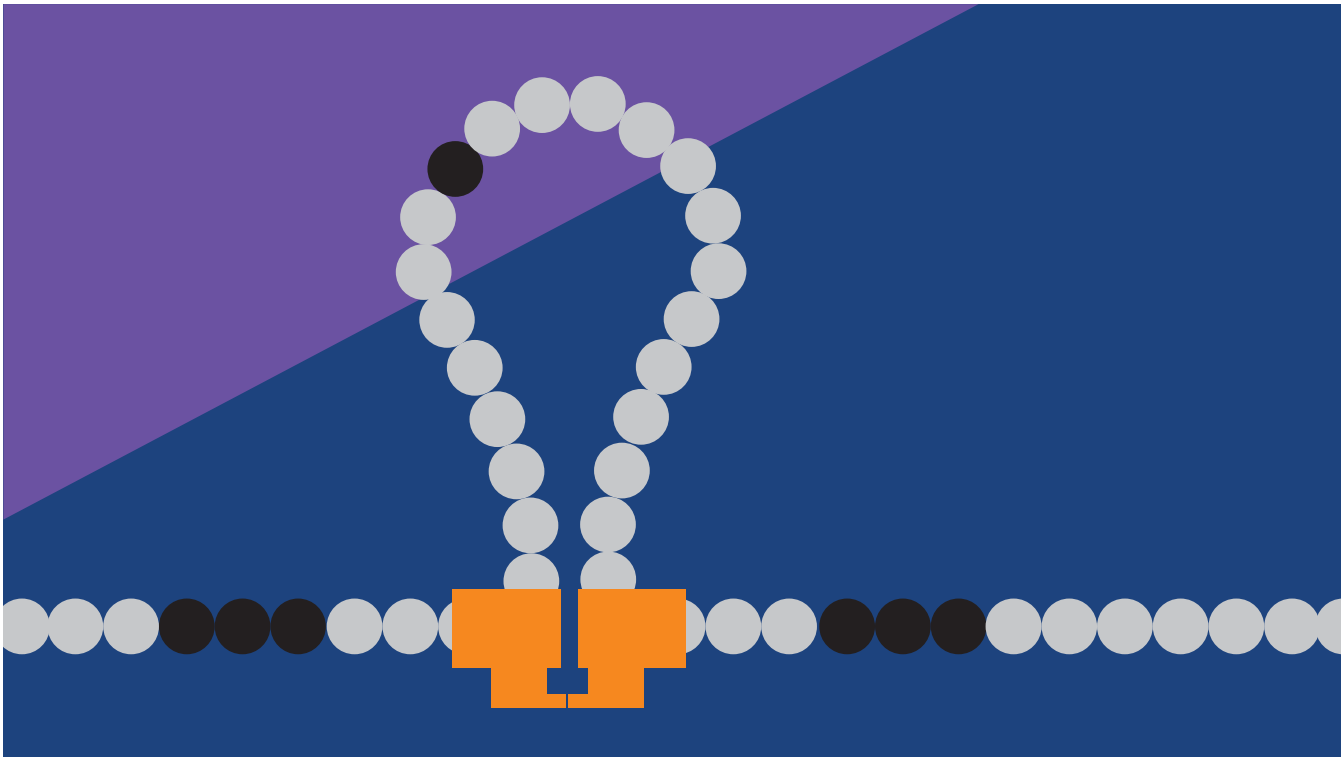
Bulletin



The Canadian Society for Molecular Biosciences
La Société Canadienne pour les Biosciences Moléculaires

2013

www.csmb-scbm.ca

Bulletin

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Molecular Biosciences
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Biosciences Moléculaires

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Cover images were provided by Dr. Benoit Chabot (see article standing on p32).

CSMB Board for 2013

The CSMB Board at its annual Fall meeting in Guelph, November 2013.

From left to right: Randal Johnston, Christian Baron, Arthur Hilliker, Andrew Simmonds, Kristin Baetz, David Williams, Jim Davie, John Orlowski, Frances Sharom, Jan Rainey

President/Président
Dr. Andrew Simmonds
University of Alberta
Department of Cell Biology
5-19 Medical Sciences Bldg
Edmonton AB T6G 2H7
Tel: (780) 492-1840
andrew@ualberta.ca

Past-President/
Président Précédent
Dr. Arthur Hilliker
York University
Department of Biology
4700 Keele Street
Toronto ON M3J 1P3
Tel: (416) 817-9325
hilliker@yorku.ca

Vice-President/Vice-Président
Dr. Christian Baron
Université de Montréal
Département de biochimie
C.P. 6128, Succ. Centre-ville
Montréal, QC H3C 3J7
Tel: (514) 343-6372
Christian.Baron@umontreal.ca

Treasurer/Trésorier
Dr. Arthur Hilliker
York University
Department of Biology
4700 Keele Street
Toronto ON M3J 1P3
Tel: (416) 817-9325
E-mail: hilliker@yorku.ca

Secretary/Secrétaire
Dr. Randal Johnston
University of Calgary
Department of Biochemistry and Molecular Biology
Faculty of Medicine
3330 Hospital Drive N.W.
Calgary AB T2N 4N1
Tel: (403) 220-8692
E-mail: RNJohnst@ucalgary.ca

Councillor/Conseiller
Dr. Jim Davie
University of Manitoba
Manitoba Institute of Cell Biology
675 McDermot Avenue
Winnipeg MB R3E 0V9
Tel: (204) 787-2391
E-mail: davie@umanitoba.ca

Councillor/Conseiller
Dr. John Orlowski
McGill University
Department of Physiology
3655 Promenade William Osler
Montréal QC H3G 1Y6
Tel: (514) 398-2973
E-mail: john.orlowski@mcgill.ca

Councillor/Conseiller
Dr. Jan Rainey
Dalhousie University
Department of Biochemistry and Molecular Biology
Tupper Medical Building
Halifax NS B3H 1X5
Tel: (902) 494-4632
E-mail: jan.rainey@dal.ca

Councillor/Conseiller
Dr. Kristin Baetz
University of Ottawa
Department of Biochemistry, Microbiology & Immunology
451 Smyth Road, Roger Guidon Hall
Ottawa ON K1H 8M5
Tel: (613) 562-5800 X8592
E-mail: kbaetz@uottawa.ca

Councillor/Conseiller
Dr. Martin Bisaillon
University of Sherbrooke
Département de biochimie
2500 Boul. de l'Université
Sherbrooke QC J1K 2R1
Tel: (819) 821-8000, X75287
E-mail: Martin.Bisaillon@USherbrooke.ca

Councillor/Conseiller
Dr. Reinhart Reithmeier
University of Toronto
Department of Biochemistry
Medical Sciences Bldg. Rm. 5216
1 King's College Circle
Toronto ON M5S 1A8
Tel: (416) 978-7739
E-mail: r.reithmeier@utoronto.ca

Bulletin Editors/ Éditeurs du Bulletin

Dr. Frances Sharom
University of Guelph
Department of Molecular and Cellular Biology
Science Complex Rm. 3446
Guelph, ON N1G 2W1
Tel: (519) 824-4120 X52247
E-mail: fsharom@uoguelph.ca

Dr. David Williams
University of Toronto
Department of Biochemistry
Medical Sciences Bldg. Rm. 5316
1 King's College Circle
Toronto ON M5S 1A8
Tel: (416) 978-2546
E-mail: david.williams.utoronto.ca

Chair, Nominating Committee/ Président, Comité de mise en candidature
Dr. Arthur Hilliker
York University
Department of Biology
4700 Keele Street
Toronto ON M3J 1P3
Tel: (416) 817-9325
E-mail: hilliker@yorku.ca

Secretariat & CSMB Office/ Secrétariat et le Bureau de la SCBM:
Mrs. Wafaa H. Antonious
Canadian Society for Molecular Biosciences
c/o Rofail Conference and Management Services (RCMS)
17 Dossetter Way
Ottawa, ON K1G 4S3
Tel.: (613) 421 7229
Fax.: (613) 421 9811
E-mail: contact@csmb-scbm.ca

President's Report – 2013
Dr. Andrew Simmonds

I came to the CSMB-SCBM via the merger of the GSC with the CSBMCB in 2010. Having been a member of both societies and an organizer of past CSBMBC and GSC meetings, I was happy to join the board of the new merged organization. I then volunteered to serve as Vice President in 2012-2013 and President for 2013-2014. Personally, I feel that the CSMB-SCBM plays a very important role in supporting Canadian molecular biosciences. However for much of the past few years the CSMB-SCBM has been largely concerned with absorbing new members and reorganizing. As president, I felt that we needed most was to get a firm grasp on what the CSMB-SCBM represents and, more importantly, what unique services we can offer geneticists, biochemists, molecular and cell biologists in this country. Thus, I led off our fall 2013 board meeting with a question: "Why does the CSMB-SCBM exist and what do we offer Canadian scientists?" I have noticed that Canadian bioscientists as a group tend to look outside their own country and are usually members of various American and international societies. When I ask my colleagues why this is so, the answer is usually that the larger size of these groups means that they can offer a lot in terms of resources and international prestige. This often means that the CSMB-SCBM often gets 'forgotten'. That said, I think that now, more than ever, there is a compelling need for Canadian researchers to organize within Canada and support CSMB-SCBM. With the multitude of changes occurring at all levels of science funding, and a government that at times seems to have an antipathy toward science in general, the role of CSMB-SCBM becomes obvious. While these larger American or other worldwide societies do many things well, they do not have any compelling interest in defending and promoting Canadian scientists and trainees. Thus, the mandate of the CSMB-SCBM becomes obvious; advocate for Canadian bioscientists to various levels of Canadian governments and other funding agencies; serve the unique requirements of trainees at Canadian institutions; and promote interaction between Canadian bioscientists and discussion of the issues that are unique to the practice of molecular biosciences in this country.

In the past year the CSMB-SCBM has introduced or further advanced multiple initiatives that support these three core mandates. First and foremost is a strong and vigorous advocacy for Canadian bioscience to various levels of government. Representing Canadian bioscientists, we recently completed an extensive document submitted to Industry Canada responding to planned changes to Canadian Science, Technology and Innovation policy (posted on our website). Similarly, each year we formally respond to the federal budget, advocating for increased funding for the open grant competitions (posted on our website). An approach that has had quite positive feedback is our campaign to have recent recipients of major awards from CIHR or NSERC contact the government explaining what kind of research these funds will facilitate, and how it will benefit Canadians. We are expanding this approach to get trainee awardees to do the same. As president, I have also contacted the Federal Ministers of Health, Science and Industry directly. As with all advocacy efforts I received various levels of responses, but some were quite positive, including a letter the society received from the Minister of Industry, James Moore (posted on our website under Advocacy). We continue to support national lobby efforts through membership in advocacy organizations like Research Canada. We have also been busy improving our processes of information dissemination, a challenge in a country as spread-out as Canada. We are now engaging with our members and supporters worldwide using social-media sites such as Facebook (www.facebook.com/CSMB.SCBM) and Twitter (@CSMB_SCBM). This allows us to dialogue with our members in more of a "real-time" fashion than our traditional web-site and Bulletin annual review formats. Note for the traditionalists among you, we are planning a major update to our web-site and remain committed to publishing our annual report (The Bulletin).

Our second core mandate is to promote training at all levels and in all areas of Biochemistry, Cell Biology, Genetics, and Molecular Biology in Canada. We continue to support student initiatives, and as you will see in the pages of this year's Bulletin, these have been quite successful. I am also particularly excited about our new initiative to directly increase trainee involvement in the day-to-day operation of the CSMB-SCBM. In 2013, we put out a call for nominations for our first graduate student and postdoctoral board members. Note that trainee membership in the CSMB-SCBM is free. Also, CSMB-SCBM offers multiple trainee awards, including poster prizes travel awards. Starting in 2013 we initiated a co-sponsored travel award with the American Society of Cell Biology. This award helps pay for a distinguished Canadian trainee to attend the ASCB meeting each year. However, note that to be eligible for most of these awards, trainees and their supervisors must be ongoing members of the CSMB-SCBM.

Our third mandate is to facilitate conferences within Canada. Notably, this past year, several efforts to attract major world scientific congresses to Canada have come to fruition with planning well underway. I am happy to report that the CSMB-SCBM will be hosting the 2016 International Union of Biochemistry and Molecular Biology (IUBMB) and the International Genetics Federation's (IGF) 2018 International Congress of Genetics both in Vancouver. These represent wonderful opportunities to showcase Canadian bioscience to our fellow Canadians, politicians and more importantly, bring the world to Canada.

In closing, in these times of great change, we as scientists need to do something we are generally not used to doing. In addition to a day-to-day focus on our research, we need to organize and speak with a united voice, to manage ongoing decisions related to how that research is funded and regulated in this country. To answer my own question, why does the CSMB-SCBM need to exist? Because we are the only ones prompting Canadian issues to Canadian governments; we support Canadian trainees, and we are increasingly becoming one of the only groups that has an interest in supporting Canadian-based conferences financially and organizationally. Your continued membership makes all that happen and more.

Incoming Member of the CSMB Executive Board

Martin Bisaillon, *Councillor*

Martin obtained his B.Sc. in biology at the Université de Sherbrooke (biotechnology, 1994) and a Ph.D. in Microbiology and Immunology at the Université de Montréal (1999). Under the supervision of Prof. Guy Lemay, he took part in the characterization of various important enzymes for the replication of viruses. He then completed post-doctoral training at the Sloan-Kettering Institute in New York City (2000-2001) under the supervision of Prof. Stewart Shuman, where he worked on the characterization of yeast enzymes. He was then recruited to the Faculté de médecine et des sciences de la santé of the Université de Sherbrooke in 2002, and was named Head of the Biochemistry Department in 2011.

Martin's research program aims at understanding the interactions between viral proteins and their substrates, with the ultimate goal of developing effective antiviral strategies, since many viruses have enzymes which differ significantly from proteins found in the cells that they infect. As a biochemist and protein expert, Martin devotes most of his research tasks to the study of viral proteins involved in the synthesis and maturation of the viral mRNAs. More particularly, his research team is interested in the hepatitis C virus, West Nile virus and vaccinia virus. They have developed a unique structural and enzymatic approach to characterize the thermodynamic forces responsible for the interaction of ligands with various proteins involved in nucleic acid synthesis/maturation. In collaboration with the pharmaceutical industry, his research team takes an active part in determining the mechanism of action of various antivirals that are currently under development. Their research could make it possible to develop new strategies to prevent emerging viral infections. Their work also contributed to the identification of some promising inhibitors. As CSMB councilor, Martin hopes to increase the visibility of the CSMB, and help to promote fundamental sciences in Canada.

Minutes of the 56th Annual General Meeting 2013
Niagara-on-the-Lake, Ontario - June 5 2013

Attendees: A. Hilliker, R. Johnston, V. Duronio, F. Sharom, A. Fradet-Tracotte, C. Yeh, P. Pitel, R. Gilbert, H. Song Sun, S. Simoes, M. Pellikka, N. Silva-Gagliardi, K. Baetz, C. Baron, A Simmonds, T. Harris, O. Brashavitskaya, K. Kazazian, W. Antonious.

1. Greetings from the President (Hilliker)
Hilliker called the meeting to order and welcomed the attendees.

2. Approval of quorum and agenda
Johnston declared quorum. Sharom made a motion to approve the agenda, motion seconded by Simmonds, all in favour, agenda approved.

3. Approval of the minutes of 55th Annual General Meeting in Whistler, BC, March 2012
Simmonds made a motion to approve the minutes, seconded by Johnston, all in favour, motion approved.

4. Business arising from the minutes (Johnston)

a) Approval of Society name, constitution and bylaws by Corporations Canada
Johnston went through the action items from the minutes. The name change procedure has been completed and we have received the letter of patent from Industry Canada and have changed the name on the bank account. Over the next year the society will need to review its by laws to ensure its adherence to the newly announced not-for-profit Canada Corporations Act.

b) Advocacy
Hilliker commented that there were no significant decreases in competitive funding for research (but also no increases). Thus our letter writing campaigns might have had some effect in a difficult financial year. Hilliker encouraged the attendees to check the website for the various advocacy activities.

5. Secretary's Report (Johnston)

a) Membership
Johnston reported that the society membership continued to grow year by year. There are well over 1000 members. CSMB is considered one of the biggest Canadian scientific societies because of the merger with the GSC. In the coming years we need to further increase our membership as we are organizing 2 international meetings.

6. Treasurer's Report (Duronio)

a) Presentation of the Accountant's Reviewed Financial Statement

b) Presentation of 2013-2014 Budget
Duronio explained that the CSMB chose to have a review of engagement instead of an audit, mainly because our activities were not that extensive and it was cheaper than an audit. The financial statement was prepared by an accountant. The society lost money in the 2012 Whistler Conference. Even so, the society continues to do well financially as it has an investment fund that had a good financial increase mainly due to market behaviour. The 2013 conference will also have a financial loss due to poor attendance, but the loss is minimized due to the fact that the organizers were able to raise some external financial support. Duronio then went through the various expenses in the financial statement. We have a secretariat contracted through RCMS who provides administrative support and website services. CSMB also supports various student research days. The board decided at the latest board meeting to increase the budget for the support to $5,000 annually. The society previously supported the Canadian Science policy meetings for $5,000, but the board felt recently that they do not reflect the CSMB advocacy interest and decided not to support its future events. The bulletin is prepared, printed and mailed out. Many of the emeritus members are enjoying receiving it. Duronio stated

that he had been the Treasurer for ten years and he would be stepping down. Hilliker would take over as Treasurer.

c) Acceptance of the Reviewed Financial Statement (2012-13)

Duronio made a motion to accept the financial statement prepared by Mrs. Andrea Poole, Baron seconded the motion, all in favour, motion approved.

d) Approval of Signing Officers

Duronio made a motion to approve the signing officers who will be Hilliker and Johnston, Baron seconded the motion, all in favour, motion approved.

7. Board Membership for 2013-2014 (Hilliker)

a) Councillors

Hilliker stated the nominations received for the councilors were Reithmeier, Davie, and Bisaillon. Simmonds made a motion to approve the nominations for the three councillors, Baetz seconded the motion, all in favour, nominations accepted.

b) Vice-President (Elect)

Hilliker reported that the board was nominating Christian Baron as Vice President. He asked for any nomination from the floor, none was received. He then made a motion to accept the nomination of Christian Baron as Vice President; Duronio seconded the motion, all in favour, nomination approved.

c) Treasurer

Hilliker stated that there was no need to make a motion to approve the position of treasurer as it was approved previously.

8. Future meetings (Johnston)

a) 2014, April 9-14, Banff: Membrane Proteins in Health and Disease; in partnership with the German Society for Biochemistry

Johnston reported that the 2014 Banff meeting will be organized by a group in Alberta who was experienced in organizing conferences for CSMB. They are anticipating that there will be 300 registrants for that conference.

b) 2015, Halifax: Membrane Lipids in Signalling and Regulation

c) 2016, July 16-23, Vancouver: Signalling Pathways in Development, Disease and Aging; in partnership with IUBMB & PABMB

Johnston stated that the CSMB is hoping that there will be around 3,000 registrants. He added that was why the CSMB had to work on increasing the membership to 2000 members of paid, students and post docs.

d) 2017: TBA

Johnston put forward a call for proposals for 2017 and encouraged the attendees to provide support, and be involved in increasing the number of CSMB members.

e) July 14-19, 2018, Vancouver: Genetic Horizons: Evolution, Development, Sustainability and Health; in partnership with IGF and GSA

9. Other business/Adjournment

There was no other business.

Johnston made a motion to adjourn, Baetz seconded the motion, all in favour, meeting adjourned.

CANADIAN SOCIETY FOR MOLECULAR BIOSCIENCES
Financial Statement

STATEMENT OF FINANCIAL POSITION

AS AT DECEMBER 31, 2013 (with unaudited comparative figures as at December 31 2012)
UNAUDITED

	2013	2012
ASSETS		
CURRENT		
Cash	$ 10,955	$ 6,406
Accounts receivable - CSMB	12,718	10,718
Accounts receivable - GSC	-	741
Conference deposit	14,316	22,000
	37,989	39,865
INVESTMENTS (note 4)	409,275	398,309
	$ 447,264	$ 438,174
LIABILITIES		
CURRENT		
Accounts payable and accrued liabilities	$ 15,807	$ 18,582
Deferred membership and subscription fees	3,207	2,859
Deferred conference income	5,357	-
	24,371	21,441
LONG TERM		
Deferred membership fees	4,643	4,172
UNRESTRICTED NET ASSETS	418,250	412,561
	$ 447,264	$ 438,174

STATEMENT OF OPERATIONS AND CHANGES IN NET ASSETS

AS AT DECEMBER 31, 2013
(with unaudited comparative figures as at December 31 2012)
UNAUDITED

	2013	2012
REVENUE		
Membership dues	$ 26,099	$ 29,571
Corporate contributions	55,459	34,146
Annual meeting	25,896	26,600
Other	670	1,145
	108,124	91,462
Investment income	11,855	8,770
	119,979	100,232
EXPENSES		
Annual meeting (note 5)	117,544	136,890
Secretariat	16,160	12,440
Meeting sponsorship	11,892	6,500
Board meetings	11,455	10,096
Bulletin	6,381	11,462
Professional fees	3,293	2,200
Website	2,600	5,150
Bank and credit card fees	2,282	2,007
Science advocacy	2,019	6,000
Office	902	530
Dues and subscriptions	658	-
Membership drive	170	-
Insurance	73	-
	175,429	193,275
NET (EXPENSES) FOR THE YEAR	$ (55,450)	$ (93,043)
Unrestricted net assets at beginning of year	$ 412,561	$ 469,113
Balance before items affecting net assets	357,111	376,070
Gains from sale of investments - realized (note 3)	8,479	6,981
Gains on investments - unrealized (note 3)	52,660	29,510
UNRESTRICTED NET ASSETS AT END OF YEAR	$ 418,250	$ 412,561

STATEMENT OF CASH FLOWS

AS AT DECEMBER 31, 2013
(with unaudited comparative figures as at December 31 2012)
UNAUDITED

	2013	2012
CASH PROVIDED BY (USED FOR)		
OPERATING ACTIVITIES		
Cash from operations		
Net (expenses) revenue for the year	$ (55,450)	$ (93,043)
Non-cash portion of investment income	(11,855)	(8,770)
	(67,305)	(101,813)
Net change in non-cash working capital balances		
Accounts receivable	(1,258)	(8,177)
Conference deposit	7,684	44,714
Accounts payable and accrued liabilities	(2,775)	6,317
Deferred membership and subscription fees	819	(2,968)
Deferred conference income	5,357	(5,036)
	(57,478)	(66,963)
INVESTING ACTIVITY		
Transfer of funds from investment account	62,027	66,000
INCREASE (DECREASE) IN CASH	4,549	(963)
Cash, beginning of year	6,406	7,369
CASH, END OF YEAR	$ 10,955	$ 6,406
CASH POSITION		
Cash	$ 10,955	$ 6,406

NOTES TO THE FINANCIAL STATEMENTS

DECEMBER 31, 2013
UNAUDITED

1. PURPOSE OF THE ORGANIZATION

The Canadian Society for Molecular Biosciences (CSMB) was incorporated without share capital in 1979 under Part II of the Canada Corporations Act and is recognized as a not for profit organization for income tax purposes. The main objective of the Society is to foster research and education in Biochemistry, Molecular Biology and Cellular Biology in Canada.

2. SIGNIFICANT ACCOUNTING POLICIES

These financial statements are the responsibility of management and have been prepared in accordance with Canadian accounting standards for not for profit organizations (ASNFPO) using the accounting policies summarized below.

(a) Revenue Recognition
CSMB follows the deferral method of accounting for contributions. Restricted contributions are recognized as revenue in the year in which the related expenditures are incurred. Unrestricted contributions are recognized as revenue when received or receivable if the amount to be received can be reasonably estimated and collection is reasonably assured.

(b) Capital assets
Capital assets purchased at a cost of less than $2,000 are expensed in the year of purchase. The Society does not own capital assets at this time.

(c) Use of estimates
The preparation of the financial statements in conformity with Canadian accounting standards for not for profit organizations requires management to make estimates and assumptions that affect the reported amounts of assets, liabilities, revenue and expenses and disclosure of contingent assets and liabilities. These estimates are reviewed periodically and adjustments are made to net revenue as appropriate in the year they become known.

d) Financial Instruments
The Society initially measures its financial assets and financial liabilities at fair value. The Society subsequently measures all its financial assets and financial liabilities at amortized cost, except for investments in equity instruments that are quoted in an active market, which are measured at fair value. Changes in fair value are recognized in the statement of operations.

Financial assets measured at amortized cost include cash and accounts receivable. Financial liabilities measured at amortized cost include accounts payable.
The organization's financial assets measured at fair value include quoted shares.

3. FINANCIAL RISKS AND CONCENTRATION OF RISKS

The carrying values of cash, accounts receivable and accounts payable approximate their fair values due to the short term nature of these assets and liabilities.

Marketable securities are comprised of bonds, money market investments and segregated mutual funds. These are initially recorded at fair value based on quoted market prices and are subsequently measured at fair value at each year end. Net gains and losses arising from changes in fair value are recognized in the Statement of Operations. For the year ended March 31, 2013, the net unrealized gain was $52,660 (March 31, 2012 gain was $29,510).

Fair value approximates amounts at which financial instruments could be exchanged between willing parties, based on current markets for instruments of the same risk, principal and remaining maturities. Fair values are based on quoted market values.

Unless otherwise noted, it is management's opinion that the Society is not exposed to significant interest, currency or credit risks arising from these financial statements.

4. INVESTMENTS (at Market Value)

CSMB investments are recorded at market value. As required by CICA Section 3856 unrealized gains or losses on the portfolio as a whole at December 31 are recorded as "Gains (losses) on investments unrealized" and included on the Statement of Operations and Changes in Net Assets.

BMO Nesbitt Burns Canadian Account	**2013**	**2012**
Cash and short term investments	$ 3,238	$ 960
Fixed Income	53,194	63,127
Common equity	281,347	247,701
	337,779	311,788
BMO Nesbitt Burns US Account (in $ Canadian)		
Cash and short term investments	685	6,056
Common equity	70,811	80,465
	$ 409,275	$ 398,309

5. ANNUAL MEETING EXPENSES

	2013	**2012**
Exhibits and facility	$ 64,722	$ 60,824
Travel and Expenses	35,624	46,253
Awards	8,924	8,702
Organizing and planning	6,250	13,874
Supplies and other	2,024	3,167
Reception and Banquets	-	4,070
	$ 117,544	$ 136,890

The 56th Annual meeting of the CSMB
Niagara-on-the-Lake, 2013

"Cellular Dynamics during Development, Regeneration and Cancer" Scientific Program

Monday June 3, 2013	
7:30 - 8:00 pm 8:00 - 8:15 pm	**NRC Research Press Senior Investigator Award** **Mechanisms of alternative splicing regulation during stress and human diseases** Benoit Chabot, Université de Sherbrooke, Sherbrooke *Discussion & Award Presentation*
8:15 - 9:00 pm 9:00 - 9:15 pm	Keynote speaker Mechano-transduction at cell-cell contacts: mechanisms and consequences James Nelson, Stanford University, Palo Alto *Discussion*
Tuesday June 4, 2013	
8:30 - 11:30 am	**Symposium I: Frontiers in cellular imaging genome stability** *Chair:* Laurence Pelletier, Samuel Lunenfeld Research Institute, Toronto
8:30- 8:50 am 8:50 - 8:55 am	**A sub-diffraction glimpse of centrosome biogenesis** Laurence Pelletier, Samuel Lunenfeld Research Institute, Toronto *Discussion*
8:55- 9:15 am 9:15 - 9:20 am	**Octameric CENP-A nucleosomes are present at human centromeres throughout the cell cycle** Paul Maddox, IRIC, Université de Montréal, Montréal *Discussion*
9:20 - 9:32 am 9:32 - 9:35 am	**Myopodin stimulates cell migration by promoting membrane protrusion formation** FuiBoon Kai, Dalhousie University, Halifax *Discussion*

9:35 - 9:45 am	**Polarized mRNA transport regulates secretion and activity of Wnt1** Andrew J. Simmonds, University of Alberta, Edmonton
9:45 - 9:50 am	*Discussion*
10:05 - 10:17 am	**Rotational motion during three-dimensional morphogenesis of mammary epithelial acini relates to laminin matrix assembly** Hui Wang, Ontario Cancer Institute, Toronto
10:17 - 10:20 am	*Discussion*
10:20 - 10:32 am	**Usp37 is required for normal mitotic progression** Christina Yeh, Samuel Lunenfeld Research Institute, Toronto
10:32 - 10:35 am	*Discussion*
10:35 - 10:47 am	**53BP1 is a reader of the DNA damage-induced H2A Lys15 ubiquitin mark** Amélie Fradet-Turcotte, Samuel Lunenfeld Research Institute, Toronto
10:47 - 10:50 am	*Discussion*
10:50 - 11:10 am	**Life inside the cell: super-resolution microscopy** Bo Huang, University of California, San Francisco
11:10 - 11:15 am	*Discussion*
11:15 - 11:35 am	**Microtubules in brain development and disease** Gary Brouhard, McGill University, Montréal
11:35 - 11:40 am	*Discussion*
11:40 am - 12:05 pm	**GE presentation** Paul Goodwin, GE Healthcare
1:00 - 3:00 pm	Hands-on microscope workshop Nikon Inc, Carl Zeiss Microscopy, LLC and Leica Microsystems
4:00 - 6:00 pm	**Poster Session I**
7:00 - 7:30 pm	**Light Sheet Fluorescence Microscopy: LSFM** Scott Olenych, Carl Zeiss Microscopy, LLC
7:30 - 10:10 pm	**Symposium II: Cytoskeletal dynamics migration and metastasis** *Chair*: Calvin Roskelley, University of British Columbia, Vancouver
7:30 - 7:50 pm	**Modulating modes of tumor motility and invasion** Calvin Roskelley, University of British Columbia, Vancouver
7:50 - 7:55 pm	*Discussion*

7:55 - 8:15 pm	**Extrinsic and intrinsic regulation of tensional homeostasis in cancer** Val Weaver, University of California, San Francisco
8:15 - 8:20 pm	*Discussion*
8:20 - 8:32 pm	**Rho GTPase-based regulation of cell motility by Plk4** Olga Brashavitskaya, Samuel Lunenfeld Research Institute, Toronto
8:32 - 8:35 pm	*Discussion*
8:35 - 8:45 pm	**Podocalyxin drives collective primary breast tumor microinvasion independent of an overt epithelial-to-mesenchymal transformation** Marcia Graves, University of British Columbia, Vancouver
8:45 - 8:50 pm	*Discussion*
9:05 - 9:17 pm	**Force fluctuations within focal adhesions guide cell migration in response to rigidity of the extracellular matrix** Sergey V. Plotnikov, Cell Biology and Physiology Center, NHLBI/NIH
9:17 - 9:20 pm	*Discussion*
9:20 - 9:40 pm	**How do cells escape epithelial tissues?** Andy Ewald, Johns Hopkins University, Maryland
9:40 - 9:45 pm	*Discussion*
9:45 - 10:05 pm	**Quantitative assays for anillin function in cytokinesis** Amy Maddox, Université de Montréal, Montréal
10:05 - 10:10 pm	*Discussion*
Wednesday June 5, 2013	
8:30 - 11:50 am	**Symposium III: Cell polarity, morphogenesis and cancer** *Chair*: Senthil K. Muthuswamy, Ontario Cancer Institute, Toronto
8:30- 8:50 am	**Cell polarity proteins and cancer initiation and progression** Senthil K. Muthuswamy, Ontario Cancer Institute, Toronto
8:50 - 8:55 am	Discussion
8:55- 9:15 am	**Met RTK signaling to EMT and mammary tumorigenesis** Morag Park, McGill University, Montréal
9:15 - 9:20 am	**Discussion**

9:20 - 9:30 am	**Structure of parkin reveals mechanisms of activation** Kalle Gehring, McGill University, Montréal
9:30 - 9:35 am	*Discussion*
9:35 - 9:45 am	**A novel human pluripotent stem cell derived model for pancreatic cancer initiation** Huang Ling, Ontario Cancer Institute, Toronto
9:45 - 9:50 am	*Discussion*
10:05 - 10:17 am	**EPB41L5 and the E3 ligase Mind bomb 1 regulate epithelial cell morphology** Nancy Silva-Gagliardi, McGill University, Montréal
10:17 - 10:20 am	*Discussion*
10:20 - 10:32 am	**Subversion of autophagy by Kaposi's sarcoma-associated Herpesvirus impairs** oncogene-induced senescence Andrew M. Leidal, Dalhousie University, Halifax
10:32 - 10:35 am	*Discussion*
10:35 - 10:55 am	**The emergence of pannexins and their putative role in melanomas** Dale Laird, University of Western Ontario, London
10:55 - 11:00 am	*Discussion*
11:00 - 11:20 am	**Regeneration and homeostasis in 3D epithelial structures** Keith Mostov, University of California, San Francisco
11:20 - 11:25 am	*Discussion*
11:25 - 11:45 am	**Cell polarity in morphogenesis and metastasis** Ian Macara, Vanderbilt University. Nashville
11:45 - 11:50 am	*Discussion*
11:35 am - 12:15 pm	**Imaging beyond the diffraction limit** Nathan Claxton, Nikon Inc
1:15 - 3:00 pm	**Hands-on microscope workshop** Nikon Inc, Carl Zeiss Microscopy, LLC and Leica Microsystems
4:00 - 6:00 pm	**Poster Session II**
4:00 - 5:00 pm	**CSMB Annual General Meeting**
7:00 - 7:30 pm	Super resolution with STED microscopy Lianne Dale, Leica Microsystems

7:30 - 10:20 pm	**Symposium IV: Cell polarity and development** *Chair*: Ulrich Tepass, University of Toronto, Toronto
7:30 - 7:50 pm	**Linking polarity protein function to vesicle trafficking in epithelial cells** Ulrich Tepass, University of Toronto, Toronto
7:50 - 7:55 pm	*Discussion*
7:55 - 8:15 pm	**Bringing balance: basolateral antagonists of apical polarity** David Bilder, University of California, Berkeley
8:15 - 8:20 pm	*Discussion*
8:20 - 8:30 pm	**Rho GTPase and its effector Shroom differentially regulate Rho-kinase junctional localization and planar cell polarity during Drosophila axis elongation** Sergio Simoes, Sloan-Kettering Institute, New York
8:30 - 8:35 pm	*Discussion*
8:35 - 8:45 pm	**SAPCD2 regulates spindle orientation during epithelial morphogenesis and asymmetric cell division** Stephane Angers, University of Toronto, Toronto
8:45 - 8:50 pm	*Discussion*
9:05 - 9:25 pm	**Regulation of cell-cell coordination during collective cell migration** Gregory Emery, Université de Montréal, Montréal
9:25 - 9:30 pm	*Discussion*
9:30 - 9:50 pm	**An Arf-GEF regulates antagonism between endocytosis and the membrane cytoskeleton during epithelial development in Drosophila** Tony Harris, University of Toronto, Toronto
9:50 - 9:55 pm	*Discussion*
10:55 - 10:15 pm	**Injury induced BMP signaling negatively regulates Drosophila midgut homeostasis** Ben Ohlestein, Columbia University, New York
10:15 - 10:20 pm	*Discussion*
Thursday - June 6, 2013	
9:00 am - 12:20 pm	**Symposium V: Cell microenvironment interaction** *Chair*: Rama Khokha, Ontario Cancer Institute, Toronto

9:00 - 9:20 am	**The Timp gene family directs the CAF cell state** Rama Khokha, Ontario Cancer Institute, Toronto
9:20 - 9:25 am	*Discussion*
9:25 - 9:45 am	**TBA** Jeff Wrana, Samuel Lunenfeld Research Institute, Toronto
9:25 - 9:45 am	*Discussion*
9:45 - 10:02 am	**Control of epithelial organization and growth by a PKC** Luke McCaffrey, McGill University, Montréal
10:02 - 10:05 am	*Discussion*
10:05 - 10:17 am	**Wnt activates Nkd1 to antagonize Wnt signaling by inhibiting the nuclear accumulation of ß-catenin** Terry Van Raay, University of Guelph, Guelph
10:17 - 10:20 am	*Discussion*
10:20 - 10:32 am	**GPR56 inhibits melanoma growth by internalizing and degrading its ligand TG2** Lei Xu, University of Rochester Medical Center, Rochester
10:32 - 10:35 am	*Discussion*
10:50 - 11:02 am	**Glycogen synthase kinase-3 genes in liver functionality, regeneration and hepatocellular carcinoma: dissecting the roles of an accomplished kinase** Prital Patel, Samuel Lunenfeld Research Institute, Toronto
11:02 - 11:05 am	*Discussion*
11:05 - 11:25 am	**MT1-MMP/Mmp14 and the cytoskeletal regulation of cancer cell invasion and differentiation programs** Steve Weiss, University of Michigan, Ann Arbor
11:25 - 11:30 am	*Discussion*
11:30 - 11:50 am	**The ShcA PTB domain functions as a biological sensor of phospho-tyrosine signaling during breast cancer progression** Josie Ursini-Siegel, McGill University, Montréal
11:50 - 11:55 am	*Discussion*
11:55 - 12:15 am	**New insights into mechanisms regulating the tumor microenvironment** Zena Werb, University of California, San Francisco
12:15 - 12:20 pm	*Discussion*

1:30 - 5:00 pm	**NSERC**
5:00 - 5:30 pm 5:30 - 5:45 pm	**Jeanne Manery Fisher Memorial Lectureship** **Dynamic complexes of intrinsically disordered proteins and their regulation by phosphorylation** Julie Forman-Kay, Hospital for Sick Children, Toronto *Award Presentation & Discussion*
5:45 - 6:15 pm 6:15 - 6:30 pm	GE Healthcare New Investigator Award Cell growth regulation by mTOR-dependent signalling Philippe Roux, Université de Montréal, Montréal *Award Presentation & Discussion*
7:00 - 9:00 pm	*President's Banquet & Awards Presentation*
Friday - June 7, 2013	
8:30 - 11:30 am	**Symposium VI: Cell biology of neuronal development** *Chair:* - James Fawcett, Dalhousie University, Halifax
9:00- 9:20 am 9:20 - 9:25 am	**Polarity proteins and dendritic spine morphogenesis** James Fawcett, Dalhousie University, Halifax *Discussion*
9:25- 9:45 am 9:45 - 9:50 am	**Making memories stick: cadherin adhesion complexes at the synapse** Shernaz Bamji, University of British Columbia, Vancouver *Discussion*
9:50 - 10:02 am 10:02 - 10:05 am	**Investigating the role of the polarity protein Scribble in mammary gland development** Leena Baker, Ontario Cancer Institute, Toronto *Discussion*
10:05 - 10:17am 10:17 - 10:20 am	**Function of NCK in DCC sensitive circuits** Ciaran Lane, University of Dalhousie, Halifax *Discussion*
10:35 - 10:47 am 10:47 - 10:50 am	**Membrane to brain: A novel role for the ShcD adaptor protein in EGFR signalling** Melanie Wills, University of Guelph, Guelph *Discussion*

10:50 - 11:10 am	**Neuronal polarity illuminated: a look under the hood of the migrating neuron** David Solecki, St Jude's Children's Research Hospital, Memphis
11:10 - 11:15 am	*Discussion*
11:15 - 11:25 am	**Shaping the spinal cord in development and disease** Brian Ciruna, Hospital for Sick Children, Toronto
11:25 - 11:30 am	*Discussion*
11:30 am	**Close of meeting**

Scenes from the 56th Annual meeting
Niagara-on-the-Lake, 2013

Benoit Chabot (Université de Sherbrooke) receives the NRC Research Press Senior Investigator Award from Art Hilliker, President of the CSMB (2012-13)

Julie Forman-Kay (Sick Children's Hospital) is presented with the Jeanne Manery Fisher Memorial Lecturer Award by Art Hilliker, President of the CSMB (2012-13)

Fiona Fitzgerald (GE Healthcare) presents Phillipe Roux (Université de Montréal) with the GE Healthcare New Investigator Award

Phillipe Roux (Université de Montréal) presents his award lecture, entitled "Cell growth regulation by mTOR-dependent signalling"

Outgoing Treasurer Vince Duronio receives a plaque for his long years of service to the CSMB from Art Hilliker, President of the CSMB (2012-13)

Sergey Plotnikov receives the Biochemical Journal Poster Award from Frances Sharom (Biochemical Journal Editor and CSMB Councillor) and Vince Duronio (CSMB Treasurer)

Scenes from the 56th Annual meeting, *Niagara-on-the-Lake, 2013*

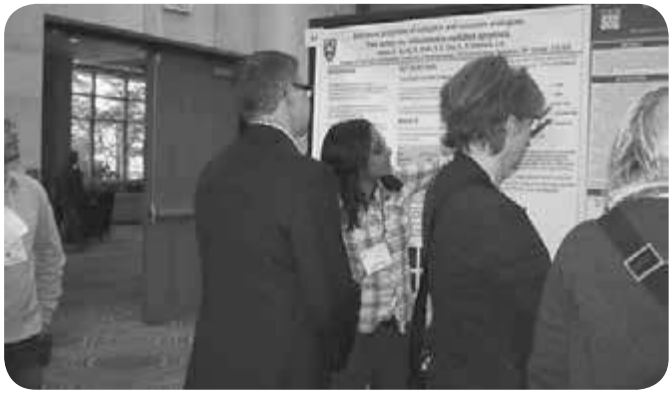
Vince Duronio (right; CSMB Treasurer) presents Ciaran Lane (left) with the Jake Duerckson Poster Award in Cell Biology, and Amelia Fradet-Turcotte (centre) with the Margaret Thompson Poster Award

New England Biolabs Travel Award winners receive their awards from Vince Duronio (CSMB Treasurer)

The vendor displays attracted much discussion

GE Healthcare ran a display and presented a technical workshop

Leica Microsystems, Carl Zeiss Microscopy and Nikon operated displays and also presented several very popular technical and hands-on microscopy workshops



Lively debate at the poster sessions

Scenes from the 56th Annual meeting, *Niagara-on-the-Lake, 2013*

Lively debate at the poster sessions

Lively debate at the poster sessions

Relaxing at the opening mixer

Relaxing at the opening mixer

Relaxing at the opening mixer

Poster and Travel Award Recipients
56th CSMB Annual Meeting, Niagara-On-The-Lake

POSTER PRIZES

AWARDEE	UNIVERSITY
Jake Duerckson Poster Award in Cell Biology	
Ciaran Lane	Dalhousie University, Halifax Neale Ridgway laboratory
Margaret Thompson Poster Award	
Dr. Amélie Fradet-Turcotte	Lunenfeld-Tanenbaum Research Institute, Mount Sinai Hospital, Toronto Daniel Durocher laboratory
Biochemical Journal Poster Award	
Dr. Sergey Plotnikov	Cell Biology and Physiology Center, NHLBI/NIH Bethesda, MD USA Clare Waterman laboratory

TRAVEL AWARDS

New England Biolabs Travel Awards

AWARDEE	UNIVERSITY	SUPERVISOR
Eshwari Addala	University of Saskatchewan, Saskatoon	Dr. Brian Bandy
Andrew Archibald	McGill University, Montreal	Dr. Luke McCaffrey
Marcia Graves	University of British Columbia, Vancouver	Dr. Calcin Roskelly
FuiBoon Kai	Dalhousie University, Halifax	Dr. Roy Duncan
Nicole Smith	Memorial University of Newfoundland, St. John's	Dr. Christian Sherri

2014 Society Award Designates

GE Health Care New Investigator Award

John Rubinstein, Molecular Structure and Function Program, Research Institute, The Hospital for Sick Children, Toronto

John Rubinstein obtained his B.Sc. from the University of Guelph in 1998. He received his Ph.D. from Cambridge University in 2002 where he worked in Medical Research Council laboratories under the supervision of Sir John E. Walker and Dr. Richard Henderson. His research interests relate to the use and development of electron cryomicroscopy methods to study the structure and function of large membrane protein complexes of biomedical importance. He is a senior scientist at the Hospital for Sick Children's Research Institute, where he has been since 2006.

CSMB Jeanne Manery Fisher Memorial Lecturer

Susan Lees-Miller, Departments of Biochemistry and Molecular Biology, Oncology and Biological Sciences, University of Calgary, and the Southern Alberta Cancer Research Institute

Susan Lees-Miller is head of the Genome Instability and Aging group at the Southern Alberta Cancer Research Institute and holds the Engineered Air Chair in Cancer Research. In 2010, she was elected to the Royal Society of Canada. Her research focuses on mechanisms of genomic instability, in particular the non-homologous end-joining (NHEJ) pathway for DNA double strand break repair. Current research projects involve elucidation of the mechanism of NHEJ and the function of the DNA-dependent protein kinase, DNA-PK.

NRC Research Press Senior Investigator Award

James McGhee, Department of Biochemistry and Molecular Biology, University of Calgary

Jim McGhee was an undergraduate at the University of Toronto, a graduate student at the University of Oregon (Eugene) and a postdoctoral fellow at the National Institutes of Health (Bethesda, Maryland). He is currently Professor in the Department of Biochemistry and Molecular Biology at the University of Calgary.

2014 Society Award Designates

CSMB Arthur Wynne Gold Medal

Janet Rossant, FRS, FRSC, The Hospital for Sick Children, Toronto

Janet Rossant received her undergraduate degree from the University of Oxford and her Ph.D. from the University of Cambridge. After postdoctoral work in Oxford, she moved to Canada in 1977. She is currently Professor in the Departments of Molecular Genetics, Obstetrics/Gynaecology and Paediatrics, University of Toronto and Chief of Research at The Hospital for Sick Children, Toronto. She is the Deputy Scientific Director of the Canadian Stem Cell Network and is actively involved in the Centre for Modelling Human Disease in Toronto, which is undertaking genome-wide mutagenesis in mice to develop new mouse models of human disease. Her research interests are focussed on understanding the genetic control of normal and abnormal development in the early mouse embryo using both cellular and genetic manipulation techniques.

Robert H. Haynes Young Scientist Award in Genetics

François Bachand, Department of Biochemistry, Université de Sherbrooke

In 1996, François Bachand obtained a B.Sc. in Microbiology and Immunology from McGill University. In 1998, he then obtained a Master's degree from the Université de Montréal under the supervision of Dr. Eric A. Cohen, working on the biology of HIV-1. His doctoral studies were under the supervision of Dr. Chantal Autexier at the Lady Davis Institute for Medical Research affiliated to McGill University, and focused on the biology and biochemistry of the human telomerase enzyme. His post-doctoral training was from 2002-2005 with Dr. Pamela Silver at the Dana Farber Cancer Institute in Boston, where he studied the role of arginine methylation on the function of various RNA-binding proteins. François Bachand joined the Department of Biochemistry of the Université de Sherbrooke in October 2005, where he is now Associate Professor. In 2011, he was awarded a Canada Research Chair in Quality Control of Gene Expression.

2014 Society Award Designates

2013 Young Canadian Cell Biologist of the Year

Ridhdhi Desai, Department of Cell and Systems Biology, University of Toronto

An award for the "Young Canadian Cell Biologist of the Year" has been established by the CSMB and the American Society for Cell Biology (ASCB) for a Ph.D. student or post-doctoral fellow at a Canadian institution to attend the ASCB Annual Meeting. The CSMB will provide $500 towards travel costs, and the ASCB will provide free meeting registration. The award winner will be a Ph.D. student or post-doctoral fellow at a Canadian institution who has published a high impact, first or co-first author, cell biology paper in the past year. They will also be judged on their ability to place their research into context. The award winner must be a CSMB member (free for students and postdocs) and their supervisor must also be CSMB member in good standing for at least the past two years.

The 2013 winner of this award, Ridhdhi Desai, provided the following report on the 2013 ASCB meeting, held in New Orleans:

In December 2013, I had the opportunity to attend the ASCB Annual meeting for the second time, as the CSMB's Young Canadian Cell Biologist of the Year. At this meeting, impressive keynote presentations from renowned scientists Elaine Fuchs and Craig Venter highlighted some of their greatest contributions in Stem Cell Biology and Genome Sequencing. Nobel Laureates Jim Rothman and Randy Schekman described their journey to the discovery of how the trafficking machinery operates to transport molecules in and out of cells and across tissues. Together, they emphasized the importance of research in basic sciences for the proper understanding of how cells and tissues work together as a system.

I presented some of the findings from my PhD. work during a poster session at the meeting, and was happy to receive feedback and comments from leaders in the field. As I begin my postdoctoral research, I was particularly interested in mechanisms that affect epithelial polarity in cancer cells. The meeting offered me a chance to interact with cell biologists working in similar research areas, which led to interesting discussions that provided valuable suggestions and ideas for potential projects. Also, I was particularly intrigued by presentations on advanced technologies such as Light Sheet Microscopy, which allows long-term 3D imaging of live embryos in high resolution with little to no phototoxicity, and the use of the CRISPR-Cas9 system, a genetic-engineering technique that allows precise and targeted control of any gene function in the entire genome.

In addition to being a great place to gain insights on recent developments in diverse scientific disciplines, the conference also encompassed a myriad of workshops and science career round tables that offered interesting discussions and guidance opportunities for researchers looking to pursue alternative career paths such as teaching and/or research in industry.

Overall, the meeting was intense and packed with exciting posters and presentations. I am grateful to the organizers of ASCB and Canadian Society for Molecular Biosciences (CSMB) for providing me with a chance to attend this meeting. I believe that the ASCB is an excellent place for any young scientist, and am hopeful that I will attend this meeting again soon.

2013 NRC Research Press Senior Investigator Award

My road to alternative splicing control: from simple paths to loops and interconnections

Benoit Chabot
Department of Microbiology and Infectious Diseases, Faculty of Medicine and Health Sciences, Université de Sherbrooke

Abstract

With the functional importance of alternative splicing being validated in nearly every mammalian biological system and implicated in many human diseases, it is now crucial to identify the molecular programs that control the production of splice variants. In this article, I will survey how our knowledge of the basic principles of alternative splicing control evolved over the last 25 years. I will also describe how investigation of the splicing control of an apoptotic regulator led us to identify novel effectors and revealed the existence of converging pathways linking splicing decisions to DNA damage. Finally, I will review how our efforts at developing tools designed to monitor and redirect splicing helped assess the impact of misregulated splicing in cancer.

The period following the discovery of split genes in 1977 has been prodigious in its revelation of novel processes in which RNA is implicated. During the last 25 years, we have learned how the structural plasticity of RNA is exploited to produce ribozymes and riboswitches. Enzymatic machines that rely on the propensity of RNA to base-pair with other single-stranded nucleic acids, from the telomerase and miRNA silencing complexes to the intricate ribosome and spliceosome, have been characterized. The discovery of trans-splicing, nonsense-mediated RNA decay and RNA editing have documented the diversity, versatility and sophistication of RNA regulatory processes. New roles for RNA still remain to be uncovered, and the field is now in the midst of identifying and unraveling expanding functions and molecular mechanisms associated with a profusion of small and large non-coding RNAs.

These outstanding discoveries should not distract us from the fact that during that period, alternative splicing (AS) went from anecdotal to widespread; from an ingenious way for small viral genomes to condense coding potential to seminal descriptions

of functional refinement (with CGRP/calcitonin and antibody production as two early examples (Alt et al., 1980; Leff et al., 1986)), and the recent demonstration that AS occurs in nearly all human multi-exonic genes (Pan et al., 2008; Wang et al., 2008). Despite this continuum of examples, researchers have rarely engaged in systematically testing the function of splice variants produced from their favorite gene. Given that AS frequently alters protein localization and activity, as well as its capacity to interact (Ellis et al., 2012; Nilsen & Graveley, 2010), it is becoming crucial not only to annotate AS profiles, but to assess the functional relevance of splice variants produced in normal and diseased conditions, as well as to understand how splicing decisions are orchestrated and linked to other biological processes. The goal of this review is to survey some of the steps that have marked the quest to decode molecular principles of splice site selection. I offer the disclaimer that the panorama of discoveries presented will be incomplete and strongly biased to reflect contributions involving my own research team.

Alternative splicing as a generator of diversity

Following gene transcription, the architecture of almost every human pre-messenger RNA (pre-mRNA) is reconfigured through AS to produce an average of eight to ten splice mRNA variants (Djebali et al., 2012; Pan et al., 2008; Wang et al., 2008), but sometimes up to hundreds and even thousands of different variants (Schmucker et al., 2000). While in many cases, mRNA splice variants program the synthesis of proteins with distinct functions, AS can also affect mRNA stability by making them more sensitive or resistant to destabilizing miRNAs or to nonsense-mediated RNA decay (Huang & Wilkinson, 2012; Sandberg et al., 2008). Recent compilations reinforce the staggering functional diversity bestowed by AS (Hagen & Ladomery, 2012; Kelemen et al., 2013; Shkreta et al., 2013; Warzecha & Carstens, 2012). One striking example involves a channel protein expressed in vampire bats that helps detect infrared radiation in warm-blooded prey (Gracheva et al., 2011). With the additional diversity revealed by sequencing the transcriptomes of various human cell types, conditions and disease states, the task of attributing functions to this expanding repertoire of splice variants is becoming a daunting, yet critically important, enterprise that will most certainly contribute to the development of new theranostic approaches.

A source of diversity that remains poorly investigated arises from genes harboring tandem repeats, a subset of them known as mini-satellites or VNTRs (for Variable-Number of Tandem Repeats). Because of polymorphism in their length in the human population, VNTRs have been used as DNA markers for individual identification and forensics. VNTRs change at remarkable rates, with point mutations occurring at each generation (Bois & Jeffreys, 1999; Jeffreys et al., 1999), yielding an estimated mutation rate that can be 1000-fold superior to that of the average human gene (Jeffreys et al., 1997). Because of inherent difficulties associated with mapping transcripts that harbor short repetitive elements, these units have been largely disregarded in microarray or short-read sequencing projects. Using a RT-PCR approach with primers located in unique flanking regions, we have shown that these repetitive elements can be part of transcribed genes, often embedded in coding sequences (Zhuo et al., 2007). Moreover, the presence of splice sites in these repeats leads to an exceptionally high rate of AS (Zhuo et al., 2007), and it has been shown that VNTRs located in the transcribed portions of genes can produce functional plasticity through AS (Tokino et al., 1996; Turri et al., 1995). mRNAs containing varying portions of repeats therefore produce related proteins with different numbers of repetitive domains. Such a dynamic process occurring throughout human evolution may have driven changes in protein structure, potentially explaining why multiple flanking domains of similar origin are a frequent feature of large proteins (Chothia & Gough, 2009). Thus, the intrinsic genomic instability of VNTRs may produce mutations that impact AS, rapidly creating novel mRNAs and protein isoforms with distinct functional attributes. This process may accelerate when genome stability is further compromised, such as in cancer cells. The combination of intrinsically unstable elements in an unstable nuclear environment may provide an exceptional mechanism to produce, and ultimately select, splicing profiles that offer adaptation and escape routes to challenging extracellular conditions.

Regulation of alternative splicing

A biological process that produces proteins with different functions should be tightly controlled. Compared to splice sites associated with constitutive or generic exons, splice sites flanking alternative exons are in general weaker, providing ideal substrates for

positive or negative modulation by auxiliary sequence elements bound by trans-acting regulatory factors. Repression can occur by a variety of mechanisms including the blocking of splice site recognition or through the assembly of complexes that prevent normal spliceosome formation (Chiou et al., 2013; House & Lynch, 2006; Izquierdo et al., 2005; Sharma et al., 2011). Stimulation can occur at every step of spliceosome assembly, but in the majority of cases it is the early steps that are improved by the recruitment of generic splicing factors such as U1 snRNP, U2 snRNP and U2AF binding at the 5'ss, branchsite and 3'ss, respectively (Chen & Manley, 2009).

Simple paths. The first mammalian protein capable of regulating splice site choice was discovered simultaneously by the groups of Manley and Krainer (Ge & Manley, 1990; Krainer et al., 1990). This protein, now known as SRSF1, is a member of a related family of proteins collectively known as the SR proteins. Our group provided one of the first descriptions of a mechanism by which SR proteins alter splice site selection. We showed that exon splicing enhancer element was bound by SR proteins and that led to a stimulation of U2 snRNP binding at the branchsite/3'ss (Lavigueur et al., 1993) **(Figure 1a)**.
Following the acquisition of more descriptions of SR proteins associated with the activity of enhancer elements, these proteins were readily catalogued as activators (Manley & Tacke, 1996). In contrast, the ability of the hnRNP A1 protein to antagonize the activity of SR proteins in vitro (Mayeda & Krainer, 1992), to affect 5'ss choice in vivo (Yang et al., 1994), and a demonstration of the repressive function for the hnRNP I protein (also known as PTB) (Chan & Black, 1997) contributed to the branding of hnRNP proteins as negative regulators (Martinez-Contreras et al., 2007). This simplistic division of labor was relatively short-lived since SR proteins were also shown to display repressor function when bound to intron sequences (Kanopka et al., 1996; Simard & Chabot, 2002). We then showed that PTB could even antagonize the repression imposed by SR proteins (Paradis et al., 2007), thus indicating that hnRNP proteins could also stimulate splicing **(Figure 1b)**.

Loops. The distinction between an activator and repressor became more ambiguous when we began to investigate the molecular mechanism of splicing control by hnRNP A1 when bound to intronic sites. A1 binding sites on both sides of a splice site (or of an exon) repressed splicing (Blanchette & Chabot, 1999; Chabot et al., 1997; Hutchison et al., 2002; Nasim et al., 2002). Because a similar effect was obtained

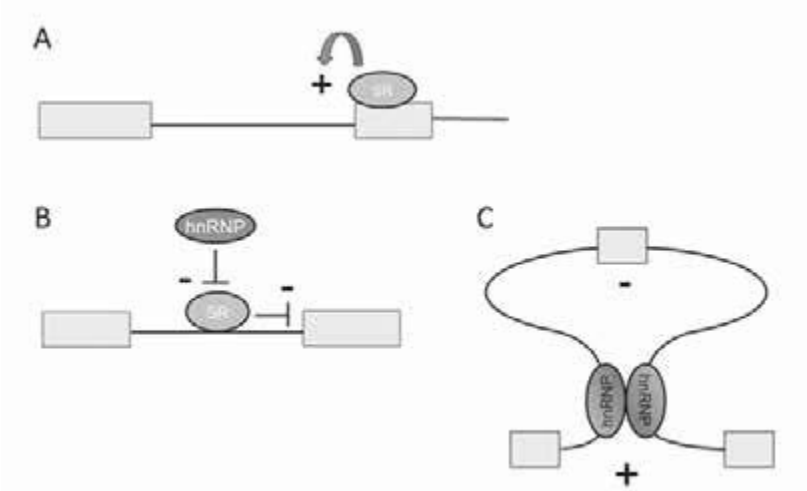


Figure 1. Splicing regulation: lines, rectangles and loops. *Three examples of splicing control identified in my laboratory. A. An enhancer element in fibronectin exon EDI is active when located less than 300 nt from the 3'ss. SR proteins bind to this purine-rich enhancer element leading to stimulation in U2 snRNP binding to the branchsite region (Lavigueur et al., 1993). B. The SR protein SRSF9 (previously known as SRp30c) binds to one intron of the hnRNP A1 pre-mRNA to repress splicing (Simard & Chabot, 2002). This repression is abrogated by hnRNP I/PTB (Paradis et al., 2007). C. Looping occurs following the interaction between two hnRNP A1 proteins bound at distinct locations (Blanchette & Chabot, 1999; Chabot et al., 1997). A splice site or an exon in the loop is repressed (although the 5'ss can be recognized by U1 snRNP (Nasim et al., 2002)), whereas distal exons are brought into closer proximity to stimulate commitment between splicing factors bound at their respective 5' and 3' splice sites.*

by placing the splice site in the hairpin portion of a duplex, we proposed that repression occurred through an interaction between bound hnRNP A1 (**Figure 1c**). Notably, this looping also brings into close proximity the *flanking* pair of exons, thus revealing a stimulatory role for A1 in splicing. This concept was validated when we provided A1 binding sites near the ends of long introns (Martinez-Contreras et al., 2006). The hnRNP F and H proteins were similarly capable stimulating splicing (Martinez-Contreras et al., 2006). Moreover, since hnRNP H and A1 proteins can interact and collaborate to modulate such events (Fisette et al., 2010), this finding suggests that interactions between different RNA binding proteins (RBPs) could modulate splicing by changing the structure of the pre-mRNA to stimulate splicing between distant splice sites or repress them by placing them in a loop.

The notion that interactions between proteins can reconfigure the architecture of a pre-mRNA to affect splicing decisions is a simple extension of what RNA secondary structure can do to affect splice site selection. Local duplex formation can sequester a splice site, as is the case in the pre-mRNA of hnRNP A1 (Blanchette & Chabot, 1997). Longer range interactions may also occur, but their formation may compete with protein binding and the speed of transcription. In yeast, duplex formation implicating sequences downstream from the 5'ss and upstream from the branchsite plays an almost generic role in consolidating spliceosome assembly (Newman, 1987). We have documented base-pairing interactions between sequences at similar positions in the mammalian *NCAM* pre-mRNA (Cote & Chabot, 1997). However, in this case, duplex formation interfered with spliceosome assembly. It would be worth examining on a global scale whether such interactions are common and functionally relevant in mammalian pre-mRNAs.

Maps. Global studies have now validated the concept that a RNA binding protein (RBP) can lead a double life, sometimes as an activator and other times as a repressor. This dual function is explained by distinct binding positions of the protein on a pre-mRNA. This mechanism was revealed by combining the results of knockdown of RBPs with information on their binding position on the reacting transcripts using an elegant in vivo crosslinking approach. This strategy has produced RNA binding and functional maps for several RBPs (Michelle et al., 2011; Ule et al., 2005) **(Figure 2)**.

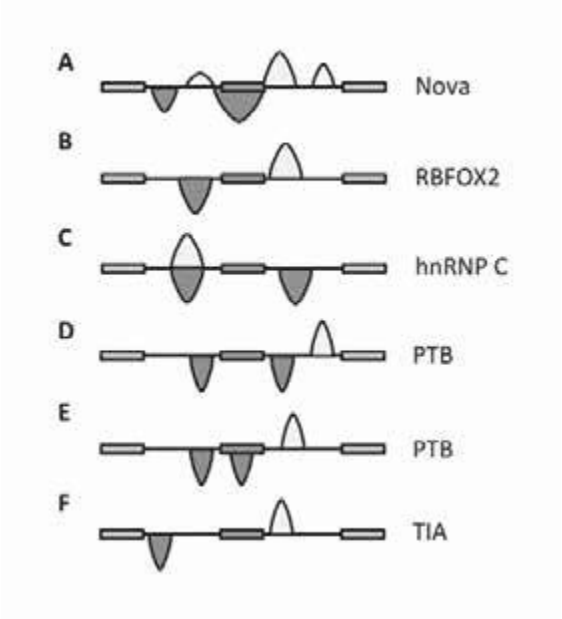


Figure 2. RNA maps for selected RNA binding proteins. *RNA maps illustrate the correlation between the binding positions for RNA binding proteins and the impact on alternative splicing. The individual maps are presented relative to a generic splicing unit where the central exon is alternative. Peaks represent regions of high density binding for the proteins. Peaks on top of the pre-mRNA are associated with inclusion of the regulated exon, while peaks below the pre-mRNA are associated with exon skipping. Shown are RNA maps for Nova (Ule et al., 2006), RBFOX2 (Yeo et al., 2009), hnRNP C (Konig et al., 2010), TIA (Wang et al., 2008) and two distinct reports for PTB (Llorian et al., 2010; Xue et al., 2009).(Modified from Michelle et al., 2011).*

In all cases, the activating or repressing activity of a RBP matches a specific profile of binding in and around alternative exons; but in most cases it is unclear how differential binding can elicit differential splicing.

Another important finding is that splicing regulators do not always belong to the classical SR or hnRNP families of proteins, although these regulators sometimes share structural features that would justify their inclusion in these families. For example, TDP-43 looks very much like a hnRNP protein with its RNA Recognition Motifs (RRMs) and glycine-rich domain, whereas Nova is a KH-domain-containing RBP very similar to hnRNP K (Martinez-Contreras et al., 2007). A somewhat unexpected group of AS effectors has turned out to be components of the basic splicing machinery. This result should not be entirely surprising because components that we now assume to be required for the splicing of all genes have in reality been identified

originally by studying the b-globin gene and the adenovirus major late transcription unit, two genes that are not constitutively expressed in all human tissues. On the other hand, reducing the level of a generic splicing component can impact AS (Jia et al., 2012; Park et al., 2004; Saltzman et al., 2008), possibly because it reveals a suboptimal step in spliceosome assembly, that may vary between competing pairs of splice sites. It remains to be shown whether regulating the expression of snRNP components or associated proteins is a strategy normally used to control a specific group of splicing events.

However, it is also becoming clear that mutations in generic components linked to U2 snRNP (e.g. SF3B1 and U2AF65) are associated with cancer (Harbour et al., 2013; Makishima et al., 2012). While mutations in splicing factors may have an impact on AS, possibly even contributing to the disease, I consider it significant that a drop in the expression of RBPs can promote R-loop formation (Aguilera & Garcia-Muse, 2012; Li & Manley, 2006). Because R-loops elicit genomic instability, this situation provides an alternative mechanism by which splicing factors can create havoc when their expression drops below critical levels.

Combinatorial splicing regulation and networking with other processes

Studying the function and mechanism of individual splicing regulators brings invaluable insight into how the splicing machinery is recruited or is prevented from interacting with specific splice sites. From the perspective of the gene however, splicing decisions are often orchestrated in response to multiple inputs produced or received by the cell. This implies a convergence of networks that may act on one or several splicing regulators. Teasing apart the intricacies of this regulatory network is very challenging. As a model to address this complexity, we focused on a splicing event involving the apoptotic regulator *Bcl-x*.

Apoptosis or programmed cell death is a process critical for normal tissue homeostasis and is misregulated in a variety of diseases including cancer. Because apoptosis can be triggered by diverse extracellular and intracellular stresses, anti-cancer drugs often exploit this response, for example after promoting DNA damage. Members of the Bcl-2 family of proteins play a critical role in the control of apoptosis and display either anti- or pro-apoptotic activity (Adams, 2003; Green & Kroemer, 2004). While overexpressing anti-apoptotic members or reducing the expression of the pro-apoptotic genes may protect cells against death, preventing the expression of anti-apoptotic forms promotes or sensitizes cells to death stimuli. Anti-apoptotic (e.g., Bcl-2, Bcl-xL, Bcl-w, Mcl-1) and pro-apoptotic (e.g., Bax, Bak, Bok, Bim, Bcl-xS, Puma) Bcl-2 family members differ in the number of Bcl-2 homology domains that they contain (White, 1996; Wu et al., 2003). Some pro-apoptotic members of this family (e.g., Bax, Bak and Bok) generate pores in the mitochondrial outer membrane, which triggers the activation of caspases and thus irreversibly execute cell death (Hengartner, 2000; Jiang & Wang, 2004). Other pro-apoptotic proteins of the Bcl-2 family operate by binding to anti-apoptotic proteins such as Bcl-2 and Bcl-xL. Apoptosis is therefore controlled by a delicate balance of pro- and anti-apoptotic activities.

AS plays a crucial role in the control of apoptosis by dictating the production of splice variants that often display opposite function (Schwerk & Schulze-Osthoff, 2005). The functional consequences of AS on apoptosis have been documented for cell surface receptors such as Fas; adaptor proteins and regulators such as TRAF2, APAF-1, survivin; mediators such as *Bcl-x*, Bak, Mcl-1, Bim and Bid; and caspases (Jiang & Wu, 1999; Schwerk & Schulze-Osthoff, 2005; Wu et al., 2003). For example, inclusion of exon 6 in the *Fas* receptor pre-mRNA produces a membrane-bound form that acts as an effector of apoptosis. In contrast, skipping of exon 6 yields a soluble form that inhibits apoptosis (Cascino et al., 1996; Cheng et al, 1994).

Bcl-x is produced mainly in two forms through the use of alternative 5'ss **(Figure 3)**. *Bcl-x*L is anti-apoptotic, whereas the shorter *Bcl-x*S variant is pro-apoptotic (Boise et al., 1993). Numerous studies have reported high levels of *Bcl-x*L in cancer tissues. Its overexpression confers resistance to apoptotic stimuli and favors metastasis (Du et al., 2007; Olopade et al., 1997). In contrast, *Bcl-x*S can induce apoptosis and alleviate multidrug resistance (Clarke et al., 1995; Mercatante et al., 2002).

A multitude of factors impose control of *Bcl-x* splicing. Although the 5'ss of the pro-apoptotic Bcl-xS is intrinsically weak based on its match to consensus,

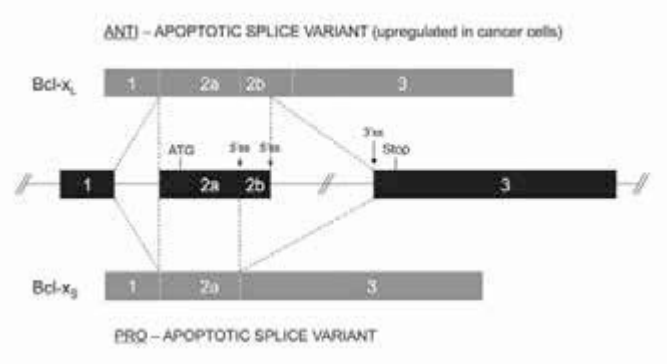


Figure 3. Life and death controlled by a simple case of alternative splicing. *Bcl-x alternative splicing produces predominantly two splice variants based on the differential use of two competing 5'ss. The large variant (Bcl-xL) is anti-apoptotic, whereas the short one (Bcl-xS) is pro-apoptotic (Boise et al, 1993).*

our analysis of *Bcl-x* splicing regulation has revealed an important blockade of events aimed at further repressing this 5'ss **(Figure 4)**. Several sequence elements in exon 2 bound by splicing regulators contribute to the repression of Bcl-xS (Figure 4). B1 is a composite element comprising adjacent and overlapping enhancers and silencers. The silencer portion of B1 is bound by hnRNP K which represses the production of Bcl-xS (Revil et al., 2009). The SB1 element also represses splicing to the 5'ss of Bcl-xS (Revil et al., 2007) (Figure 4). By individually knocking down nearly 50 RNA binding proteins, we identified RNPS1 and eIF4A3 as factors regulating Bcl-x (Michelle et al., 2012). Using a collection of mutants, we linked the activity of RNPS1 with the SB1 element, and the activity of eIF4A3 was associated with an element immediately downstream of B2G (Michelle et al., 2012) (**Figure 4**). Since signaling events involving protein kinase C are important to maintain the repression mediated through SB1 (Revil et al., 2007), our results support a model whereby phosphorylation of a SB1-bound factor (such as RNPS1) may prevent the production of pro-apoptotic Bcl-xS.

Notably, eIF4A3 is a well-known component of the core exon junction complex (EJC) deposited upstream of the splice junction concomitantly with splicing (Le Hir et al., 2001). We have shown that in addition to eIF4A3, two other components of the core EJC, Magoh and Y14, are involved in Bcl-xS splicing repression (Michelle et al., 2012). Our discovery therefore documents a novel function in splicing control for the core components of the mammalian EJC.

As expected for a role in splicing, eIF4A3 interacts with the *Bcl-x* pre-mRNA (Michelle et al., 2012). The SB1-interacting factor RNPS1 is an auxiliary component of the EJC, suggesting that it might interact with the core EJC. If this interaction occurs when RNPS1 and

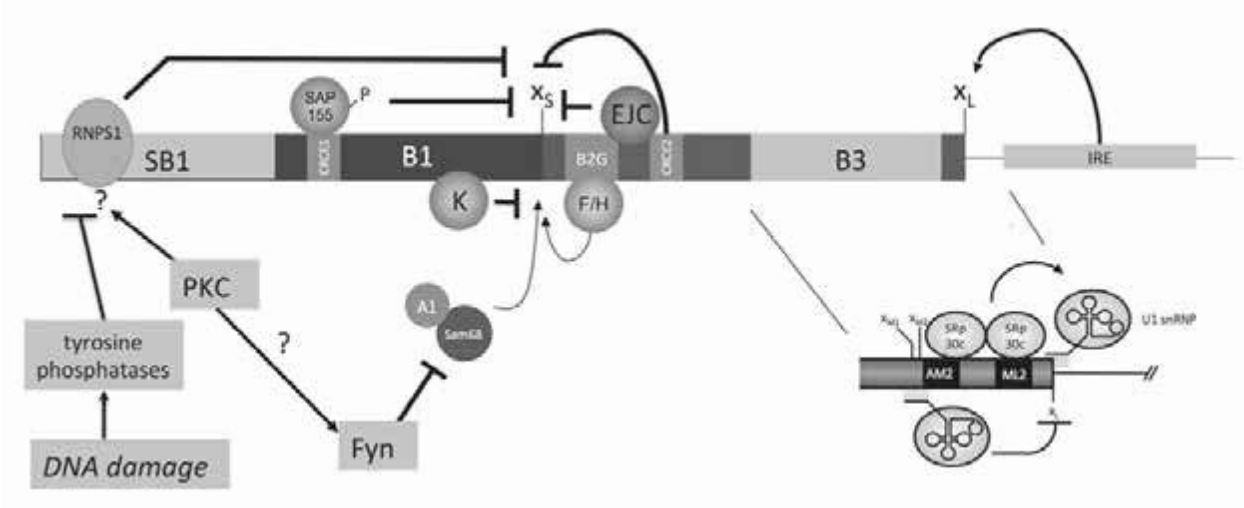


Figure 4. Control of Bcl-x splicing; a blockade of repression targeting Bcl-xS. *The current situation with Bcl-x splicing regulation. While each of the two competing 5' splice sites are subjected to positive and negative regulation, there is a bias of effectors negatively converging on the 5'ss that defines the pro-apoptotic Bcl-xS variant. See text for details.*

eIF4A3 are bound to their respective sites on the *Bcl-x* pre-mRNA, the interaction would loop out and repress the intervening 5'ss of Bcl-xS in a model similar to the aforementioned hnRNP A1-mediated looping (Figure 1c). Notably, we found that the AS of *Bim1* is similarly regulated by RNPS1, Y14 and eIF4A3, their depletion shifting *Bim1* splicing towards more pro-apoptotic splice forms (Michelle et al., 2012). What could be the biological reason for EJC components to regulate the splicing of apoptotic genes? The NMD-associated function of the EJC is critical to eliminate mRNAs that carry non-sense mutations. Thus, when the levels of EJC components are insufficient to guarantee optimal mRNA surveillance, this deficiency may trigger a switch in splicing to favor the production of pro-apoptotic variants to initiate cell death.

Other studies revealed that ceramide, a regulator of the stress response, could lift Bcl-xS repression by activation of protein phosphatase 1 (PP1), which in turn inactivates the RNA binding protein SAP155 bound to the repressor element CRCE1 (Chalfant et al., 2002 Massiello et al., 2006; Massiello et al., 2004) (**Figure 4**). CRCE2 is also a repressor element but its mechanism of action remains unclear.

Yet, another way to antagonize the production of Bcl-xS is to favor the use of the 5'ss of Bcl-xL. A large intron region downstream of the Bcl-xL 5'ss (IRE in **Figure 4**) is required for that purpose in response to growth factors (Li et al., 2004). We have also found that the exonic B3 element enhances the use of Bcl-xL through SRSF9 (previously known as SRp30c) (Cloutier et al., 2008)(**Figure 4**). SRSF9 appears to attenuate the impact of pseudo 5'ss bound by U1 snRNP that antagonize splicing to the authentic site in a manner that is reminiscent of the splicing regulation of the P element transposase in *Drosophila* (Siebel et al., 1992).

The convergence of repressive measures that prevent the production of Bcl-xS is balanced by a set of elements and factors that favors the production of the Bcl-xS splice variant. Phosphorylation of Sam68 by Fyn stimulates the production of Bcl-xS, and hnRNP A1 cooperates with Sam68 to improve this splicing event (Paronetto et al., 2007), but where Sam68 and hnRNP A1 bind and how they act is not known. Finally, the B2G element located downstream of the Bcl-xS 5'ss contains G-rich sequences bound by the hnRNP F/H proteins that enhance the use of the Bcl-xS site (Garneau et al., 2005). The mechanism of stimulation is unclear but the hnRNP F/H proteins may be important to prevent G-quadruplex formation in and around the 5'ss of Bcl-xS (Dominguez et al., 2010).

Linking *Bcl-x* splicing control to transcription and signaling. Given the number of enhancer and silencer elements regulating *Bcl-x* splicing, splicing decisions are likely dictated by a tight balance based on the affinity of positive and negative regulators to their target sites, and the competitive assembly of repressor or enhancer complexes. One way to tip the balance in favor of repression or activation is through variations in the speed of transcription. Indeed, pausing the RNA polymerase II at specific sites or changing the overall rate of transcription elongation can change the production of splice variants by altering the window of time given to form a regulatory complex before an antagonistic one is assembled (Kornblihtt et al., 2013). In collaboration with the group of Carles Suñe in Granada, we have found that overexpression of the transcription elongation factor TCERG1 shifts splicing towards the pro-apoptotic Bcl-xS, while its depletion does the opposite (Montes et al., 2012). Given the importance of transcription elongation in many biological processes, including development (Levine, 2011), and the possibility that an overly processive RNA polymerase II may be mutagenic, our result suggest that *Bcl-x* splicing may be used as a sensor for excessive TCERG1 activity.

The multiple control points impacting *Bcl-x* splicing likely involve tight integration with the signaling machinery. Our first incursion into this arena was prompted by asking if known anti-cancer drugs could modulate *Bcl-x* splicing. Staurosporine, a protein kinase C (PKC) inhibitor once considered as an anti-cancer agent, displayed a remarkable capacity to shift splicing to favor *Bcl-x*S in transformed 293 cells, an event confirmed by the use of more specific PKC inhibitors (Revil et al., 2007). This PKC-mediated repression required the SB1 element in 293 cells. In cancer cells, while SB1 also played a repressive role, inhibiting PKC did not impact *Bcl-x* splicing, suggesting that PKC signaling and *Bcl-x* splicing regulation have been uncoupled in cancer cells, and that other signaling routes enforce the repression of the *Bcl-x*S 5'ss to prevent apoptosis (Revil et al., 2007).

In contrast to staurosporine, the anti-cancer drugs oxaliplatin and cisplatin improved the production of Bcl-xS in all cell lines tested (Shkreta et al., 2008). Oxaliplatin and cisplatin are intercalating agents that elicit DNA damage by interfering with transcription and replication. Consistent with their mode of action, the oxaliplatin-induced increase in Bcl-xS requires components of the DNA damage response pathway (e.g. ATM1 and CHK2) (Shkreta et al., 2011). Likewise, the depletion of p53 by RNA interference or its pharmacological inhibition abrogated the oxaliplatin-mediated *Bcl-x* splicing shift, suggesting that cancer cells with a mutated p53 cannot activate the Bcl-xS road to apoptosis, and thus may display greater resistance to these anti-cancer drugs. However, cancer cell lines lacking p53 (e.g. MCF-7) maintain a *Bcl-x*-splicing response to platinum agents (Shkreta et al., 2011), suggesting that redundant pathways exist to compensate for the loss of p53-mediated *Bcl-x* splicing regulation.

Interestingly, the oxaliplatin-mediated increase in *Bcl-xS* requires the SB1 element and tyrosine phosphatases, suggesting that one or several repressors bound to SB1 may become dephosphorylated and inactivated in response to DNA damage (Shkreta et al., 2011). It will be interesting to test whether the SB1 interacting repressor RNPS1, is a target for the PKC/tyrosine phosphatase signaling pathway. Sam68 could be an alternative factor that relieves the SB1-mediated repression given that its activity on *Bcl-x* splicing is antagonized by the tyrosine kinase Fyn (Paronetto et al., 2007), itself known to entertain a physical and functional interaction with PKC delta (Crosby & Poole, 2003) **(Figure 4)**.

Global efforts towards annotation, regulation and function of splice variants in cancer tissues

All cellular mechanisms contributing to carcinogenesis (Hanahan & Weinberg, 2011) implicate genes whose alternative splicing is often disrupted during cancer. Genes encoding proteins involved in cell growth (such as p53, FGFR2, BRCA1), adhesion and migration (such as CD44 and Ron), angiogenesis (such as VEGF), replicative immortality (such as hTERT) and apoptosis (such as Fas and Bcl-x) display altered splicing patterns in cancer (Revil et al., 2006; Shkreta et al., 2013). The same is true for genes enforcing specific metabolic features in neoplastic tumours or those providing cancer cells the ability to resist attacks of the immune system and chemotherapeutic drugs (Christofk et al., 2008; He et al., 2004; Rodriguez-Cruz et al., 2011).

At the time when many groups were using DNA microarrays to identify differences of AS in cancer tissues, several colleagues in Sherbrooke (Sherif Abou Elela, Claudine Rancourt, Jean-Pierre Perreault, Roscoe Klinck, Raymund Wellinger and I), embarked on a similar quest with the financial support of Genome Canada and Genome Quebec. Our angle was to use the gold standard, RT-PCR, to identify splicing alterations in cancer tissues. For that purpose, a high-throughput screening platform integrated with a bioinformatic infrastructure was built and used to compare the impact of 14 hnRNP proteins on a set of 56 AS events occurring in apoptotic genes in several cell lines (Venables et al., 2008b). In addition to our observations of broad impact by hnRNP K and hnRNP C, and shared regulation of some events in different cell lines, we noted several instances of hnRNP proteins displaying cell line specificity. While all major hnRNP proteins affected AS control, different hnRNP proteins affected distinct sets of targets with little overlap, even between closely related hnRNP proteins (Venables et al., 2008b). Thus, our study showed revealed an intricate and often cell line-specific network of hnRNP proteins dedicated to the control of individual alternative splicing events. Moreover, our study indicated that nearly every hnRNP protein could be associated with exon inclusion almost as frequently as with exon skipping.

We then used the RT-PCR platform to compare the alternative splicing patterns of 600 genes relevant to ovarian and breast cancer and identified 45 and 41 events associated with ovarian and breast cancer, respectively (Klinck et al., 2008; Venables et al., 2008a). Overlap of target identity suggested that common pathways are regulating AS in these two types of cancer.

Encouraged by the above results, we embarked on a more exhaustive analysis to cover all known simple AS events (cassette exons, alternative 5' or 3' splice sites) that were listed in the database RefSeq (Venables et al., 2009). From more than 3000 events analyzed in 46 samples, we identified hundreds of events associated with both ovarian and breast cancer, confirming the

significant overlap between the two types of cancer. The compilation revealed a significantly higher incidence of events associated with genes involved in maintaining the cytoskeleton, especially at the periphery of motile cells, suggesting a role for AS in cell migration. To address the functional impact of AS, we developed a procedure that involves the use of oligonucleotides containing a portion complementary to an exon region close to the target splice site linked to a non-hybridizing tail that provides repressor function. When the tail contains splicing signals or binding sites for hnRNP A1, these bifunctional oligonucleotides will repress splice site use (Villemaire et al., 2003) (Garcia-Blanco, 2006; Gendron et al., 2006). This bifunctional oligonucleotide design has been coined TOSS for Targeted Oligonucleotide Silencer of Splicing (Garcia-Blanco et al., 2004). In contrast to RNA interference, which by decreasing the level of an mRNA variant also impacts total gene expression, the redirecting of pre-mRNA splicing by TOSS does not in principle affect global expression since the targeted decrease in one variant is usually compensated by an increase in the other splice variant. TOSS can therefore be useful to assess the function of splice variants in cancer and other systems (Prinos et al., 2011).

Recent studies have identified many splicing changes associated with the epithelial-mesenchymal transition (Biamonti et al., 2012). Remarkably, many of the splicing differences that distinguish normal ovarian tissues from ovarian cancer were also seen when splicing products were compared between normal mesenchymal and normal epithelial tissues (Venables et al., 2013a). Profiles of splice variants can provide an effective means to classify cancer cell lines according to their epithelial/mesenchymal characteristics; for this reason we used these cell lines to identify the role of 87 potential splicing regulators in establishing these splicing signatures in five cancer cell lines. This analysis exposed the staggering complexity associated with the epithelial/mesenchymal splicing signatures. Importantly, it also revealed a crucial role for the RNA binding protein RBFOX2 in establishing the mesenchymal splicing signature (Venables et al., 2013a). Consistent with this view, the expression of RBFOX2 is higher in normal mesenchymal than epithelial tissues (Venables et al., 2013a), and it is suppressed in breast and ovarian cancer (Venables et al., 2009). We recently used the same strategy to inquire about splicing changes during pluripotent stem cell differentiation. This study revealed a critical role for the splicing regulators MBNL1 and RBFOX2 late in that process and established an important role for AS in carrying out the instructions of transcriptional control networks (Venables et al., 2013b).

Conclusions

The research accomplished over the last 25 years has revealed the tremendous contribution that AS makes to proteomic diversity. Likewise, our view of how splicing decisions are implemented has led to the discovery of a multitude of splicing regulators whose activity appears to be tightly integrated and coupled to other processes such as transcription and signaling. While experimental and bioinformatic tools are evolving rapidly to help provide insight into this functional and regulatory complexity, the molecular mechanisms that control splice site selection in a tissue-specific manner, or when cells are stressed or diseased still remain poorly understood. My intention is therefore to continue to use a mixture of global approaches and high resolution inquiries on model genes like *Bcl-x*, with the goal of providing a better understanding of the positive and negative regulatory strategies that converge to balance the use of competing splice sites. By expanding our studies horizontally to other apoptotic genes, and vertically to other layers of regulation (e.g. transcription, chromatin structure and signaling), our objective will be to reveal the intimate level of integration that controls splice site selection in apoptotic genes, and how this tight coupling is affected by a variety of stresses. Concurrent with this fundamental research effort, we will pursue our development of state-of-the-art tools aimed at offering robust functional validation as well as novel biomarkers and therapeutic targets that may have value in the clinical setting.

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Obituary

Dr. Mario Moscarello with his long-standing colleague and friend, Dr. D. Denise Wood

Dr. Mario Antonio Moscarello *(1929 - 2013)*

Dr. Mario Moscarello, a pioneer in myelin research and the role of myelin instability in multiple sclerosis (MS), passed away on August 8, 2013 at the age of 83. Mario's wife of many years, Rebeka (Reva, nee Sheinin), pre-deceased him in 2005. At his death, he left a son (Raphael), a daughter (Carmen), and 4 grandchildren (Tia, Dominic, Matthew, and Nathan). Mario was born in Timmins, Ontario, and obtained three degrees from the University of Toronto – B.A. (Physiology and Biochemistry, 1951), Medicine (1955), and Ph.D. (Biochemistry, under the supervision of Professor Charles Hanes, 1961). From 1962-64, Mario received an MRC Fellowship to carry out post-doctoral work with Dr. Lou Siminovitch at the Ontario Cancer Institute. In 1964, he joined the Biochemistry Department at the Research Institute of the Hospital for Sick Children, where he served as a staff member at the hospital until his death. In 1971, Mario was appointed as an Assistant Professor in the Department of Biochemistry at the University of Toronto, the first cross-appointment from Sick Children's Hospital to the University. He became a Full Professor in 1980, and was cross-appointed to the Department of Laboratory Medicine and Pathobiology in 1982. Mario retired in 1994 at the age of 65, but remained as a Professor Emeritus at the University, and a Senior Scientist Emeritus at the Hospital.

Mario understood the give and take necessary to forge new paths in science; however, he played to win. Over the span of his scientific life, he published 280 publications and 7 book chapters, and trained 51 post-doctoral fellows and graduate students. Mario showed tireless energy as a research scientist, giving time to journals and grant review panels such as the MS Society of Canada, which funded his research throughout his career. He also served the hospital in several other capacities over the years. In 1965, Mario started the internal grant review process for all scientists at Sick Kid's Research Institute, a first in any Canadian institution. For many years he was also a partner in a successful medical laboratory services company. As Chair of the hospital's Equipment Committee (1977-1995), Mario's business experience ensured that Sick Kids obtained the best value for money from its suppliers.

Mario believed that a strong foundation in basic science

would lead to better understanding and treatment of childhood diseases. His research program focussed on demyelinating diseases, particularly MS, integrating the underlying structural biochemistry of the myelin sheath with the mechanisms responsible for myelin breakdown. His early research led to studies of a newly-discovered encephalitogenic determinant in myelin, which we now know as myelin basic protein (MBP). In 1971, his discovery that MBP fractions contained the non-coded amino acid citrulline was arguably one of the early milestones in the field of deimination (citrullination) research. Over the following decades, Mario's research program focussed on MBP, which he considered the "executive" molecule of the myelin sheath. He proposed early on that a defect in MBP was responsible for changes in myelin that preceded the autoimmune response. Mario noted that the severity of MS correlates with the degree of deimination of MBP, so that, paradoxically, the myelin of adults with MS resembles normal childhood myelin. Post-translational disease modification of MBP could explain many aspects of disease pathogenesis, including the release of immunodominant epitopes. Mario's group established that up-regulation of a peptidylarginine deiminase isozyme (PAD2) was responsible for hyper-deimination not only of MBP, but also other glial proteins, and could represent an early molecular event that preceded the formation of MS lesions. He believed that targeting this enzyme could offer new avenues for therapy for MS patients. Mario actively pursued this concept, using novel animal models to evaluate PAD inhibitors, until illness forced him to withdraw from the laboratory a few months before his death.

Today, we still do not know the initial events that lead to demyelinating foci in myelin and eventually to MS. Mario's ideas in the 1970s foreshadowed current "inside-out" models of disease pathogenesis and the role of epigenetic mechanisms. The study of protein deimination in a plethora of disorders is now a rapidly expanding discipline, to which Mario made ground-breaking contributions.

On a personal level, Mario was a superb athlete, a championship runner in his youth, and a formidable competitor in squash during his long years at Sick Kids. He also loved ice hockey, and helped to create the infamous Sick Children's Hospital hockey team. In fact, Mario promoted extra-curricular activities with his trainees, as he believed that if you played well together, collaboration in the laboratory would follow. Mario's intellect was apparent not only in his science but also in his sense of humour and fondness for pranks, and his office door was the site of friendly pictorial banter regarding any subject from heritage to sport. One of Mario's great delights, both as a producer and consumer, was wine, and for many years he bought Zinfandel grapes imported from California, and converted them into a superb red wine using a press in his basement. Mario lived all aspects of his life on his terms and to the fullest. He will be greatly missed by his family, friends, and scientific colleagues.

Harry Schachter, Research Institute, Hospital for Sick Children, Toronto
JoAnne McLaurin, Department of Laboratory Medicine and Pathobiology, University of Toronto
George Harauz, Department of Molecular and Cellular Biology, University of Guelph
(Adapted with permission from a tribute published in the Multiple Sclerosis Journal 2014 20: 773-774)

Obituary

Anthony (Tony) James Pawson OC OOnt CH FRS FRSC *(1952 - 2013)*

Tony Pawson was born in Maidstone UK into an eminent family. His father, Tony, was a champion fly fisher, footballer and cricketer who competed at the 1952 Olympics and later became a sports writer. His mother Hilarie, was a botanist and high-school biology teacher, who inspired his interest in science. Tony received an MA in biochemistry from Clare College, Cambridge, and a PhD from King's College London, which he followed up with postdoctoral work at the UC Berkeley from 1976 to 1980. From 1981 to 1985, he was Assistant Professor in the Department of Microbiology at the University of British Columbia, after which he moved to Toronto, where he was a Distinguished Investigator and former Director of Research at the Samuel Lunenfeld Research Institute of Mount Sinai Hospital, and a Professor in the Department of Molecular Genetics at the University of Toronto.

Tony was one of Canada's most influential biomedical scientists and contributed to several areas of research, notably through the publication of ~450 scientific manuscripts. He made a radical discovery in the mid-1980s, which introduced an entirely new framework for understanding dynamic cell signalling in normal and disease states. He found that cytoplasmic tyrosine kinase oncoproteins have folded non-catalytic domains which are critical for their transforming activity. He went on to define the conserved SH2 domain, and to show that it controls the enzymatic properties of such tyrosine kinases, and their interactions with cellular targets. In a physiological setting, he showed that the autophosphorylation of receptor tyrosine kinases creates docking sites for the conserved SH2 domains of diverse cytoplasmic effectors. His discoveries were the starting point for the identification of a large family of interaction domains that control virtually every aspect of cellular function. Tony's work established the multi-domain nature of regulatory proteins, revealed the general mechanisms underlying signalling from cell surface receptors and intracellular cues, and elucidated the predominant function of post-translational modifications. The now accepted concepts that signalling networks are primarily formed through regulated protein-protein interactions, mediated by dedicated interaction domains, and that aberrant protein interactions are a fundamental cause of human disease, are directly attributable to his work. He thereby uncovered a completely new and overarching principle of cellular organization that has transformed and codified our understanding of protein regulation and function. Over the past decade, his pioneering findings that oncogenic tyrosine kinases toggle between active and inactive states, and that cellular pathways and networks are assembled through protein interactions, have underpinned rational design and mechanistic understanding of clinically important signal transduction inhibitors.

Throughout his work, Tony developed and applied cutting-edge technologies, primarily proteomics approaches. He authored some of the earliest studies of mammalian protein-protein interaction networks (e.g. for the 14-3-3 proteins and the WW domains), and devised clever ways to monitor bidirectional signalling events in mammalian cells. Sustained and active collaborations with mass spectrometry vendor AB SCIEX enabled Tony to build a pioneering laboratory dedicated to the development of novel tools in mass spectrometry and proteomics. The success of this collaboration is evidenced by multiple large grants (CFI, Genome Canada, Ontario Research Fund) in this area. His recent innovations, as evidenced by coupling of affinity purification with selected reaction monitoring, enabled accurate tracking of signalling events downstream of receptor tyrosine kinases. He

recently expanded this type of approach to enable the monitoring of network rewiring in embryonic stem cells.

The huge impact of Tony's numerous accomplishments on biomedical research has been acknowledged by dozens of prestigious awards, including the Gairdner award, the Kyoto Prize in Basic Sciences and the Wolf Prize in Medicine. He was awarded the CSBMCB Senior Investigator Award in 1997. Tony was nominated at least eight times for a Nobel Prize. He was a member of the Order of Ontario, an officer in the Order of Canada, and was appointed by Queen Elizabeth II to the Order of Companions of Honour. Tony played an essential and instrumental role in powering the successful wave of signal transduction and proteomics research, and in mentoring many outstanding junior scientists in Canada. He will be sadly missed by both his immediate family (his grown children, Catherine, Nick and Jeremy, his grand-daughter Millicent, and his partner Barb Bennett) and by the entire scientific community of Canada.

News from Member Departments

Dalhousie University

Department of Biochemistry & Molecular Biology
Correspondent: Stephen L. Bearne

This past year has been particularly special for the Department of Biochemistry & Molecular Biology at Dalhousie University, with **Ford Doolittle** (Professor Emeritus) being awarded the 2013 NSERC Gerhard Herzberg Canada Gold Medal for Science and Engineering (see photo). The NSERC Herzberg Medal is the Council's highest honour and was awarded this year in recognition of Ford's more than 40 years work in evolutionary biology, leading to his assertion that life evolved from a population of many different primitive cells that exchanged genetic material through lateral gene transfer. **Andrew Roger** (Tier I, CRC in Comparative Genomics and Evolutionary Bioinformatics) was elected to Fellowship in the American Academy of Microbiology. **John Archibald** has written a book for the general public entitled *One Plus One Equals One* describing the endosymbiont hypothesis and the evolution of complex life.

Drs. John Archibald, Ford Doolittle, Michael Gray, and Andrew Roger attending the NSERC awards ceremony at Rideau Hall. (Photo courtesy of Paddy Muir.)

We continue to celebrate the success of our students, postdoctoral fellows, and research associates: **Pak Poon**, a long-standing research associate working in the laboratory of **Richard Singer** and **Gerald Johnston**, received the 2013 *Schnare-Spencer Prize,* which was established by **Mike Gray** in honour of two long-time research associates in his lab; Rafaela Andrade-Vieira, a graduate student with **Paola Marignani**, received the 2014 Doug Hogue Award for persistence and dedication to research; and Eric Fisher, a graduate from Roger McLeod's lab, received the departmental Patrick Prize for outstanding research by a recent Ph.D. graduate. This year, **Roger McLeod** completes his 3-year term as Assistant Dean, Graduate & Postdoctoral Studies in the Faculty of Medicine. He will serve for a second term starting July 1, 2014.

Our alumni (and anyone else interested) are invited to find out about the latest news and events of the Department of Biochemistry & Molecular Biology at www.biochem.dal.ca. We hope to see many colleagues at next year's CSMB 58th Annual Conference in Halifax (June 14–17, 2015).

Hospital for Sick Children Research Institute

Correspondents: John Brumell, Program in Cell Biology, and Lynne Howell, Program in Molecular Structure & Function

Big changes have occurred at SickKids this year with the move of the Research Institute into a new building. On September 17, 2013, the Peter Gilgan Centre for Research and Learning – aka the PGCRL – was officially opened. Guests at the official opening in the morning included Peter Gilgan; The Honourable Greg Rickford, Minister of State (Science and Technology, and Federal Economic Development Initiative for Northern Ontario); The Honourable Reza Moridi, Ontario Minister of Research and Innovation; Dr. Gilles G. Patry, President and CEO, Canada Foundation for Innovation; Jack Diamond, Diamond Schmitt Architects; Ted Gerrard, President and CEO, SickKids Foundation and Mary Jo Haddad, President and CEO, The Hospital for Sick Children. The evening gala event for donors hosted by the SickKids Foundation included displays

and hands on demonstrations by trainees in each of the six research neighbourhoods. The Molecules, Cells and Therapies Neighbourhood, on floors 19-21, which houses members of the Programs in Molecular Structure & Function and Cell Biology was represented by **Drs. Francis Wolfram, Perrin Baker, Alaji Bah, Laura Riley** and **Paul Eckford.**

Some members of the Molecules, Cells and Therapies Neighbourhood the evening gala displays; left to right, Drs. Francis Wolfram, Perrin Baker and Alaji Bah.

The opening of the PGCRL has provided us with an opportunity for recruitment and the Cell Biology program is proud to announce the arrival of **Drs. Ran Kafri** and **Vito Mennella:**

Dr. Vito Mennella

Dr. Vito Mennella came to North America as a Fulbright Fellow, and performed his postdoctoral work in the HHMI laboratory of David Agard at UCSF. His work determined major conceptual changes in organelle biology and modified our textbook view of centrosome architecture by revealing a previously unknown structural scaffold in the Pericentriolar Material. He employs a unique cross-disciplinary toolbox, combining nanometer-resolution fluorescence imaging, in vivo functional genomics and in vitro biochemistry and structural analysis. He developed a strategy that combines super resolution microscopy techniques, Structured Illumination Microscopy (SIM) and Stochastically Optical Reconstruction Microscopy (STORM), to study both the ensemble distribution of protein molecules and their domain organization, all in the context of cells. He also implemented for the first time 3D volume alignment and averaging analysis and applied it to the super-resolution field. This method has the considerable advantage of providing excellent quantitative metrics of the spatial distribution of protein components with errors in the range of a few nanometers rather than anecdotal representative examples, closing the resolution gap between cell and structural biology.

Dr. Ran Kafri

Dr. Ran Kafri is a systems biologist interested in how individual cells regulate and coordinate growth and division in the context of their extracellular environment. Ran employs highly quantitative microscopy to study cells in culture and in their physiological environment. By trying to understand what brings about the deregulation of cell size in tumours, his research directly impinges on cancer biology and holds promise to identify new mechanisms in tumour pathology. His lab combines genetic approaches, quantitative microscopy and mathematics. Ran did his Ph.D. in genomics, bioinformatics and systems biology at the Weizmann Institute of Science under the supervision of Yitzhak Pilpel and Doron Lancet. Following his Ph.D., Ran moved to the Harvard Medical School to be trained under Marc Kirschner, a founding scientist in the field of cell biology, and Galit Lahav. In his postdoctoral training, Ran pushed his personal boundaries to develop new methods of highly quantitative measurements and means for their interpretation.

It is with deep sadness that the Program in Molecular Structure & Function announces the passing of **Dr. Mario Moscarello**, a long time friend and colleague, on August 8, 2013. At his death Mario was a Professor Emeritus, University of Toronto and Senior Scientist Emeritus at SickKids, and was actively pursuing the development of novel compounds for the treatment of multiple sclerosis. Further details of Mario's life and contributions can be found in this issue of the Bulletin.

2013 also saw the retirement of two members of the Program in Molecular Structure & Function, **Drs. Michelle Letarte and Joan Boggs.**

Dr. Michelle Letarte

Michelle Letarte retired from active research at the end of 2013. She was Professor of Immunology and Medical Biophysics at the University of Toronto and a Senior Scientist at SickKids. She joined the Program in Molecular Structure & Function 10 years ago and has been a member of CSMB since 1976. Her research was focused on endoglin, a membrane protein of endothelial cells that her laboratory identified in 1984 and showed to be a co-receptor for TGF-β. Her work also led to the recognition of endoglin as the gene mutated in Hereditary Hemorrhagic Telangiectasia, a disorder that affects 1:5000 people and leads to arteriovenous malformations. She established a molecular diagnosis for this disease and worked for 20 years on its underlying mechanisms. She was also involved in the discovery of circulating endoglin as a marker for preeclampsia. As an Emeritus Senior Scientist, Michelle will continue to chair the Education Committee for the International Union of Immunological Societies, and help organize courses in the developing world. She will also devote more time to her second career as a painter.

Dr. Joan Boggs

Joan Boggs retired in early spring 2013 after 38 years at SickKids. She was Professor of Laboratory Medicine and Pathobiology at the University of Toronto and a Senior Scientist at SickKids. Joan first joined the Research Institute as a post-doctoral fellow working with the late Mario Moscarello. In 1980 she was appointed as a Scientist in the Division of Biochemistry Research (now the Program in Molecular Structure & Function) and over the next 33 years her research focused on the study of myelin proteins, their protein-protein interactions and protein-lipid interactions. She published well over 160 refereed articles, books and monographs. As an Emeritus Senior Scientist Joan continues to play an active role in the department, and has discovered that she now has time to travel and enjoy the pleasures of skiing and hiking.

Dr. Julie Forman-Kay

We are also pleased to announce that Dr. Julie Forman-Kay was awarded the 2013-14 Zellers Senior Scientist Award by Cystic Fibrosis Canada. The award recognized her outstanding contributions over 20 years to furthering our understanding of the CFTR protein, with particular emphasis on the disordered regions within the protein. Her research is focussed on revealing the molecular details that will help in the development of new CF therapeutics.

In other news, a small but dedicated group of runners, members of "Team Molecular Structure & Fun" ran in The Toronto 5K on September 14, helping to raise over $5000 for the SickKids Foundation in the process.

Team Molecular Structure & Fun

Harry Schacter and some of the speakers at the Glycobiology Lecture and symposium held in his honour. Left to right: David Williams, Cliff Lingwood, Kevin Campbell (2013 Harry Schachter Glycobiology Lecturer), Harry Schachter, James Rini, and Jim Dennis

In honour of Senior Scientist Emeritus Harry Schachter's 80th birthday, the Department of Biochemistry, University of Toronto teamed up with the Programs in Molecular Structure & Function, and Cell Biology to create the Annual Harry Schachter Glycobiology Lecture. This lectureship was created to celebrate Harry's many and varied contributions to the glycobiology field and in its inaugural year was part of a mini-symposium that highlighted the work of both local experts Drs. David Williams, Cliff Lingwood, James Rini, and Jim Dennis, as well as Dr. Kevin Campbell of the University of Iowa, who was the 2013 Harry Schachter Glycobiology Lecturer. The symposium was preceded by a dinner with family, friends and colleagues, and culminated in a cake-cutting ceremony.

Harry deftly wielding two knives at his cake-cutting ceremony

Harry and his wife Judy at his 80th birthday cake-cutting ceremony

McMaster University

Department of Biochemistry and Biomedical Sciences

Correspondent: Alba Guarné

In 2013, **Eric Brown** finished his five-year term as Department Chair and passed the torch to **Karen Mossman**, who has been an active associate member of the Department since 2001. **Mossman**, whose main appointment is in Pathology, brings a fresh perspective to the Chair's office and has taken the organization of the Department and the launching of our new program in Biomedical Discovery and Commercialization (BDC) in full force. **Eric Brown**, who spearheaded this initiative, will serve as the inaugural director of the program.

Our faculty continued to make a splash. **Lori Burrows, Brad Doble, Geoff Werstuck, Murray Junop** and **Jonathan Draper** renewed their CIHR grants and **Sheila Singh** and **Jonathan Schertzer** received new operating funds from CIHR. **Karun Singh** was awarded a grant from the J.P. Bickell Foundation. The Canadian Cancer Society selected a discovery by **Mick Bhatia** as one of the top 10 significant cancer research breakthroughs. **Nathan Magarvey** received a Tier 2 Canada Research Chair and was named McMaster's Innovator of the Year. **Felicia Vulcu** received the MSU Pedagogical Innovation Award. **Gerry Wright** received the Canadian Society of Microbiologists (CSM) Murray Award for Career Achievement. Work led by **Ray Truant** published in PNAS visualized the conformational changes of native and variants of the huntingtin protein found in Huntington patients. **Greg Steinberg's** laboratory unlocked the secrets of the diabetes drug metformin. This work was published in Nature Medicine and unveiled how metformin works on fat in the liver. **Karen Mossman's** team showed that combining chemotherapy with a herpes virus could help killing cancer cells.

Our graduate students have continued to produce top-notch science. Three of our talented students received Departmental Impact awards, recognizing their contributions to peer-reviewed journals. Using metabolic suppression, **Soumaya Zlitni** (Brown lab) explored anti-bacterial inhibitors under nutrient limitation (Nature Chemical Biology). **Nick Caron** (Truant lab) published an elegant study in PNAS analyzing the flexibility of the polyglutamine domain of huntingtin. **Chad Johnston's** (Magarvey lab) work on gold biomineralization by a metallophore from a gold-associated microbe was also published in Nature Chemical Biology. Five PhD (**Matthews, Stalker, Jomaa, Sugiman-Marangos and Lau**) and twenty-one MSc students graduated from our program in 2013. One of our PhD graduates, **Dr. Lindsay Matthews** (Guarné lab), was awarded the Governor General Academic Gold Medal for her intellectual contributions during her PhD work. This is the first Governor General Academic Gold Medal awarded to a student in our program. Well done Lindsay! More than thirty PhD and four MSc students were funded by competitive external scholarships. **Brian Tuinema** (Coombes lab) was awarded the second Michael Kamin Hart Memorial scholarship.

Our undergraduates thrived both inside and outside the classroom. The thesis day, where undergraduates present their undergraduate research projects to the Department, was a smashing success. A new initiative involving biochemistry undergraduates was a student-produced video series aimed at demystifying academia. During the summer a group of undergraduates endeavored to interview many professors across campus including biochemists **Alba Guarné and Jonathan Schertzer**. Some of these interviews have already been released as part of the "After Office Hours" series including the episode entitled "After Office Hours with Dr. Alba Guarné" (https://www.youtube.com/watch?v=f_B-ULK89JQ). Stay tuned for upcoming episodes.

The Biochemistry and Biomedical Sciences Graduate Association (BBSGA) was also busy making sure that we had our regular doses of fun. This year we had a record participation at our annual Biochemistry Olympics. One of the **Li** teams took gold, closely followed by the **Brown** and **Guarné** teams. The **Nodwell** lab received a coveted recognition: the Spirit Award. This award is presented to the lab that goes above and beyond in extracurricular spirit. The Burrows and **Sloboda** labs dominated the Halloween celebrations. The **Burrows** gang won best group costume for their creative representation of "Gru and the Minions", while the Sloboda lab won best individual costume (Deborah Sloboda) and the first place at the pumpkin-carving contest. The **Guarné-Junop** team won the BBSGA

Gingerbread House Building competition and the **Li** lab won best Christmas ornament. This year the Biochemistry and Biomedical Sciences Potluck raised $420 ($2100 in spending power) for the Hamilton food bank and the IIDR Holiday party raised $750 for the Michael Kamin Hart Memorial scholarship and City Kidz.

The end of the year was marked by the implementation of the Mosaic project. Mosaic modernizes McMaster's administrative and businesses processes and it has become a revolution on campus. We will remember December 2013 as the month when Mosaic was launched!

Memorial University of Newfoundland

Department of Biochemistry

Correspondent: Valerie Booth

The Department of Biochemistry at Memorial University of Newfoundland recently recruited a new, external Department Head. Dr. Mark D. Berry will join our department in the summer of 2014. Dr. Berry is an internationally recognized leader in the field of trace amine research and joins MUN from Brandon University where he spent the last 10 years as a member of the Chemistry department, three of which he served as Chair of the Department. He also brings with him 5 years of industrial experience from his time with ALviva Biopharmaceuticals, a spin-off company from the University of Saskatchewan. Dr. Berry is very much looking forward to joining the more research-oriented environment of MUN, and working with the members of the Biochemistry department to further develop relationships and the reputation of the department with other units at MUN, the wider national and international scientific community, and the residents of St. John's and Newfoundland & Labrador.

Dr. Mark D. Berry is the new department head

In other big news, the site for Memorial's new core sciences building has been selected and planning and design work is well under way. Construction is scheduled to finish by June 2019.

Participants at the 3rd annual Biochemistry Summer Student Symposium

Our graduate students, with help from faculty members Rob Brown and Sherri Christian, successfully pulled off the 3rd annual Biochemistry Summer Student Symposium. The venue for this year's event was the Johnson GEO CENTRE. This year's symposium had a record turnout as well as a record number of presenters. Dr. Tony Lam from the University of Toronto and Dr. Gordon Zello of the University of Saskatchewan were the keynote speakers.

2013 saw the establishment of the Faith Elizabeth (Rusted) Bayley Nutrition Lecture. This annual lecture was established by a bequest from Dr. Nigel Rusted in memory of his sister, a dietitian and RCAF squadron leader in the Eastern Air Command during WWII. The purpose of this lecture is to attract a well-spoken leader in nutrition research or discovery.

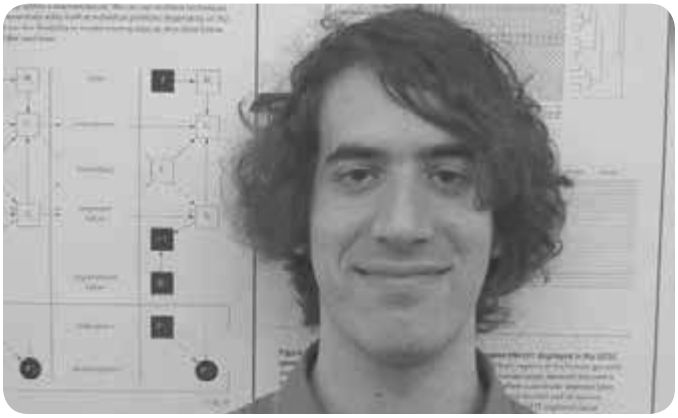
Princess Margaret Cancer Centre
(formerly the Ontario Cancer Institute)
Correspondent: Linda Penn

Dr. John Dick

Stem cell biologist is awarded prestigious research prize: Princess Margaret Cancer Centre Senior Scientist **Dr. John Dick** has been awarded the Canadian Cancer Research Alliance's (CCRA} Outstanding Achievements in Cancer Research award. He received the award for his seminal research and leadership in the field of stem cell biology, including his role in providing the first proof that cancer stem cells are not created equal. This award is presented once every two years to acknowledge the contributions of individuals who have had a remarkable impact on cancer research and the cancer research community. It was presented to Dr. Dick at an award dinner on November 5 during the CCRA's Canadian Cancer Research Conference in Toronto. The CCRA fosters the development of partnerships amongst cancer research funding agencies in Canada and promotes the development of national cancer research priorities and strategies.

Leukemia Researcher given award by Canadian Cancer Society: The Canadian Cancer Society has named **Dr. Aaron Schimmer** as the recipient of the Bernard and Francine Dorval prize. The award is given to a promising young Canadian investigator who began their independent research within the last ten years and whose research has the potential to lead to better understanding of cancer, cancer improved treatments, cures or new advances in cancer control. Dr. Schimmer is recognized for his research into drug discovery for the treatment of leukemia.. Using automated methods, he developed new tools to improve our understanding of biological vulnerabilities in leukemia cells and identify targets for drug development. He has already advanced three drugs into clinical trials for patients with leukemia and related blood disorders.

Dr. Aaron Schimmer

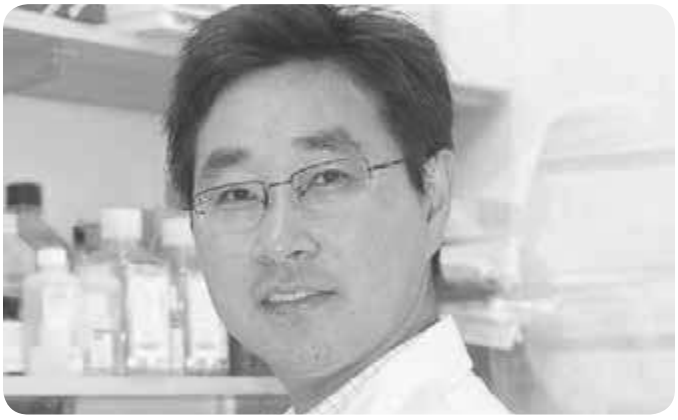


Dr. Michael Hoffman

Dr. Michael Hoffman received his PhD from the University of Cambridge (UK). He conducted his doctoral research at the European Molecular Biology Laboratory's prestigious European Bioinformatics Institute. Before joining UHN, Dr. Hoffman was a postdoctoral fellow in Dr. William Stafford Noble's group at the University of Washington in Seattle. Notably, Dr. Hoffman was awarded the National Genome Research Institute Pathway to Independence Award. Dr. Hoffman's research program focuses on machine learning in genomics and epigenomics. He developed Segway, a software package that integrates results from multiple functional genomics experiments, allowing scientists to more easily interpret genome structure and function and generate new hypotheses.

Dr. Trevor Pugh joins UHN as a Scientist and Lead of the Clinical Genomics Research Program at the Princess Margaret Cancer Centre. Dr. Pugh is an expert in genomics and computational technologies. His research program focuses on the comprehensive genomic profiling of tumours to link genomic alteration with cancer phenotype and treatment response. He also spends a portion of his time supporting molecular diagnostic testing in the hospital as a clinical molecular geneticist. Dr. Pugh joins UHN from the Dana-Farber Cancer Institute and the Broad Institute of Harvard and the Massachusetts Institute of Technology, where he worked under Dr. Matthew Meyerson. He has also trained as a Clinical Molecular Genetics Fellow at Harvard Medical School under Dr. Heidi Rehm. He received his PhD from the University of British Columbia under the supervision of Dr. Marco Marra.

Dr. Trevor Pugh



Dr. Housheng Hansen He

Dr. Housheng Hansen He's research program focuses on investigating the dynamic interplay between transcription factors and epigenetic controls in a variety of cancers with a special focus on noncoding RNA. He was recruited from the Dana Farber Cancer Institute at Harvard Medical School where he was appointed an instructor in Medicine in the Department of Medical Oncology. Dr. He completed his PhD under the supervision of Drs. Runsheng Chen and Geir Skogerbo at the Institute of Biophysics Chinese Academy of Sciences. He undertook his postdoctoral training at the Dana Farber Cancer Institute under the supervision of Drs. Xiaole Shirley Liu (in the Dept. of Biostatistics and Computational Biology) and Myles Brown (Dept. of Medical Oncology)

Dr. Benjamin Haiber-Kains

The research performed in **Dr. Benjamin Haibe-Kains'** laboratory focuses on the integration of high-throughput data from various sources to simultaneously analyze multiple facets of diseases, with a particular emphasis on cancer. Dr. Haibe-Kains and his team are using publicly available genomic datasets and data generated through his collaboration to better understand the biology underlying diseases and to develop new predictive models in order to significantly improve disease management. Dr. Haibe-Kains' main contributions include several prognostic gene signatures in breast cancer, subtype classification models for ovarian and breast cancers, as well as genomic predictors of drug response in cancer cell lines.

Ryerson University

Department of Chemistry and Biology

Correspondent: Roberto Botelho

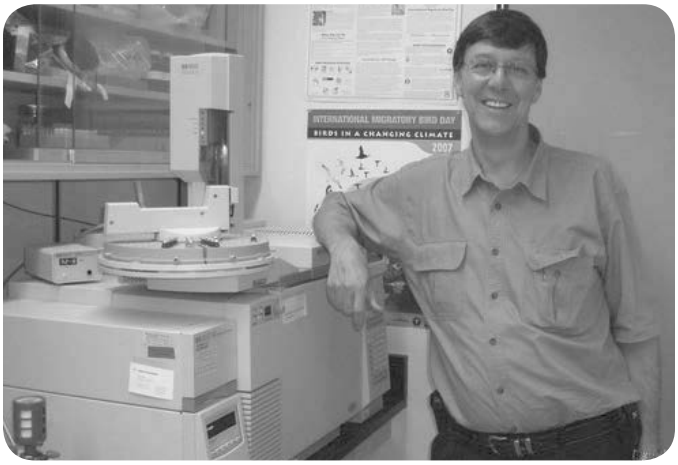
The Department of Chemistry and Biology at Ryerson University encompasses multi-disciplinary interests in research and education. Our Chemistry research programs are generally focused on macromolecular, synthetic and medicinal chemistry. The research interests in Biology enjoy strengths ranging from biochemistry, molecular and cell biology to genetics, microbiology and environmental biology. The breadth and variety of research interests creates an exceptional environment that permits cross-pollination of ideas and an open-concept milieu for learning and teaching.

In 2013, there were again a number of exciting changes within our Department and Ryerson University. The Faculty of Science, hosting Chemistry and Biology, Physics, Computer Science and Mathematics, celebrated its one-year anniversary and we inaugurated a new undergraduate program in Biomedical Sciences. This B.Sc. program will promote undergraduate education in molecular and cell biology, genetics and biochemistry to prepare future generation of researchers. We also hosted our second Annual Research Symposium that showcased our exciting and emerging research activities across various disciplines and highlighted both undergraduate and graduate-based research. In fact, our keynote speaker for this year was **Dr. Reinhart Reithmeier**, a key figure in the CSMB. Our graduate program in Molecular Science has now matured enough that our students are engaged as a community, organizing events like the Department Picnic in the Toronto Island, Alumni Meetings, Career Developmental Workshops, Halloween lab door competition and more. It is exciting to see our student body take charge of its community and enliven our Department and research community.

Dr. Michael Arts was recruited to Ryerson from Environment Canada and is a world-leader in essential fatty acids and their role in the environment

In 2013, our Department recruited **Dr. Michael Arts** from Environment Canada and **Dr. Janet Koprivnikar** from Brandon University. Dr. Arts is a leading investigator on essential fatty acids like omega-3 fatty acids and their role in the health and well-being of aquatic organisms and ecosystems. In particular, he is interested in the food web distribution and effects on humans. He employs

Highlighted speakers and poster winners from our Second Annual Departmental Research Symposium. The student winners include graduate and undergraduate students across a variety of research fields.



Dr. Michael Arts in his laboratory in Burlington.

Dr. Janet Koprivnikar was recruited to Ryerson in 2013. Her research aims to understand the ecology and evolution of infectious diseases, particularly aquatic host-parasites.

a truly diverse approach to his research, ranging from biochemical to ecosystem analyses. Dr. Koprivnikar is interested in the ecology and evolution of infectious diseases, especially in relation to aquatic animal parasites, their hosts and ecology. She is particularly focused on how environmental factors affect host susceptibility and tolerance to parasite infection, as well as the ecological roles of parasites.

Dr. Roberto Botelho

The recruitment of Drs. Arts and Koprivnikar is strategically important to help our Department maintain the research momentum built over the last few years, and strengthen our expertise in evolutionary biology and aquatic biosystems. Indeed, 2013 was another good year in terms of publication output, including several publications in developmental biology (**Marie Killeen**), host-pathogen interactions (**Debora Foster**), biofilm properties (**Gideon Wolfaardt, Martina Hausner**), lipid signaling (**Roberto Botelho**), chromatin regulation (**Jeff Fillingham**) and proteomics (**John Marshall**). Importantly, our research output is complemented by continued success in securing external funding. This year, **Roberto Botelho** received an NSERC RTI grant to set up a facility to measure phosphoinositides, which to our knowledge is the first in Canada.

Overall, 2013 was a very exciting time for the Department of Chemistry and Biology at Ryerson University. We expect our Department to continue growing its research footprint and visibility within Canada and at the international stage, and to advance research and education in the disciplines represented by the CSMB. Indeed, 2014 is poised to be an even better year than 2013.

Simon Fraser University

Department of Molecular Biology and Biochemistry

Correspondent: Christopher Beh

This year's report highlights just a few of the achievements made by our SFU MBB Department, which demonstrate why we take pride in the success of our research and teaching programs. We are also continuing our outreach program to engage and contact our large number of student graduates and postdoc alumni. To any MBB Department alumni, we welcome the chance to hear about your post-graduation exploits, so please contact us at mbbalumni@sfu.ca.

Department highlights

We are particularly pleased to report several significant awards bestowed on our faculty during this past year. We congratulate **Dr. David Vocadlo**, a member of the MBB Department who shares a position with the Department of Chemistry, for his award of a *Tier I Canada Research Chair.* This year Dr. Vocadlo also received the *Boehringer Ingelheim Research Excellence Award* for his work on chemical glycobiology and the therapeutic targeting of O-linked glycosylation. One of the Department's recent hires, **Dr. Ryan Morin**, received the *Maud Menten New Principal Investigator Finalist Prize*, recognizing the excellence of his research in applying next generation sequencing and bioinformatics to the analysis of cancer and human genetic disease. We also congratulate **Dr. Fiona Brinkman** who was appointed to the Board of Directors of Genome Canada in recognition of her work in bioinformatics. **Dr. Peter Unrau** received an NSERC

Discovery Accelerator Supplement (DAS) for his novel and potentially transformative research. Dr. Unrau has made significant contributions to research exploring prebiotic life and the "RNA World hypothesis".

Alumni achievements

Although it is relatively young, the MBB Department has graduated many distinguished undergraduate and graduate students, and takes great pride in their successes. As examples of graduate students who have gone on to successful positions, **Drs. Peter Stirling** and **Hani Zaher** recently became Assistant Professors, and are now doing stellar research in their own labs. Dr. Stirling (a former PhD student in the Leroux lab) is a new hire at the BC Cancer Research Centre, where he applies functional genomics and molecular genetics to study genome maintenance and stability. Dr. Zaher (a former PhD student in the Unrau lab) took a position in the Department of Biology and Washington University, St. Louis, where his work on the fidelity of protein synthesis has garnered huge attention. To these former students, and our many other graduates, we wish you all continued success in your future ventures.

Sunnybrook Research Institute

Biological Sciences Platform

Correspondent: David Andrews

The focus of the Biological Sciences platform at Sunnybrook Research Institute (SRI) is the study of molecules, cells and organs, on their own, in interaction with each other and as part of an interconnected system. Location of the platform within an academic health sciences centre ensures the efficient application, where appropriate, of findings to clinical domains. Areas of disease interest include cancer, cardiovascular disease, brain disorders like stroke and dementia, and traumatic injury, acute and acquired.

Dr. David Andrews

Under the leadership of **Dr. David Andrews**, there are 40 scientists conducting research within the platform, including clinician-scientists who interact directly with patients as well as run labs. Scientists in Biological Sciences work closely with those from SRI's two other platforms: Physical Sciences and Evaluative Clinical Sciences.

Main areas of investigation are varied. They include apoptosis, angiogenesis (including antiangiogenic therapy), immunology and T cell development, Notch signaling, cancer vaccines, neurogenesis and neuroregeneration, chronic total occlusions, developmental neuroscience, hair cell regeneration, fracture repair, stem cell therapy and natural killer cell biology.

Biological Sciences at SRI has several labs and core facilities containing state-of-the-art equipment for internal and external use. Last year we either established or enhanced several of these facilities. One example is the Centre for Flow Cytometry and Scanning Microscopy; new in 2013 is the addition of a BD influx cell sorter, which is custom-designed with six lasers for 17-parameter, six-way sorting, index plate sorting and small particle resolution. Some enhanced applications available are up to six fluorescent proteins simultaneously and sorting particles or organelles down to 200 μm. The Centre has a biosafety Level 2 hood and can accommodate analysis of live, noninfectious human samples.

Another example is the current good manufacturing practice (cGMP) laboratory, which recently opened. This facility is designed for the creation of new biological agents for cell-based therapies and vaccines in a strictly controlled environment, such that quality is built into each step of the design and manufacturing process. This guarantees that products developed in the lab are safe, pure, and effective for clinical testing in humans.

Also newly established is the high-content cellular analysis (HiCCA) lab, which seeks to understand and exploit protein-protein interactions and apoptosis toward identifying and validating potential

therapeutic targets. This lab can perform automated fluorescence microscopy, fluorescence lifetime imaging, fluorescence correlation spectroscopy, single molecule imaging and hyperspectral imaging.

The OPERA system in the new high-content cellular analysis screening lab at SRI

The cGMP and HiCCA labs were established with awards from the Canada Foundation for Innovation (CFI) and Ministry of Research and Innovation. They are integrated within the much larger Centre for Research in Image-Guided Therapeutics, or CeRIGT, a $160-million project funded by the CFI, with further support from industry and Ontario, which opened in late 2012.

Dr. Alain Dabdoub is a new recruit to SRI

These facilities ensure that our scientists have access to leading technology, and facilitate critical scientist-clinician interaction. One notable new recruit is **Dr. Alain Dabdoub**, from the University of California, San Diego, who is focused on discovering and elucidating the molecular signaling cascades and transcription factors responsible for the generation and development of inner ear sensory hair cells, and auditory neurons.

Looking ahead, Dr. Andrews will be recruiting additoonal new scientists to the platform. They will join a group of young and established researchers who consistently achieve success with grants and external

Dr. Isabelle Aubert, senior scientist at SRI

awards. To wit, last year **Dr. Isabelle Aubert** was awarded two W. Garfield Weston Foundation grants, one on which she is principal PI, and the other on which she is co-PI. In each, she is seeking to advance the use of focused ultrasound to deliver targeted biological therapeutics to the brain to treat dementia and other brain disorders. This work is being done in collaboration with Physical Sciences, which is leading the device development component of the awards.

Université de Montréal

Department of Biochemistry and Molecular Medicine

Correspondent: Christian Baron

In 2013 the Department changed its name from "Biochemistry" to "Biochemistry and Molecular Medicine". The new name better represents the changing scope of research of many of its members towards more biomedically applied work and the undergraduate program that has chosen the same name after a major reform in 2009. The Department stays of course grounded in basic research that is the foundation of all applied and translational work.

Appointments and promotions:

In 2013 one Associate Professor joined the Department. **Nicole Francis** who was previously at Harvard University established her Biochemistry of Epigenetic Inheritance research unit at the Université de Montréal-affiliated research institute IRCM (Institut de Recherches Cliniques de Montréal).

In contrast, the bioinformaticians **Benjamin Haibe-Kains** (IRCM), **Nicolas Lartillot** and **Hervé Philippe**

Dr. Nicole Francis

left our institution; we wish them all the best in their new research environments at the University of Toronto (Haibe-Kains) and at the CNRS in France (Lartillot and Philippe). **Jacques Archambault** at the IRCM was promoted to Full Professor in 2013.

Operating and infrastructure funds:
In this year's **CFI** competition a team of **Antonio Nanci** (Stomatology, Faculty of Dentistry) with our faculty members **Pascal Chartrand** and **Gerardo Ferbeyre** obtained a 1.5 million $ CFI leader's opportunity grant to purchase cryo-electron microscopy equipment and the first super-resolution microscope at our institution. **Pascal Chartrand** also obtained a major grant from the Québec government and from the Amorchem investment fund for his applied work aimed at finding treatments for the heritable disease Myotonic Dystrophy (Steinert disease). The French Pharma company Domain therapeutics signed a contract agreement aimed at finding novel GPCR-targeting drugs with IRICoR, a University-affiliated commercialization unit directed by CEO **Michel Bouvier**. Our institution obtained a new CREATE training grant termed Mine of Knowledge involving applicants **Christian Baron** and **James Omichinski** (PI Marc Amyot in Biological Sciences).

Our Faculty members did also stand their ground at **CIHR** operating grant competitions in 2013 (**Pascal Chartrand, Gerardo Ferbeyre, Nathalie Grandvaux**/ CR-CHUM and **James Omichinski**) and we obtained funding also from other sources, such as **Pascale Legault** (Parkinson Society), **Martine Raymond** (NSERC), **Léa Brakier-Gingras** (NSERC), and **Pascal Chartrand**, **Éric Lécuyer** and **Marlene Oeffinger** (CIHR Myotonic Dystrophy/Rachel Fund).

Research highlights:
Our faculty members published articles in high-impact journals that attracted significant attention. **Pascal Chartrand** published an article on the importance of "dark matter" on the maintenance of genome stability in *Molecular Cell*. **Stephen Michnick** and **Daniel Zenklusen** published an article on the molecular mechanism of rapamycin action on the cell cycle in Cell.

Awards:
Alain Moreau received the Ernest Charron prize from the Faculty of Dentistry.

Université de Sherbrooke

Département de biochimie
Correspondent: Martin Bisaillon

It has been a busy year for our faculty members. **Xavier Roucou** made the headlines in Quebec by being named the Personnalité de la semaine by the La Presse newspaper. He also won the Discovery of the Year Award given by Quebec Science, a magazine devoted to scientific news, for his recent discovery of more than 80,000 predicted alternative proteins. Their discovery implies that coding of multiple proteins in a single gene by the use of alternative open reading frames (ORFs) may be a common feature in eukaryotes, and confirms that translation of unconventional ORFs generates an as yet unexplored proteome. **François Bachand** recently won the 2014 Robert H. Haynes Young Scientist Award in Genetics given by the CSMB. The Award is intended to recognize a notable paper or series of related papers based on original research in genetics or allied fields completed and published by the candidate in a refereed journal, during the 15 year period immediately following the completion of a first degree. The Bachand lab is focusing on understanding the role of protein methylation in the regulation of gene expression and growth control. Interestingly, another colleague of ours, **Éric Massé**, also won the Robert H. Haynes Young Scientist Award in Genetics last year for his outstanding work on small RNAs.

A number of our faculty members recently moved

to a new building dedicated to cancer research. The Pavillon de recherche appliquée sur le cancer (PRAC) harbours 30 research teams with expertise in RNomics and proteomics, as well as oncology and molecular cell biology of cancer. The research teams now have world-class facilities in order to push the boundaries of knowledge about cancer.

Finally, it should be noted that **Marcel Bastin** retired in 2013. Prof. Bastin was one of the first scientists to clone genes in Canada. His work on the large T antigen was pivotal in understanding the role of this important protein in DNA replication.

University of Alberta

Department of Biochemistry

Correspondent: Joe Casey

In 2013, Department of Biochemistry Chair, **Charles Holmes**, was glad to be able to present the "Chair's Single Malt Whisky Award", fluidly recognizing special achievements, to **Larry Fliegel** (Faculty of Medicine Tier 1 Graduate Student Mentor of the Year] and **Mark Glover** (Award of a Tier 1 CRC Chair). Larry and Mark join a long line of distinguished previous awardees, including **Joel Weiner** (Election to FRSC), David Brindley (Election to FRSC), **Brian Sykes** (University Cup 2011) and **Marek Michalak** (University Cup 2012). In other news; **Richard Fahlman** was promoted to Associate Professor in July, **Joanne Lemieux** was approved for tenure and promotion to Associate Professor next July and **Leo Spyracopoulos** was approved for promotion to Professor in July 2014.

Biochemistry Study Abroad at University of Leipzig, Germany May-August 2013:

Charles Holmes recently visited the University of Leipzig to give a research talk at the Fakultat fur Biowissenschaften, Pharmazie und Psychologie der Universitat Leipzig- Institut fur Biochemie. This talk "Molecular Mechanisms Underlying Protein Phosphatase and p53 Regulation in Health and Disease", was part of the Biochemisches Kolloquium series of invited lectures at Leipzig in the original 1908 Herr Beckmann Horsaal auditorium in the "Angewandte Chemie" building on the University campus comprising undergraduate, graduate students and Faculty, on March 25th, 2013. The visit was organized by Prof. Dr. Annette Beck-Sickinger, Chair of the Institut fur Biochemie at University of Leipzig.

Following this visit, and coordinated by **Dr. Adrienne Wright**, 10 Biochemistry undergraduate students travelled to Leipzig during the Summer to work in research laboratories there. Our students had a great experience and this study abroad program (now oversubscribed!) will continue in future years for U of A Biochemistry undergraduates. **Dr. Andrea Pohl**, Director of Undergraduate Biochemistry programs in Leipzig and **Prof. Torsten Schoneberg**, Vice Dean of Research, Medicine and Biosciences are now arranging for German graduate students to visit the U of A in a similar vein in 2014.

The NSERC CREATE grant-supported International Research Training Group (IRTG) in Membrane Biology, centred in the Department of Biochemistry, began operation in April 2012. The IRTG's Biochemistry members (Drs **Joe Casey, Larry Fliegel, Joanne Lemieux, Nicolas Touret, Joel Weiner**, and **Howard Young**) support one PDF and seven graduate students with funding through the IRTG. The "international" in IRTG comes from the group's linkages with a similar team based at Technical University Kaiserslautern and Saarland University, Germany. In addition to their immersion in membrane biology, trainees spend three months with a German partner lab and also develop an understanding of industrial biochemistry through industrial visits. In 2013, trainees visited the Sanofi-Aventis factory outside Frankfurt, which produces tons of recombinant insulin each year. Students were

Dr. Joe Casey, Department of Biochemistry graduate students, and German partners at Sanofi-Aventis, Frankfurt, August 2013.

duly impressed by the scale of the chromatography columns on display! The IRTG principal investigators travelled to Germany for a meeting with their German counterparts, enjoying some great science and beer (see Larry Fliegel below) along the way.

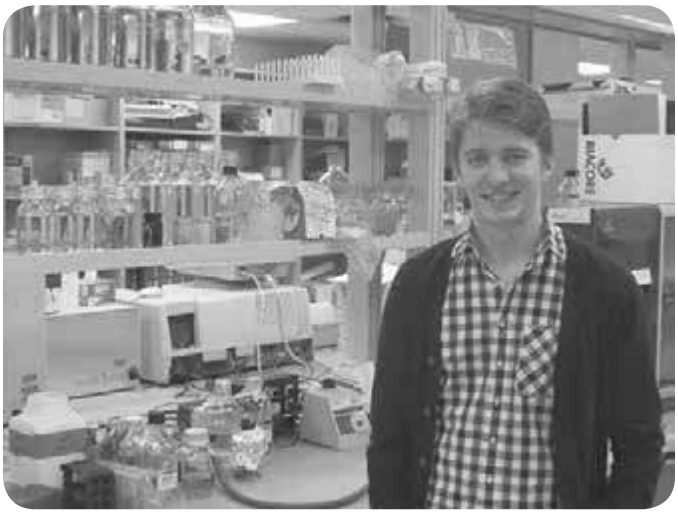
Dr. Larry Fliegel studying local fermentation technology, Bad Münster Am Stein, Germany at the joint IRTG meeting, 2013.

As part of the IRTG in Membrane Biology, graduate students busily crossed the Atlantic. **Joe Primeau**, a Ph.D. student in Dr. Howard Young's laboratory visited Dr. Ekkehard Neuhaus' lab in Kaiserslautern Germany to work on a collaborative project.

Dr. Marek Michalak had a very busy year. In April, Marek organized the 10th International Calreticulin Workshop in Banff with support from University of Toronto's Dr. David Williams and CSMB. In July, Marek stepped down from the position of Vice-Dean, Research of the Faculty of Medicine and Dentistry, which he held 2009-2013. In October he presented the Murray L. Barr Award Lecture at Western University on "A tour of protein quality control, coping with ER stress".

Dr. Marek Michalak in his role as Vice-Dean Research

Daniel Prins, a Ph.D. student in Dr. Marek Michalak's laboratory won a Frederick Banting and Charles Best Canada Graduate Scholarship as the top-rated candidate in the CIHR studentship completion. Daniel is investigating store operated calcium channels and their role in breast cancer metastasis.



Daniel Prins at the bench

Dr. Mike Ellison has led the University of Alberta's team of undergraduates in the International Genetically Engineered Machine (IGEM) competition. The 2013 project was to develop a biological computer, using synthetic biology. The University of Alberta team was winner of the "Best Presentation" iGEM North American Regional Finals out of a field of 72 teams, in a competition held in Toronto.

2013 marked the 100th Anniversary for the Faculty of Medicine and Dentistry (the home for the Department of Biochemistry). The faculty hosted a "Centennial Lecture series" of public lectures as part of the festivities, where **Drs. Joe Casey**, Marek Michalak and **Howard Young** each presented their work.

Dr. Ron McElhaney, looking ahead to his retirement in 2014 says "My remaining friends in the Canadian biosciences community would probably be interested in learning of my impending retirement from the University of Alberta and the Department of Biochemistry as of June 30, 2014, after 44 years in the Department. I plan to stay on after my retirement as an Active Emeritus Professor, writing up some

of the large amount of data on lipid and membrane biophysics which I have not had an opportunity to do over the years. However, I plan to do more bird watching and travel, and will probably spend most of the winter in a warmer climate, likely Costa Rica, in future. I also hope to get back into my old hobby of photography in a serious way."

In Memoriam: Dr. John Colter, Chair, Department of Biochemistry 1961-1987

John Colter was a member of an Alberta family that has distinguished itself in the academic and medical professions. Following a path traveled by many young Albertan scientists over a number of generations, he used a BSc in Honors Chemistry at the University of Alberta as a springboard to graduate studies. In John's case, he moved to McGill, where he obtained his PhD in 1951. John then developed an international reputation for virus research while on the staff of Lederle Laboratories and subsequently at the Wistar Institute in Philadelphia. A transforming event for the University of Alberta was his recruitment, in 1961, to head the Department of Biochemistry. John was eventually to serve in this capacity for 26 years, until his retirement in 1987. During this time, he built an outstanding department that has become recognized throughout the world of biomedical research. Although he began his work here only in the early 1960s, John Colter was in many ways as much a pioneer as those who founded the institution more than half a century earlier. His insistence on the application of international standards of excellence served the Department, the Medical Faculty, and the University well, and continues to affect the courses of their histories. The Department of Biochemistry's Colter Lectureship was established, largely from individual donations, and has hosted six Nobel Laureates to date. John passed away on June 20, 2013 at University of Alberta Hospital, Edmonton.

Dr. Michael James presents the 2013 Colter Lecture, "My Long-standing Interests in Enzyme Mechanisms: from Bacterial Serine Peptidases to Glycoside Hydrolases in Lysosomal Storage Diseases."

Dr. Dennis Vance presents a lecture in Kyoto, Japan November 2013

University of Alberta

Department of Cell Biology,
Faculty of Medicine and Dentistry
Correspondent: Paul LaPointe

The Cell Biology department at the University of Alberta comprises 16 primary and cross-appointed investigators whose research interests span a variety of areas in cell biology, with a strong molecular focus in each case. Research in our department includes mRNA export, nuclear pore structure and function, neuroscience, Drosophila development, organelle biogenesis and inheritance, protein folding, protein lipidation, mitochondrial biology and metabolism, protein and lipid transport, evolutionary cell biology, the RNAi system, and virology.

In 2013-14, members of our department were

successful in attracting nearly a total of $4.4 million in operating grants, training awards and visiting speaker awards from provincial and national sources. Our department has 32 graduate students who have been successful in obtaining prestigious fellowships including the Vanier, and Dr. Fred Banting and Dr. Charles Best CIHR Graduate Fellowships. Members of our department have also been successful in adapting to the new research funding paradigm both nationally and provincially, with success in acquiring funding for basic science-clinical partnerships.

Our department is proud to have our own **Dr. Andrew Simmonds** elected as President of the CSMB. Dr. Simmonds is an advocate of basic research and science education at the local, provincial and national levels. Also this year we say goodbye to **Dr. Bob Campenot**, who is retiring after a highly successful career as a neuroscientist. Dr. Campenot will be missed in our department and in the neuroscience community at large, but we wish him well in his retirement and in his new career as an author.

Our faculty members look forward to working through the CSMB to promote basic research across the country at the provincial and national levels; and to ensure that CIHR continues to equitable and adequately fund the important work being done by the Canadian research community.

University of Calgary

Department of Biochemistry and Molecular Biology, Faculty of Medicine

Correspondent: Jonathan Lytton, Head and Professor

The Department of Biochemistry and Molecular Biology at the University of Calgary continues to provide an important and productive home for fundamental research in the University's Faculty of Medicine. This year we were happy to recruit **Dr. Peng Huang** as a new faculty member to our model organism "genes and development" group. Among a group of distinguished scientists, Peng joins fellow researchers **Sarah Childs** and **Deborah Kurrasch** to form a strong zebrafish team with a growing reputation.

There have been a number of other changes of note to faculty members' roles in the Department during the past year. As we said hello to Peng, we also bid farewell to **Drs. Jeb Gaudet** and **Sung-Woo Kim**. Meanwhile, **Drs. Mark Bieda** and **Mayi Arcellana-Panlilio** accepted new roles in the Department as Instructors with major responsibilities in the Faculty's Bachelor of Health Science undergraduate program. **Dr. Julie Deans** took on the mantle of Associate Dean for the Faculty of Graduate Studies, **Dr. Tara Beattie** became the Associate Dean for Graduate Science Education in the Faculty of Medicine, and **Dr. Sarah Childs** took the helm as our graduate program Director. And last, but not least, joint member **Dr. Stephen Robbins** was appointed as Scientific Director of the CIHR Institute of Cancer Research. We are very proud of the contributions our members make to leadership at our University and beyond!

Our department members continue to lead in the area of research too. This year **Dr. Susan Lees-Miller** was recognized with the 2013 Killam Annual Professorship, and was a nominee for Outstanding Leadership in Science at the Alberta Science and Technology ("ASTech") Awards. Department members **Drs. William Brook, Savraj Grewal, Justin MacDonald, Karl Riabowol** and **Carol Schuurmans**, as well as associate member **Dr. Tony Schryvers**, were all successful in tough CIHR competitions. PhD candidate **Uma Rajarajacholan** (Karl Riabowol's lab) won this year's Cyril M Kay Graduate Studentship Award, as the top ranked applicant in the Alberta Cancer Foundation graduate studentship competition.

Departmental awards, which will be presented at our upcoming spring scientific and social "advance", were given this year to **Dr. Jennifer Cobb** (Leon Browder Rising Star Award), **Dr. David Schriemer** (Associate Professor Award), **Dr. Karl Riabowol** (Schultz Award for General Excellence), **Dr. Roy Gravel** (Hans van de Sande Leadership & Service Award), and **Dr. Frans van der Hoorn** (Education Award).

The Department will continue to build on our strengths in 2014, with ongoing new faculty recruitment in bioinformatics and brain tumour biology. We continue to seek top students for our strong graduate program. Please visit our website at www.ucalgary.ca/bmb/ for more information about the Department.

University of Calgary

Department of Biological Sciences,
Faculty of Science
Correspondent: Vanina Zaremberg

The Biological Sciences Department at the University of Calgary is currently organized in four clusters based on general research and teaching interests. They include Biochemistry, Microbiology, Cell Development & Physiology, and Ecology & Evolutionary Biology. During this year **Drs. Sergei Noskov** and **Marie Fraser** have been chairs of the Biochemistry cluster and Biochemistry program respectively.

Several colleagues have been recognized with distinctions/awards for their contributions or have received important funding to support future or ongoing projects.

Dr. Raymond J. Turner returned from a successful sabbatical in Europe exploring the production of metalloid nanoparticles by novel bacteria respiration. He received the Faculty of Science research Excellence Award and was convinced to take on the role of Associate Department Head. His group published a foundational review on metal ions as antibiotics in Nature Reviews in Microbiology.

Dr. Greg Moorhead received a Cancer Research Society (CRS) grant in 2013. **Glen Uhrig** from the Moorhead lab obtained his PhD and started a post-doc at the ETH in Zurich, where he received a Maria Curie fellowship.

Dr. Elmar Prenner continues teaching and research in the areas of biophysics and biomembranes, and is heavily engaged in the minor in Nanoscience by contributing to two courses and one lab course. His applications for tenure and promotion were approved. The group is funded by an NSERC DG and also participates in an AIHS-CRIO grant on tear film structure and function with Drs. Kubes and Vogel from the University of Calgary. His collaborative work with industry was supported by an NSERC Engage grant. He is also involved in a start-up company, Alberta BioPhotonics.

Dr. Peter Tieleman's group welcomed several new members in 2013 and continued their work in the general area of computational biochemistry. Several lines of development on the MARTINI coarse-grained force field, started in 2009-2011 with the support of an NSERC Steacie fellowship, came together to significantly improve this now very widely used model, including improved accuracy, stability, and new capabilities to combine computational models at different resolutions. The group is primarily interested in the properties of lipid mixtures, including the structure and dynamics of lipid domains, in lipid-protein interactions, and in the mechanism of ABC transporters. The group has been active in drawing together the unique strengths in molecular simulation at the University of Calgary in the Centre for Molecular Simulation (http://science.ucalgary.ca/molsim), and also inaugurated an updated group website (http://moose.bio.ucalgary.ca). A special highlight was the award of a Banting postdoctoral fellowship to **Dr. Drew Bennett**, who joined Mikko Karttunen's lab at the University of Waterloo in July 2013.

Dr. Sergei Noskov spent this year on sabbatical leave at the Section of Membrane Transport, Program in Physical Biology, National Institutes of Health, working on modelling metabolite transport in a number of large pores. Later this year he was a Helen J. Levitt Visiting Lecturer at the Division of Molecular Medicine, Mayo Clinic. Several of his trainees moved on to permanent positions. **Dr. Serdar Durdagi**, a CIHR post-doctoral fellow in the Noskov lab, started his own research group at the Bahcesehir University, School of Medicine, Turkey, focussing on molecular toxicology.

Dr. Hans Vogel continues to develop and strengthen the clinical metabolomics program. A sample-jet device was just installed on the 600 MHz NMR, to increase sample processing. In addition, the installation of ICP-MS to will allow metallomics measurement of clinical samples in the near future.

Dr. Vanina Zaremberg received tenure and promotion. Her graduate student **Ola Czyz** was the recipient of the Dean's Graduate Performance Award (Biochemistry cluster). Her work focussed on examining the effect of anti-tumor lipid drugs on pH homeostasis and membrane structure in Saccharomyces cerevisiae, which was published in the Journal of Biological Chemistry.

University of Guelph

Department of Molecular and Cellular Biology
Correspondent: Frances Sharom

Faculty news:
The year 2013 was marked by a change in leadership for the department, with **Dr. Chris Whitfield** stepping down as Chair at the end of June after 11 years at the helm. This period was marked by major changes, including the opening of the $130 million Science Complex, and the amalgamation of all or part of four previous departments into our current unit. We all owe many thanks to Chris for his hard work and dedication. **Dr. Rob Mullen** took over as Chair on July 1, 2013, and, as a plant cell biologist, he brings a fresh perspective to the department. Rob's research focuses on three main areas. His research on the characterization of enzymes involved in seed oil biosynthesis is aimed at understanding the molecular and cellular mechanisms involved in producing seed oils and their proper packaging into oil bodies. One of the current goals is to engineer neutral lipid accumulation in vegetative tissues of plants. Rob's group is also working to understand the biogenesis of peroxisomes, including how membrane proteins are targeted to this organelle, and what role the endoplasmic reticulum plays in the formation of peroxisomes. They are also especially interested in understanding how certain viruses "hijack" peroxisomes for their replication in infected plant cells. Another current aim is characterize a unique class of integral membrane proteins known as "tail-anchored" (TA) proteins. The Mullen group is using bioinformatic approaches to identify the localization and targeting signals of TA proteins, as well as the receptor protein machinery mediating their membrane insertion and assembly.

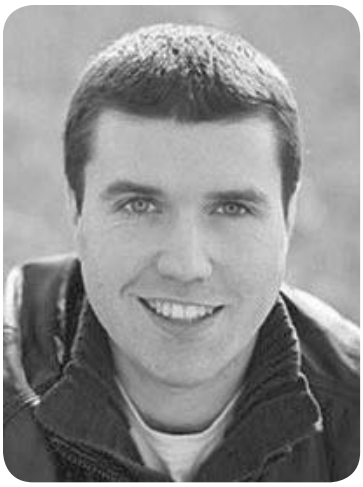
Dr. John Vessey joined the department as an Assistant Professor in Sept 2013, bringing an interest in developmental neurobiology to a flourishing neuroscience community at the University of Guelph. His interest in the neurosciences developed while pursuing his BSc and MSc degrees at Dalhousie University. During his graduate studies at Dalhousie, John worked with Dr. Steven Barnes, and used a combination of zebrafish retinal slice cultures, calcium imaging and confocal microscopy to elucidate mechanisms of synaptic signaling at the photoreceptor synapse. After graduating, he moved to Europe

Dr. John Vessey

where he undertook his doctoral training under the supervision of Dr. Michael Kiebler at the Max Planck Institute of Developmental Biology and the University of Tübingen, Tübingen, Germany. John continued to study synaptic function, now focusing on synaptic plasticity in primary cultures of hippocampal neurons. It was here that he was introduced to the topic of subcellular asymmetric RNA localization and the variety of roles that this process plays. After completing his doctorate, John was awarded a Bisby post-doctoral fellowship from the Canadian Institute of Health Research for his post-doctoral research, which was conducted at the Hospital for Sick Children under the guidance of Drs. Freda Miller and David Kaplan. Here, he continued his studies of asymmetric RNA localization. However, he now turned his attention to the developing brain and the stem cells responsible for building the mammalian cortex and found that RNA localization is essential for proper brain development. At the University of Guelph, John is continuing to investigate the post-transcriptional regulation of RNA and how these processes influence neural stem cell biology. To do so, he is building a laboratory that is equipped with infrastructure necessary for microscopy, molecular biology and primary cell culture. He has recruited a team of graduate and undergraduate students and is beginning to gather promising data. John is also excited about the many collaborative opportunities that exist at Guelph. One of the other recent hires in the Department is **Dr. Scott Ryan** (see below), a neural stem cell biologist interested in neurodegenerative disease. Not only do John and Scott foresee future collaborations, but they are going to so far as to develop their laboratory space together. John is also reaching out to the Ontario Veterinary College and establishing exciting collaborations to study RNA biology at very early time-points in development, the early blastocyst.

Dr. Tariq Akhtar, a plant biochemist, joined the department in November 2013. Tariq carried out his undergraduate studies at the University of Waterloo, where he stayed to complete his MSc in molecular toxicology with Dr. Bruce Greenberg. Tariq investigated the molecular mechanisms by which various environmental cues cause plants to accumulate flavonoids, a well-known class of secondary metabolites. In 2005, Tariq joined the laboratory of Dr. Andrew Hanson at the University of Florida, where he contributed to a viable and cost-effective way to overcome global folate malnutrition through plant "biofortification". His doctoral research specifically addressed how folate breakdown and storage impact the homeostasis of this plant-derived vitamin. As a post-doctoral fellow, Tariq continued studying various aspects of plant biochemistry at the University of Michigan in the laboratory of Dr. Eran Pichersky, where he helped to pioneer a stable isotope-assisted mass spectrometry-based metabolomics platform to discover a novel breakdown and recycling pathway for the plant hormone, salicylic acid. As an Assistant Professor at the University of Guelph, Tariq continues to study a variety of plant biochemical pathways that operate at the interface of primary and secondary metabolism. The current focus of his laboratory is investigation of a widespread group of plant compounds known as polyisoprenoids and the physiological roles they play.

Dr. Tariq Akhtar



Dr. Jim Uniacke

Dr. Jim Uniacke, who has expertise in mRNA translation regulation during hypoxia and cancer, joined the department as an Assistant Professor in December 2013. Jim completed his undergraduate studies in 2003 at Concordia University where he also pursued a PhD in the Department of Biology under the supervision of Dr. William Zerges, a world expert in translational regulation in organelles. Jim investigated how mRNA translation is regulated in organelles during cellular stress at the level of their spatial organization. This was an ambitious and ground-breaking project that involved the development of a new fluorescence in situ hybridization technique for the detection of mRNAs within organelles. From 2009-2013, Jim undertook a postdoctoral fellowship as a Terry Fox Fellow with Dr. Stephen Lee at the University of Ottawa. Dr. Lee is one of the world's leading experts on the molecular aspects of oxygen signaling. In Dr. Lee's laboratory, Jim continued his investigation of mRNA translation regulation during cellular stress by examining how mRNAs are translated during periods of oxygen scarcity (hypoxia) when the primary protein synthesis machinery is inhibited. Jim identified an alternative translation initiation pathway that is responsible for the translation of thousands of mRNAs during hypoxia that was published in *Nature* in 2012. Hypoxia regulates many physiological and pathophysiological processes such as embryogenesis, wound healing, exercise, cancer, and stroke. At the University of Guelph, Jim will continue to investigate how the protein synthesis machinery adapts to the hypoxia found within the tumors of numerous different types of cancers. These studies will further expand our knowledge of this fundamental pathway of cellular biology and of central importance to human health. Jim is currently funded by the Cancer Research Society, and his research has the potential to identify novel therapeutic strategies for the treatment and early detection of cancer.

Dr. Scott Ryan

In January 2014, **Dr. Scott Ryan** will join the department, bringing with him expertise in neurobiology and stem cell-based disease modeling. Scott's research focus on cellular mechanisms underlying neurodegenerative disease and regenerative therapy has developed over the course of his training both in Canada and the United States. His innovative approach uses high resolution imaging techniques coupled with biochemical analysis to model, understand and treat neurodegenerative diseases using stem cell technology. Scott began his training in neuroscience at the University of Ottawa, where he studied under the supervision of Dr. Steffany Bennett. During his graduate studies, he helped develop a systems-based method for the study of lipid second messengers in neurodegenerative disease. Following his PhD, Ryan continued his training in neurobiology and in 2009 began a postdoctoral fellowship with Dr. Rashmi Kothary at the Ottawa Hospital Research Institute. Funded by a CIHR postdoctoral fellowship, here his research focused not only on neurodegenerative disease but also on how modulation of the cytoskeleton impacts organelle function and axonal transport. The combined results of this work offered an improved understanding of the bridge connecting newly formed transport vesicles in neurons with the cytoskeletal elements necessary for neurotransmitter secretion. In the summer of 2011, Scott moved to La Jolla, California, where he held a position as a postdoctoral fellow at the Sanford-Burnham Medical Research Institute under the supervision of Dr. Stuart Lipton. Here, as a fellow of the Parkinson's Society of Canada, he further explored his interest in organelle function in the context of neurodegeneration by studying the influence of mitochondrial dynamics on Parkinson's etiology. While again focusing on modulation of second messengers, he assessed how mitochondrial respiration and redox signaling are impaired in human dopaminergic neurons. This was achieved using a robust, patient-derived, stem cell model of Parkinson's Disease. As an Assistant Professor at Guelph, Scott aims to build on these experiences to investigate how reactive oxygen and nitrogen species impair organelle function in human and animal based models of neurodegenerative disease.

Dr. Joseph Lam received a Queen's Diamond Jubilee Medal in 2013. Commemorating the 60th anniversary of Queen Elizabeth II's accession to the throne, the award recognizes Canadians who have made a significant contribution to other citizens, their community or their country. Joe received his medal on January 10 during a 50th anniversary celebration for the Kitchener-Waterloo cystic fibrosis (CF) chapter. A recognized leader in CF research, he has studied the disease since his doctorate at the University of Calgary, where his PhD supervisor had a son with CF.

Dr. Marc Coppolino was presented with the 2013 College of Biological Science Teaching Award of Excellence at a ceremony on Nov 18 hosted by the Dean, Dr. Mike Emes. He was recognized for his outstanding contribution to undergraduate classroom instruction and curriculum development.

Dr. Anthony Clarke, who is also the assistant Vice-President Graduate Studies and Program Quality Assurance, was appointed co-editor of the *Canadian Journal of Microbiology* starting in Sept 2013. Published since 1954, the monthly journal is affiliated with the Canadian Society of Microbiologists. Anthony has been serving the journal as a section editor, and in his new role, he will lead the publication through the next two years with co-editor James Germida, Vice-Provost and Professor of Soil Science at the University of Saskatchewan.

Dr. John Dawson gave the keynote address at the University of Guelph Graduate Student University Teaching Conference, while graduate students Daniel

Jeffery and Melanie Wills were workshop leaders. Daniel also won the 2013 College of Biological Science Graduate Teaching Assistant Award. A Teaching Support Services workshop on "Engaging instructors in learning outcomes assessment through curriculum mapping and improvement" was presented by John Dawson.

Dr. Emma Allen-Vercoe was in the news a lot in 2013. In March, she was a speaker at TEDx Waterloo, and in June her research was featured in Macleans' compilation of "100 Ideas, Inventions & Discoveries That Will Change the World". Intractable *C. difficile* bacterial infections are increasingly common, and powerful antibiotics often fail to help. Fecal transplants, where a donor's stool is implanted in the patient's colon, have shown promising results, likely because beneficial bacteria in the stool re-establish a healthy microbiome. Together with a team of other Canadian researchers, the Allen-Vercoe group has found a way to create "synthetic poop" that can cure patients of these infections. This fake stool, called "RePOOPulate," is made up of 33 strains of bacteria found in a healthy human colon, which are grown inside a "Robo-gut" that simulates the human colon. Emma works with Dr. Elaine Petrof of Queen's University and the Kingston General Hospital, who have performed fecal transplants on *C. difficile* patients. When RePOOPulate was administered to two elderly female patients suffering from chronic *C. difficile*; both were symptom-free within three days of receiving the artificial stool. While it will be some time before RePOOPulate treatment can be widely used, it shows great promise as a much more defined way to effectively treat these infections. In addition, the Allen-Vercoe group uses the Robo-gut to study normal gut microflora in individuals with inflammatory bowel disease (Crohn's and ulcerative colitis) and regressive autism, which are all associated with disturbances of the gut microbiome. Their work was also featured in articles in the National Post, the Vancouver Sun, and the Ottawa Citizen during 2013.

Student activities:
The first Careers in Biology Day for graduate students took place in April 2013. The event featured informative sessions with leaders from industry, government and academia, with the aim of providing career choice information to graduate students. The keynote speaker was Jim Austin, who is currently the Editor of *Science* Careers, a publication of *Science* magazine and the American Association for the Advancement of Science (AAAS). Recent Guelph graduates following a variety of career paths returned to the university for the day to chat about their employment options and network with current students. The event was a resounding success, and will be repeated next year.

Jason Carere (Dr. Stephen Seah's group) received the University of Guelph 2013 D.F. Forster Medal. This medal is awarded annually to the convocating graduate student who excels both academically and in extra-curricular activities. Jason is now an Ontario Centres of Excellence (OCE) Postdoctoral Fellow at CSIRO in Brisbane, Australia. **Salim Islam** (from Dr. Joseph Lam's lab) received the 2013 Armand-Frappier Outstanding Student Award at the Canadian Society of Microbiologists annual conference in Ottawa in the summer of 2013. Salim is currently a post-doctoral fellow at CNRS, Mediterranean Institute of Microbiology in Marseille, France.

University of Lethbridge

Department of Molecular Biosciences
Correspondent: Ute Kothe

High School iGEM Team wins international competition:
A team of Lethbridge high school students has been awarded the coveted Green Brick grand prize (the top team at the competition), and was also awarded prizes for the "Best Bio Brick" and "Best Wiki" at the iGEM High School Jamboree – an international competition for young synthetic biologists at the Massachusetts Institute of Technology (MIT) in Boston, MA. Thirty international teams competed at the event in June 2013. The team was judged on its efforts to create a longer lasting form of oxytocin – a hormone most-commonly known for its use in aiding childbirth. Oxytocin, unfortunately, has a very short half-life meaning the hormone degrades quickly and soon becomes unstable, making it expensive and difficult to store.

The Lethbridge High School team with their UofL undergraduate and graduate student advisors, plus

their faculty advisor, **Dr. Hans Joachim Wieden**, successfully developed a genetic circuit (BioBricks) to reprogram a harmless laboratory strain of the common bacterium Escherichia coli to express a stabilized variant of oxytocin.

Lethbridge high school iGEM team: Erin Kelly (UG Advisor), Isaac Ward (UG Advisor), Keiran McCormack, Elaine Bird, Yoyo Yao, Chris Isaac, Fiona Spitzig, Katie Thomas, Patrick O'Donnell, Mackenzie Coatham (GS Advisor)

UofL iGEM team celebrates North American victory:
The University of Lethbridge has further cemented its reputation as a leader in the teaching and research of synthetic biology by capturing first place at the 2013 North American iGEM Regional Jamboree in Toronto, Ontario, in October 2013. The competition featured teams from across Canada and the United States. The U of L team consisting of undergraduate and graduate students then moved on to the international competition at the Massachusetts Institute of Technology (MIT) in Boston, in November 2013. There, the team continued their success story by winning the best poster award and a Security Commendation, an overall award that debuted this year.

The U of L team's project includes developing a bioengineering part that compresses genetic information – essentially working like a zip drive. Every gene needs DNA, but there is only so much DNA that will fit in a cell. This novel part may allow future bioengineers more flexibility in their work. Additionally, the U of L team developed software that quickly determines what DNA is compatible to compress together.

UofL iGEM team: Graeme Glaister, Zak Stinson, Suneet Kharey, Jenna Friedt, Dustin Smith, and Harland Brandon.

"Each year we are also tasked with exploring the social implications of our project. Our team sought to ensure that our part could not be misused to hide dangerous genes," says team member Harland Brandon (BSc'13), a first-year master's student. "We hypothesized that our part could be used to hide dangerous sequences, such as ricin or Ebola, from gene synthesis companies. We then took it a step further and actually consulted with gene synthesis companies, U of L Risk and Safety Services and even a representative from the Federal Bureau of Investigations (FBI). Not only do we see our project benefitting the field, but we found through our critical analysis that the potential for misuse is not possible."

Dr. H.J. Wieden named Alberta Innovates-Technology Futures Chair of Bioengineering:
Alberta Innovates-Technology Futures (AITF) named Dr. Hans Joachim Wieden as the Innovates Centre of Research Excellence (iCORE) Chair of Bioengineering. AITF's $2-million investment, over five years, further enables Wieden's University of Lethbridge research team to study how biological systems can be engineered to achieve breakthroughs in materials science, chemistry, biochemistry, health and nanoscience.

The potential for discovery in the study of synthetic biology is virtually limitless. "The range of societal and commercial issues we can address through the advancement of biomolecular engineering and synthetic biology will only continue to expand as we go further," says Wieden, the newly appointed Chair and current director of the Alberta RNA (Ribonucleic acid) Research and Training Institute (ARRTI) at the

U of L. Synthetic biologists focus on how biological systems can be engineered to achieve a new desired outcome.

"The U of L has identified RNA-based research as an emerging program of emphasis due to the work of several of our researchers," says University of Lethbridge Vice-President (Research), Dr. Dan Weeks. Wieden's team, for example, recently focused its research on the development of new antibiotics that may help to battle the growing resistance of disease-producing pathogens against currently used antibiotics.

New Science Building on the horizon:
The Destination Project, a transformational undertaking that will fundamentally alter the path of the University of Lethbridge, received a $200-million investment from the Government of Alberta on Dec. 6, 2013. The Destination Project includes the construction of new science facilities that will house a significant part of the science teaching and research activities on campus. Further, a comprehensive revitalization of the iconic University Hall and the construction of a new central plant for the University will take place. The result will add 35,000 m2 to the campus footprint, but more importantly, the project will help define the University's direction for the foreseeable future. "This is the most significant development of our Lethbridge campus since University Hall was completed in 1972", says University of Lethbridge President and Vice-Chancellor Dr. Mike Mahon. "The Destination Project will contribute to Alberta's ability to recruit the best and brightest scientific talent to our province, but it is more than a teaching and research space. Rather, it is a place for community engagement and outreach; a research incubator; a place where undergraduate and graduate research opportunities develop; where knowledge transfer and commercialization happen; a place where the next generation of researchers, scientists and scholars credit for the start of their science careers."

New Biological Information Processing Research Training Program:
The Canadian Centre for Behavioural Neuroscience (CCBN) is home to a new neuroscience-training program, Biological Information Processing (BIP): From Genome to Systems Level, which is funded by the Natural Sciences & Engineering Research Council of Canada (NSERC) through their Collaborative Research and Training Experience (CREATE) program. The training grant "Biological information processing: From genome to systems level" offers training to undergraduates, graduate students and postdoctoral fellows. The program allows trainees to acquire a state-of-the-art tool kit that contains methods from three domains, tools for seeing intracellular molecular processes, for measuring activity of large distributed networks of cells, and for computation as it applies to both signal processing and cellular systems theoretical modeling.

University of Manitoba

Department of Biochemistry and Medical Genetics
Correspondent: Klaus Wrogemann

The following is a small and certainly incomplete collection of news items from the Department of Biochemistry and Medical Genetics.

Our expert in education, **Dr. Francis Amara**, spent a sabbatical year at the Oxford Learning Institute, University of Oxford. During this period, he served as a tutor for the Postgraduate Diploma in Learning and Teaching in Higher Education. He was inducted as a Fellow of the Higher Education Academy of the United Kingdom. In addition, he was also elected as Chair of the International Network of Educational Development and Scholarship for Bioscience Researchers. In October Francis was invited by the Yale Centre for Scientific Teaching, Yale University, Connecticut, USA, for a panel discussion and seminar presentation on: "Discipline-Specific Pedagogy and Reshaping of Doctoral Studies in the Biosciences".

Dr. Cheryl Rockman Greenberg, one of our clinical geneticists and also Head of Pediatrics and Child Health, was this year's recipient of the Dr. John M. Bowman Memorial Winnipeg Rh Institute Foundation Award. The purpose of the Dr. John M. Bowman Memorial Winnipeg Rh Institute Foundation Award is to recognize outstanding research accomplishments by senior University of Manitoba faculty. Dr. Greenberg

is known for her work on rare diseases which are common in Manitoba populations, for gene discovery, counselling and treatment of these orphan diseases, and for the translational aspects of discovery in the lab to benefit families and patients. The award includes a cash prize of $20,000. It is the most prestigious research award of the University of Manitoba. An annual special event is held the following year in the form of an invitational dinner, with a lecture to be delivered by the award recipient. **Dr. Kirk McManus** received a junior Rh award for his work on genome instability and colorectal cancer.

Drs. Jim Davie, Geoff Hicks, Marc Del Bigio (Pathology), Avraham Fainsod, Mojgan Rastegar and **Brenda Elias (Community Health Sciences)** were awarded a 5-year CIHR team grant to study the epigenetics of Fetal Alcohol Syndrome (FASD), including conserved changes to the methylome in animal and human tissues, at a total value of $1.37 million. This study is part of the **Canada-Israel International Fetal Alcohol Consortium**, a joint research initiative between the University of Manitoba and the Hebrew University in Jerusalem.

Dr. Tamra Werbowski-Ogilvie received a 5 year NSERC Discovery Grant for her project entitled "Investigating the role of Lin28A in human embryonic neural lineage function". She also received a CIHR operating grant for five years.

University of Toronto

Department of Biochemistry

Correspondent: David Williams

Faculty news:

After 10 years at the helm of Biochemistry, past Chair **Reinhart Reithmeier** spent a well-deserved sabbatical focusing on his research. The spring saw Reinhart back at his alma mater at UBC working on an invited chapter on anion exchangers. The summer months were spent moving the lab into newly-renovated space, recruiting new students, and completing a project on N-glycosylation of a family of human anion transporters. In the fall, Reinhart was in the lab of Mark Sansom at Oxford doing molecular dynamics simulations of membrane transport proteins self-assembled into lipid bilayers. The three months in England allowed Reinhart to visit colleagues on that side of the pond and give a number of seminars on his work on membrane anion transport proteins in human health and disease. The new-year will focus on writing up papers and a grant for the new CIHR Foundation scheme, with which Reinhart is very familiar after 6 years as CIHR Delegate for U of T. Future administrative duties no doubt lie in wait.

As Reinhart explores life after Departmental administration, new Chair **Justin Nodwell** contemplates his first year at the helm. When asked to provide some thoughts about the past year, Justin remarked: *"It is a privilege and honour to have been chosen to lead this great Department. I've greatly enjoyed my first year including in particular the ongoing process of getting to know our faculty and students. I'm very grateful for the patience with which people have attended my learning curve and the enthusiasm I sense for our further development and growth."* Now if we could only get Justin to run for mayor of Toronto....

Charles Deber has been selected to present the 2014 Everson Lectureship in Biochemistry, at the University of Wisconsin, Madison. The Lectureship, awarded each year since 1969, is named in honour of Dr. Gladys J. Everson, who was an early advocate of the importance of exercise and better nutrition. Deber's lecture, entitled "Novel Synthetic Strategies to Overcome Antibiotic Resistance", highlights his lab's recent research on development of new peptide antibiotics against bacterial biofilms, and peptide inhibitors of multidrug resistance proteins.

Congratulations to **Alex Palazzo** who received a Canadian Institute for Health Research New Investigator Award. Alex also became an editor at PLoS One.

Events:

A major event of the year is our Annual Research Day. **The 2013 Research Day** was held on June 4th, at the scenic Old Mill Inn, Toronto. The day featured work by our students and post-docs in the form of posters and oral presentations as well as selected talks from faculty members.

Theo Hofmann Lecturer Phil Hieter

This is also the venue for our annual **Theo Hofmann lecture** which was presented by Phil Hieter, University of British Columbia, who described his lab's work on chromosome instability and synthetic lethality in yeast and cancer. For some photos of the event, please go to:
http://biochemistry.utoronto.ca/news/Research_Day_2013/Research_Day_2013/Photos.html

The **CIHR Training Program in Protein Folding and Interaction Dynamics** (http://biochemistry.utoronto.ca/CIHR_folding/) held its annual retreat on November 19, 2013 in Toronto. It was a one-day event and featured talks by mentors and trainees of the program, as well as, a poster session. In addition, an invited speaker, Dr. Richard Morimoto (Northwestern University), gave the keynote lecture highlighting the role of protein homeostasis in human health and disease. The event was attended by about one hundred participants and was an excellent opportunity to foster collaborations between the different groups in the greater Toronto area interested in cross-disciplinary research into protein folding and misfolding from basic investigations to clinical implications.

Poster winners at the Training Program Retreat with Program Director Walid Houry (left) and Rick Morimoto (right)

Other events were our ever-popular **Golf Day and Year-End Party.**

Despite a rainy day and the risk of electrocution, 28 students, post-docs and faculty ranging from beginner to near-pro had a wonderful afternoon of golf at the Flemingdon Park Course in midtown Toronto. The winners of the coveted Biochemistry Cup are the foursome with their fingers raised who (purportedly) made an eagle on the 8th! For photos see: http://biochemistry.utoronto.ca/news/Golf_Day_2013/Photos.html>

This year the Department celebrated the end of the year in different style with an evening party planned and run by our graduate students. Held at the Loftraum on Gerrard, which featured separate rooms that catered to those inclined to dance the night away as well as those preferring more sedate activity, there was something for everyone. The evening began with buffet dining, then singalong science parody songs led by **John Glover, David Wiliams and Debbie Hong**, followed by a science-themed "Price is Right" game show hosted by **Graeme Sargent** (garnering lots of audience participation) and finishing up with a hugely popular DJ-driven dance floor (and adjacent bar) lasting until the wee hours. Clearly not many experiments were completed early the next morning! All in all, a great way to end the year.

Graeme Sargent winds up the crowd as host of the "Price is Right"

Appointments:
The Department welcomed two new Faculty members in 2013.

Michael Ohh

Michael Ohh, Department of Laboratory Medicine and Pathobiology, was cross-appointed at the level of Professor. Michael received his Ph.D. from the University of British Columbia and did postdoctoral work in the laboratory of Dr. William G. Kaelin Jr. at the Dana-Farber Cancer Institute prior to joining the University of Toronto. He has made seminal contributions in the areas of oxygen sensing and E3 ubiquitin ligases in tumours. Michael is the Canada Research Chair in Molecular Oncology.

Brian Shoichet

The Department was also delighted to welcome **Brian Shoichet**, Faculty of Pharmacy, who was cross-appointed as Professor. Brian did his Ph.D at the University of California, San Francisco with Irwin Kuntz and postdoctoral studies with Brain Matthews at the Institute of Molecular Biology, Eugene, Oregon. His research focus is in the area of computational and chemical biology with the longstanding motivation of bringing chemical reagents to biological problems. This is done by exploiting protein structure to predict new reagents and therapeutic leads. He develops new computational docking methods and applies them to specific targets, often G-protein coupled receptors.

Retirements:
The Department bade farewell to two long-standing members who were very well known within the Medical Sciences Building. **Annie Cunningham** joined the Department in 1973 as a technician for Theo Hofmann and more recently for Emil Pai. At her farewell reception on June 25th, Theo praised Annie for her exceptional protein purification skills that few could match in the lab. We will all miss Annie's enthusiasm and joie de vivre and wish her well.

Quelminda Homem joined the University in 1982 and served as the Department's glasswasher for 20 years. Quelminda took great pride in her work and thoroughly enjoyed her years with us. She also kept our lunchroom spotless and some of our messier lunchroom patrons missed her immediately! Quelminda could always be counted on and her warmth and kindness will be sorely missed.

Annie Cunningham (left) and Quelminda Homem

Graduate Studies:
One of the highlights of the year is the **Benjamin Schachter Memorial Lecture**, where our graduate students select a prominent alumnus to address current students as a means to gain insights and advice on diverse career choices. The lectureship is named in honour of former graduate student Benjamin Schachter, who conducted research in the Department from 1934-1939. This year, the Biochemistry Graduate Students Union invited back alumna **Zayna Khayat,** a senior leader with the International Centre for Health Innovation, a "do tank" conceived by Industry Canada in 2009 to catalyze the adoption of health innovations in health systems across Canada. Zayna gave a very upbeat and inspirational talk about the diverse career paths that one can follow with a graduate degree in Biochemistry. She emphasized the importance of making one's own opportunities by leaving the comfort zone and exposing oneself to diverse people and experiences. This advice was entertainingly illustrated by many anecdotes from her own career where opportunities apparently arose serendipitously, but were in fact facilitated by putting herself "out there" and taking a few risks.

The centerpiece of the Department's Annual Research Day is its **graduate student poster competition**. Our Theo Hofmann Lecturer, **Phil Hieter**, served as guest judge to help make the hard decisions as to which posters deserved special recognition. As usual, the quality was high and the decisions tough but, in the end, the following students (who receive cash awards) were chosen as poster winners:

From left, Marian Packham, Benjamin Schachter's son Dan Schachter, Zayna Khayat, David Isenman, Benjamin Schachter's daughter Bonnie Druxerman and Peter Druxerman

Winners in the PhD category were:
Kris Hon (Parkinson lab) *"Exploring the Potential of the HK97 Bacteriophage Capsid as a Microcompartment"*;
Gregory Whitfield (Howell lab) *"Structural and functional studies of PelE: a protein involved in polysaccharide export in Pseudomonas aeruginosa"*;
Alexander Marsolais (Smibert lab) *"Mechanisms controlling smaug mRNA stability in the Drosophila embryo"*; **Attila Balint** (Brown lab) *"Regulation of Rtt107-Slx4 Recruitment to Stalled Replication Forks"*;
Emad Heidary Arash (Attisano lab) *"βPix as an upstream regulator of the Hippo signaling pathway".*

Winners in the M.Sc. category were:
Andrew Zhai (Privé lab) *"Structural and functional characterization of PLZF-corepressor complexes"*;
Noor Alnabelseya (Howell lab) *"Hydrolytic and deacetylase activities of Pseudomonas aeruginosa PelA"*; **Andrew Judd** (Moraes lab) *"Investigating SLP translocation in Neisseria meningitidis"*;
Liang Zhao (Houry lab) *"Yeast-T4 Phage fusion protein: The serial KILLER (Fusion of yeast Rvb helicases to phage T4 lysozyme causes lethality in E. coli and yeast)"*.

The winner in the postdoc category was:
Laura Riley (Howell lab) *"Characterization of AlgX, a Member of the Pseudomonas aeruginosa Alginate Secretion System"*.

Additional graduate awards:
The winner of the ***Beckman Coulter Paper of the Year Award*** was **Amy Cui** (Palazzo lab) for her paper entitled: *p180 promotes the ribosome-independent localization of a subset of mRNA to the endoplasmic reticulum*, Cui, X.A., Zhang H., and Palazzo A.F. PLoS Biol. 2012;10(5):e1001336

Girish Sardana of Beckman-Coulter presents Amy Cui with the "Best Graduate Student Publication for 2012" Award

Lori Rutkevich and supervisor David Williams

The outstanding PhD thesis award went to **Lori Rutkevich** (Williams lab) for her examination of the functional relationships between protein disulfide isomerases and upstream oxidative enzymes within the endoplasmic reticulum.

The annual ***David Scott Prize*** for outstanding all-round graduate student was shared jointly this year by **Kristina Han** (Rini lab) and **Stephen MacKinnon** (Wodak/Parkinson labs). Award winners are selected on the basis of research and teaching excellence and outstanding contributions to the Department and to fellow students.

Graduate Coordinator Liliana Attisano presents the Scott Award to Stephen and Kristina

The Outstanding Teaching Assistant award went to David Davidson for his exceptional performance as a Tutorial leader.

Congratulations to all winners on their achievements!

Undergraduate Studies:
Congratulations to Tom Bateman and Natalie Bamford for exceptional achievement at the top of their classes in our 3rd and 4th year laboratory courses, respectively.

Tom Bateman and Natalie Bamford receive their awards from Undergraduate Coordinator, Stavroula Andreopoulos

Biochemistry department group photo

University of Toronto

Department of Cell and Systems Biology

Correspondent: Tony Harris

The Department of Cell and Systems Biology is a major contributor to research and teaching at the University of Toronto. Groups in the Department combine high-throughput, cell imaging, physiological and bioinformatics methods to understand cellular and physiological processes in both model (Arabidopsis, Drosophila, mouse, xebrafish, Xenopus) and non-model organisms. The Department's major strengths are its groups studying plant molecular biology, its labs focused on animal cell biology and tissue morphogenesis, and its groups studying neurophysiology. The Department is also home to the Centre for the Analysis of Genome Evolution and Function, a CFI-funded centre for genomics and proteomics research, in addition to a state-of-the-art CFI-funded microscopy centre.

Our labs have made numerous exciting discoveries over the last year. A few examples are highlighted here. Work from the **Desveaux** and **Guttman** labs published in *PNAS* identified an Arabidopsis pseudokinase that appears to act as a decoy to counteract pathogen effector molecules and protect plants from disease. In *Current Biology* and *Development*, the **Harris** lab reported mechanisms of cross-talk between endocytosis and the cytoskeleton, and between Par proteins and the cytoskeleton, that are important for cell formation and cell shape change in the Drosophila embryo. In a *Development* paper, the Godt lab revealed how a feedback loop between two transcription factors gauges the proper gene expression for multicellular migration through Drosophila tissues. In *Current Biology*, the **Peever** lab reported the molecular basis of cataplexy - the full loss of muscle tone in an otherwise wakeful state. In two papers in *Plant Physiology*, the **Yoshioka** lab identified functional sequences and a new component of an ion channel complex important for plant pathogen defense, development, and thermotolerance. Finally, the **Varmuza** lab reported their discovery of a critical and imprinted factor for placental development in *Development*. These examples provide a sampling of the exciting research conducted in the Department.

Our graduate program has also excelled. For example, we are very proud of our students' success in earning scholarships: NSERC CGSM, **Virlana Shchuka** (Mitchell lab), **Raphael Brisset Di Roberto** (Peisajovich lab) and **Yani Chen** (Lovejoy lab); NSERC CGSD, **Timothy Lo** (Guttman and Desveaux labs); QEII-GSST, **Brenden Hurley** (Guttman and Desveaux labs) and **Felix Gunawan** (Godt lab); OGS, **Aaron Chowdhury** (Buck lab), Navroop Dhaliwal (Mitchell lab), **Nina Kirischian** (Guttman and Desveaux labs), **Donghoon Lee** (Harris lab), **Darya Safavian** (Goring lab), **Benjamin Scott** (Peisajovich and Chang labs), **Huoi Ung** (Yoshioka lab) and **Jason Wen** (Winklbauer lab).

It is also important to congratulate **Alan Moses** and **Eiji Nambara** who were both promoted to Associate Professor.

University of Toronto Scarborough Campus

Department of Biological Sciences

Correspondent: Rongmin Zhao

The Department of Biological Sciences at the University of Toronto Scarborough campus is the home of an interdisciplinary, research-intensive group with state-of-the-art facilities. Our labs focus on research at molecular, organismal, and ecological levels, and house most of the graduate students (74 in 2013) and postdoctoral fellows (11 in 2013) in the campus. Currently, the Department has seven research clusters including Biodiversity and Conservation, Cells and Infection, Neurobiology and Stress, Comparative Physiology, Integrative Behavior and Neuroscience, Plant Cellular and Molecular Processes, and Environmental Epigenetics and Development.

The Department currently has 33 full time faculty members and is still rapidly growing with two new faculty searches in progress. Most of our faculty members are also cross-appointed with the Department of Cell & Systems Biology (CSB) and/or the Department of Ecology & Evolutionary Biology (EEB) at the St. George campus. In the past year, two new hires joined the department. **Dr. Nicholas Mandrak** joined the Department as an associate

professor. He previously directed the National Centre of Expertise for Aquatic Risk Assessment (CEARA) and will lead the professional Master's degree program in Conservation and Biodiversity. **Dr. Blake Richards** was hired as a neurophysiologist who studies how memories are altered over time, and how specific, genetically defined sub-types of neurons in the circuits of the neocortex and hippocampus help to co-ordinate activity during sleep.

Blake Richards is a neurophysiologist studying the local circuit regulation of sensory-driven plasticity in the developing nervous system

The faculty and graduate students have made many achievements during the past year. As examples, **Dr. Nathan Lovejoy's** group contributed to the identification of a previously unknown genus of electric fish in a remote region of South America. **Dr. Mark Fitzpatrick** and his PhD student **Allan Edelsparre** studied fruit flies using molecular techniques and discovered genetic link between feeding behaviour and animal dispersal. **Dr. Rudy Boonstra**, who has long been a leader in the area of mammalian ecology and physiology, won the C. Hart Merriam Award, which is given to eminent scholars in recognition of outstanding research in mammalogy over a period of at least 10 years. **Dr. Marc Cadotte** who studies species coexistence, evolution and how multi-species interactions shape ecological communities, was nominated as the TD Professor of Urban Forest Conservation & Biology. Additionally, **Dr. Aarthi Ashok** won the Pat Rogers poster prize at the 32nd Annual National Society for Teaching and Learning in Higher Education (STLHE) conference.

University of Victoria

Biochemistry and Microbiology

Correspondent: Robert Burke

The Department of Biochemistry and Microbiology continues to take the lead in biomedical science and molecular biology at the University of Victoria. With 17 faculty, 43 graduate students, 4 visiting graduate students and 14 post-doctoral fellows, our programs are based on our expertise in structural biology and proteomics, microbial pathogenesis, and gene regulation.

Our undergraduate programs emphasize hands on learning, which means our students spend a lot of time at the bench where they acquire individual skills and experience. The Coop program thrives, in part because our courses give students a skill-set that is attractive to employers. The Co-op coordinator, **Rozanne Poulson** is transitioning our students to 8 or 12 month internships in their 3rd year – something many employers like. One of our Co-op students, **Ross Prager** was awarded the Co-op Student of the Year award for Optional and Professional Programs at the University.

The Honours program, which consists of two terms in a research lab, seminars, and a thesis examination, is an essential program for students who want to become involved in research. **Marty Boulanger** and **Doug Briant** coordinated 24 Honours students this year, and again, one of our students (**Ross Prager**) took the top award on Science Honours poster day. This year we welcomed to our department **Dr. John E. Burke** as a new faculty member. John did his PhD at UC San Diego and had a very successful postdoctoral appointment at the MRC Laboratory of Molecular Biology

Dr. John E. Burke, Assistant Professor, is a new appointment in Biochemistry and Microbiology who brings expertise in structural proteomics and cellular signaling.

in Cambridge, UK. John has expertise in structural proteomics and will develop a research program in which he uses structural proteomics as a biophysical tool to test hypotheses on protein structure. He will begin teaching next year in proteomics and signal transduction. **Caroline Cameron**, has taken over as the Graduate Advisor and she will take on seeing that our graduate programs continue to grow in size and quality. One of our undergraduate students and a co-president of the Biochemistry and Microbiology Student Society, **Dylan Collins** is heading to Oxford University next year as a Rhodes Scholar. Dylan is an outstanding student who has distinguished himself both in the classroom and with all he has done in the community. He has interests in global health and we look forward to seeing him distinguish himself further on a much larger stage.

Dylan Collins will complete his undergraduate degree at the University of Victoria this year and then head to Oxford University, where he will be a Rhodes Scholar. Dylan is interested in global health and is committed to influencing public policy on harm reduction.

The department continues to move forward with innovative and distinctive programs that are based on a history of excellence in research and teaching. The fundamentals of learning by doing and the captivation of imaginative research serve us well in ensuring the success of our students and our programs.

University of Waterloo

Department of Biology

Correspondent: Bernie Dunker

2013 was another exciting year in the Waterloo Biology Department.

Awards and honours:

Josh Neufeld received the Ontario Undergraduate Student Alliance Award for Teaching Excellence, and the Fisher Scientific Award for early career researchers from the Canadian Society of Microbiologists. **Brian Dixon** won an NSERC Synergy Award, while **Bill Taylor** was presented with a Career Achievement Award by the Canadian Council of Biology Chairs. The Waterloo iGEM team, including several Biology students, won a Gold Medal and Best Poster Award at the North American regional jamboree. **Kathy Lam** (supervisor Trevor Charles) received the Best Student Presentation in Microbial Ecology, Canadian Society of Microbiologists. Finally, **Adriano Senatore** (supervisor David Spafford) won the Governor General's PhD Thesis Award.

The winning Waterloo iGEM team included several Biology students

Departures:

2013 saw the retirement of several of our most valued and honored colleagues, who will be greatly missed; **Niels Bols** (cell biology), **Bill Taylor** (aquatic ecology), **Owen Ward** (microbiology) and **Colin Mayfield** (microbiology), while **Matt Vijayan** (cell physiology) moved to a CRC position at the University of Calgary. They were all fêted at a wonderful, anecdote-filled

reception at the University Club in fall 2013, and Owen even sang us the poetic summary of Fermentation Biotechnology that he became famous for in one of his courses.

Niels Bols

Owen Ward

Bill Taylor

Arrivals:
Three new faculty members started in Biology. **Rebecca Rooney** is an aquatic/restoration/landscape ecologist who investigates the relationship of natural organisms with their environments, and how they are perturbed by human activities. **Heidi Swanson** is a fish ecologist who is interested in the effects of climate change and metal accumulation, mainly in arctic environments. **Andrew Doxey** is a computational biologist with interests in modelling protein function and evolution. Although Niels has retired, we are very excited that one of his most successful former students, **Marcel Pinheiro**, has joined us as a faculty lecturer for invertebrate biology and parasitology.

University of Waterloo

Department of Chemistry
Correspondent: Guy Guillemette

Waterloo has two new faculty members, **Derek Schipper** in Materials/Organic Chemistry and Germán Sciaini in Physical Chemistry/Chemical Physics. Derek's research program is based on the development of novel synthetic methods that allow efficient access to important conjugated materials. Ultimately, they will seek to use these materials in applications such as organic photovoltaics, light emitting diodes and field-effect transistors. The Sciaini group develops "atomic-level" cameras in a compact design that fit on a table with the size of a standard office desk. The progress in the development of such ultrafast structure-sensitive cameras over the last 20 years has been tremendous, with large scale, km long facilities such as LCLS (Stanford) built to provide the temporal and spatial resolutions required to observe atoms in motion. The main two directions in the group are based on the use of ultra-fast electron sources for the study of structure and dynamics with atomic spatial resolution.

Waterloo hosts meeting of the Canada-UK Team in Bacterial Resistance to Beta-Lactam Antibiotics:
In July 2013, a three-day meeting of the Canada-UK Team in Bacterial Resistance to Beta-Lactam Antibiotics was hosted by the Dmitrienko group in the Department of Chemistry. The Team was established in 2011 through a partnership between the Canadian Institutes of Health Research (CIHR) and the Medical Research Council (MRC) in the U.K. in recognition of the fact that the challenge of antibiotic resistance requires a multidisciplinary approach that encompasses research at all levels and takes advantage of synergistic research strengths across international boundaries.

The Team is led by **Gary Dmitrienko** of the University of Waterloo and Tim Walsh of the University of Cardiff, and is studying the hard-to-treat Gram-negative bacterial infections, such as E. coli NDM-1, that are a major cause of hospital-acquired infections. A list of the heads of the other collaborating research groups in this team at Waterloo, UBC, Montréal, Toronto, Laurentian and Calgary in Canada and Bristol, Leeds and Oxford in the U.K., and an outline of the research mandate of the team can be found at http://carbapenemase.com.

The meeting was attended by 30 researchers spanning a broad range of expertise in enzymology, microbiology, molecular biology, structural biology, organic chemistry, nanotechnology and medicinal chemistry. In addition to the academic research team members, Dr. Susan Clugston from Cubist Pharmaceuticals and Dr. Tom Pfeifer from the Centre for Drug Research and Development participated in the meeting. The first two days of the meeting were devoted to intense in-camera discussions of the collaborative research programs. On the third day, time was set aside for lectures that were open to the public on various aspects of the antibiotic resistance problem. These open lectures were dedicated to the memory of Professor Thammaiah Viswanatha (TV), who made extraordinary contributions to teaching and research in biochemistry as a faculty member at Waterloo before his untimely death in 2008. At the beginning of his lecture, Gerry Wright, Director of the Michael G. DeGroote Institute for Infectious Disease Research at McMaster University, commented on how pleased he was to have TV mentioned in the context of this meeting. He recalled that his first introduction to research was as a summer undergraduate research assistant in TV's lab at Waterloo and added that "he was a wonderful mentor and is sorely missed". Video recordings of the open lectures can be found at http://carbapenemase.com/meeting.html. The success of this meeting owes much to the efforts of several people, including Mrs. Julie Shikaze, Mrs. Val Goodfellow, Dr. Geneviève Labbé, Dr. Nan Chen and other members of the Dmitrienko group at Waterloo, and Dr. Jim Spencer at the University of Bristol, who are thanked for their contributions.

Honours and awards:

William (Drew) Bennett (supervisor: Mikko Karttunen) won a Banting Post-doctoral fellowship from the Natural Sciences and Engineering Research Council of Canada (NSERC). His work, which will focus on bioactive molecules, and has applications for drug delivery and personalized medicine, fits into the university's strategic research priority areas of health and materials manufacturing and devices.

John Honek won the Canadian Society for Chemistry 2014 Bernard Belleau Award. This award is presented to a scientist residing in Canada who has made a distinguished contribution to the field of medicinal chemistry through research involving biochemical or organic chemical mechanisms. Dr. Honek will be presented with the award during the 97th Canadian Chemistry Conference and Exhibition which will be held in Vancouver, B.C. from June 1 to 5, 2014. As the winner of this award, Dr. Honek will be asked to present a lecture at the Conference.

York University

Department of Biology

Correspondent: Logan Donaldson

Last year, I reported on the new Life Sciences Building on campus and its two open-concept floors that support twelve researchers in cell and molecular biology from the Faculty of Science and the Faculty of Health. This year, I would like to place the spotlight on one of our newest faculty members in the LSB.

Mark Bayfield is an Assistant Professor in the Department of Biology. His research focuses on La, a multifunctional protein involved in RNA processing. La is also attractive target for cancer therapies as its overexpression is correlated with tumorogenesis and metastasis. Mark's combined biochemical and molecular biological approaches in S. pombe has earned him much success over the years culminating in NSERC, CIHR operating funding and a recent Ontario Early Research Award. His laboratory is located nearly in the centre of the research floor and it really could not be a better location, as it has turned out to be a nexus of activity that has spawned a number of collaborations. As evidence of the training environment, his undergraduate thesis students are consistently among the best in the department. As Mark's lab is still expanding, I anticipate the best is yet to come. And perhaps a bit selfishly, as his next-door-laboratory-bench neighbour, I hope to convince him that structural biology would be a great addition to his research program!

CSMB-Sponsored Events

Graduate events

The CSMB provides financial support to graduate student societies for a variety of activities related to biochemistry, molecular biology, cell biology or genetics. Examples of supported activities include (but are not restricted to) the following:

Scientific Symposium Days, with invited scientists speaking on subjects in the areas of biochemistry, molecular biology, cell biology or genetics.
Student Research Conferences, where students display their research as posters, or give oral presentations.
Career Fairs or Career Workshops in areas related to biochemistry, molecular biology, cell biology or genetics.

Requests for graduate event support should be directed to the CSMB Secretary.

2013 Cell Biology Invited Speaker and Research Day

Department of Cell Biology, University of Alberta
Correspondents: Juliana Capitanio (former President of the Cell Biology Students Association) and Emily Herman (current President of the Cell Biology Students Association)

Students networking at the Research Day

The Cell Biology Students Association hosted **Dr. Frederick Roth** from the University of Toronto, who gave the keynote lecture "*Systematic Analysis of Context-Dependent Yeast and Human Interaction Networks".* The work of students in the Cell Biology department was highlighted with talks by selected students and a competitive poster session. A pizza lunch gave graduate students the opportunity to talk informally with Dr. Roth about his work and career. Later in the evening, the CBSA hosted reception for Dr. Roth for everyone to attend.

The following day, The CBSA organized a 'Careers in Science' discussion led by a panel of guest speakers, which included **Dr. Ben Monpetit,** a new Assistant Professor in the Department of Cell Biology; **Mr. Victor Tso,** Scientific Officer at Metabolomic Technologies Inc.; and **Dr. Kristoffer Palma**, a Field Application Specialist at New England Biosciences. Graduate students were excited to hear from our panellists about the multitude of career options available to them.

With this event, the CBSA was able to create an environment that encouraged learning, a sharing of knowledge and skills, and a networking forum for over 50 people, including attendees from not only the Department of Cell Biology, but also other departments in the Faculty of Medicine and Dentistry at the University of Alberta. Indeed, over half of the 30 graduate students prepared posters, and three students were chosen to give a brief talk following Dr. Roth. This gave students an important opportunity to hone their scientific communication skills - quite necessary for any career path they choose to follow.

2013 Graduate Student Symposium

College of Biological Sciences, University of Guelph

The College of Biological Sciences Graduate Student Symposium is a student-run event that aims to encourage scientific communication between students, research fellows and professors within the three departments of Molecular and Cellular Biology, Integrative Biology, and Human Health and Nutritional Sciences. This year's event was organized by Allan Debertin, Jordan Klaiman, Connor Warne, Tegan Williams, Alison Berezuk, Danve Castroverde, Liliy Nasanovsky, Elyse Roach, Veronique Taylor, Erika Howe, Tara MacDonald, Jessica Ralston, Meghan Yip, Glen Van Der Kraak (Associate Dean of Research), and Karen White.

The event was held in the Atrium of the University of Guelph Science Complex, and had 250 registrants consisting of graduate students, post-doctoral fellows, lab technicians, lab coordinators and professors. The event featured a keynote address by **Dr. Paige Geiger** of the **University of Kansas Medical Institute**. She spoke on the role of heat shock proteins in type II diabetes. The symposium also showcased graduate student research across the college in student oral presentation sessions, and the day concluded with a student poster session and social.

Graduate students intently listening to Dr. Paige Geiger`s keynote address on heat shock proteins and type II diabetes

2013 iGEM Regional NA Jamboree

St. George Campus, University of Toronto

iGEM from above (photographer: Mohammad Ali Saeed)

The International Genetically Engineered Machine competition (iGEM) is the premiere undergraduate Synthetic Biology competition. Student teams are given a kit of biological parts at the beginning of the summer from the Registry of Standard Biological Parts. Working at their own schools over the summer, they use these parts and new parts of their own design to build biological systems and operate them in living cells. This project design and competition format is an exceptionally motivating and effective teaching method. iGEM began in Jan 2003 with a month-long course at MIT during their Independent Activities Period (IAP). The students designed biological systems to make cells blink. This design course grew to a summer competition with 5 teams in 2004, 13 teams in 2005 - the first year that the competition grew internationally - 32 teams in 2006, 54 teams in 2007, 84 teams in 2008, 112 teams in 2009, 130 teams in 2010, and 165 teams in 2011. Projects range from a rainbow of pigmented bacteria, to banana and wintergreen smelling bacteria, an arsenic biosensor, Bactoblood, and buoyant bacteria.

The 2013 North American Regional competition was hosted by the University of Toronto Faculty of Arts and Science, Ontario iGEM and the Ontario Genomics Institute. The event was located on the St. George Campus of the University of Toronto and was attended by over 450 participants, mainly undergraduate science students and their faculty supervisors from across North America. The opening address was given by **Dr. Peter Lewis, Associate Vice-President, Research of the University of Toronto.** The closing address was given by **Dr. Alison Symington, Vice President, Corporate Development and Communications, Ontario Genomics Institute.**

La Journée Scientifique des Étudiants 2013 (JSE 2013)

Université Laval Cancer Research Centre, Québec City

Correspondent: Gabriel Bossé

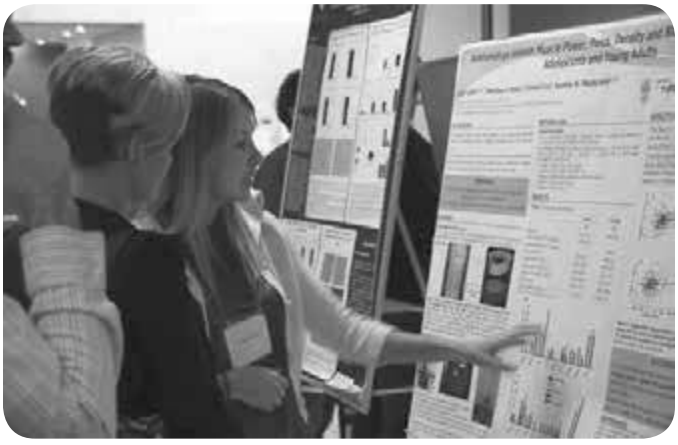
Each year, the Journée Scientifique des Étudiants is organized by the student committee of the Centre de recherche sur le Cancer de l'Université Laval/CHU de Québec, Axe oncologie. JSE 2013 was held on Aug 22 at the University Laval Cancer Research Centre in Québec City. At this meeting about 80 students presented their work by poster or oral presentation, and more than 130 people attended the different presentations. Students from multiple research centres in Québec city with an emphasis on cancer research, and from both graduate and undergraduate levels participated to the JSE. On Aug 21, **Dr. Daniel Lafontaine** (Molecular Biology) and **Dr. Daniel Houde** (Biomedical Physics), both from **Université de Sherbrooke** each gave a presentation as the invited speakers for the JSE 2013. At the JSE, more than $6,500 was awarded as fellowships to 20 students; these fellowship will be used to help students to cover the costs to attend the meeting of their choice.

Dr. Vince Duronio, UBC faculty member and CSMB Treasurer, at the posters

Experimental Medicine Program Student Research Day

University of British Columbia

With over 200 students, Experimental Medicine is the largest graduate program in the Faculty of Medicine at the University of British Columbia (UBC). Twice per year we hold a Student Research Day to allow students to present their research in oral and poster formats. We have a wide variety of research interests including molecular mechanisms of disease, drug development, biomaterial engineering, human physiology, and public policy analysis. These conferences also provide networking opportunities for students and faculty in our program that are located at numerous research facilities throughout Vancouver. Our Student Research Days are always fully organized and implemented by the Experimental Medicine Student Committee.



A graduate student explains her poster

The 2013 Student Research Days were held in June and November at the Children and Family Research Institute, and were each attended by approximately 120 people. The organizers always seek out talented and distinguished keynote speakers for these events.

Poster session

In June we heard from **Dr. Julio Montaner, Director of the BC Centre for Excellence in HIV/AIDS** and **former President of the International AIDS Society.** The November keynote address was from **Dr. Allen Eaves** who founded both the **Terry Fox**

Laboratory for Hematolgy/Oncology Research and British Columbia's largest biotechnology company, **STEMCELL Technologies**. Students benefited greatly from these presentations because both speakers included candid stories of their personal career development and offered inspiring advice for young researchers.

AECSBUM Poster Competition

Department of Biochemistry, Université de Montréal

Correspondent: Étienne Lepage

The AECSBUM (student union of the Biochemistry graduate students of the Université de Montréal) organized this event, which was held at the main hall of Roger-Gaudry on March 28th 2013. The Union Executive is composed of six students, Eric Zampini, Samuel Tremblay-Belzile, Emmanuelle St-Germain, Lian Mignacca, Éric Bonneau and Etienne Lepage. Participation in the poster competition was open to all graduate students and post-doctoral researchers from the Biochemistry department and its affiliated institutes. This activity allowed the participants to present their research project and their contributions in the field of health sciences to academic, industrial and governmental representatives. The themes of the research varied from plant biology, to molecular biology and structural biology. Approximately 100 people attended the event, and almost 50 students came to present their research, with 15 judges of different affiliations judging their posters. Three excellence prizes ($500, $300 and $200) were awarded.

Graduate students gathered for the poster competition

Research Meetings

The CSMB also provides support for research meetings that the executive views to be of particular interest to the CSMB membership, and that are within the financial means of the society. When sponsorship is awarded, CSMB members will receive an agreed-upon reduction (e.g. $75) in the registration fee for the meeting

The understanding is that the CSMB is providing seed money to establish the meeting, and the funds provided by the CSMB are considered a repayable loan. The amount of the loan that is repayable to the CSMB can be reduced by the aggregate fee reduction offered to CSMB members who register for and attend the meeting.

Requests for research meeting support should be directed to the CSMB Secretary.

9th International Retroviral Nucleocapsid Protein and Assembly Symposium

Hotel Omni Mont-Royal, Montréal, Québec
August 25-28, 2013
http://www.ncsymposium2013.org/

The conference has historically focused on the multiple roles of Nucleocapsid (NC) protein of retroviruses, which is involved in the synthesis, maintenance and integration of proviral DNA and in virus particle assembly. Its role as a chaperone protein is perhaps its most important function as it promotes reverse transcription and coats the retroviral genomic RNAs. In the context of Gag, NC promotes viral RNA assembly and dimerization and interacts with several host cell factors. It is therefore a prime target for anti-HIV-1 therapy. At the 2013 meeting in Montreal, this focus was extended to include the latest developments in viral RNA function, metabolism and trafficking, restriction factors and on the control of viral assembly. In addition, invited speakers with topical expertise in structural biology and anti-viral therapies rounded out the meeting, to recognize where the virology field is moving in the future.

Topics that were covered at this symposium included: Gag RNA Translation and Assembly; RNA Trafficking, Dimerization and Encapsidation; Host factors/Viral Restriction; Biophysical, Chaperone and Structural Studies; and Therapeutic Strategies. Keynote talks were presented by **Dr. Mark Wainberg** (McGill University AIDS Centre, Montreal, Quebec, Canada) who presented exciting findings regarding anti-HIV therapeutics, and Dr. Sarah Woodson (Johns Hopkins University, Baltimore, MD, USA) who discussed RNA chaperones and their involvement in gene regulation and RNP assembly.

Over 40 posters were presented by participants from Canada, and U.S.A. and other countries round the world.

Group photo of the participants in IRNCPAS 2013

The 10th International Calreticulin Workshop The Endoplasmic Reticulum and Beyond in Health and Disease

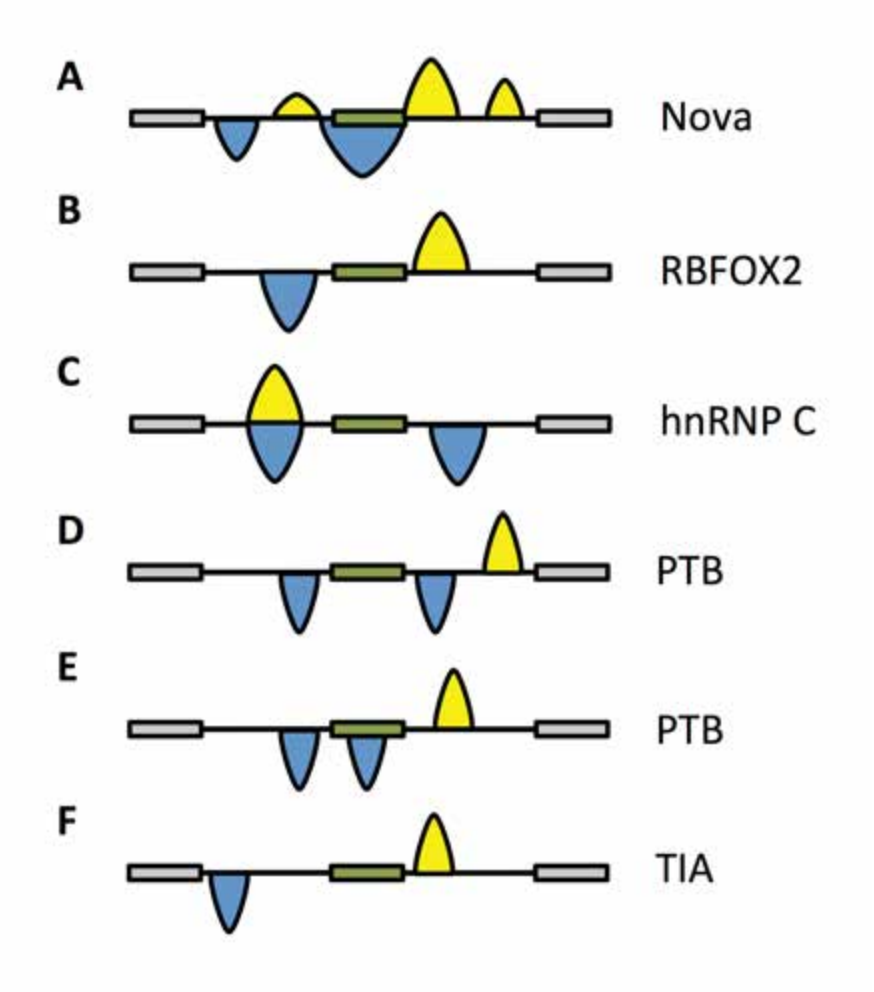
Banff, Alberta
April 10-13, 2013

The **10th International Calreticulin Workshop, The Endoplasmic Reticulum and Beyond in Health and Disease** assembled a list of outstanding speakers from every corner of the world. Key stages of planning of the conference were conducted by the local, Alberta members of the organizing committee which included Drs. M. Michalak (Co-chair) and T. Simmen. The National Organizing committee included a strong representation from other Canadian universities. Participation in the conference was opened to all interested scientists. A special effort was made to attract young investigators by inviting them to present posters at the conference. The conference highlighted the strength of Alberta and Canadian science in the area of protein folding diseases and cellular signaling.

Several aims set for the conference were achieved. There were excellent discussions of many ideas and an exchange of current scientific knowledge in the field. Internationally recognized experts in the field using most diverse state-of-the-art approaches in their studies were brought together. The conference provided an exceptional environment for many young scientists and investigators in related fields to interact with the most experienced researchers in the field. The focus was on new advances in ER control, substrate specificity and recognition of calreticulin, new entry of molecules and signalling between cellular organelles, cell homeostasis and survival, and healing and cell death. Finally, there were a number of outstanding presentations focusing on advancing our understanding of the role of components of the endoplasmic reticulum in health and disease.

Six trainees received travel awards to attend the workshop, sponsored by the CSMB; Daniel Chapman, University of Toronto; Chi-Chao Liu, University of British Columbia; Naomi Dicks, McGill University; Lorena Andrea Aguilar Guzmán, University of Chile; Paula Abello, University of Chile; Kurt Zimmerman, University of Alabama. One of the graduate students supported by the CSMB (Daniel Chapman, University of Toronto) was also a winner of a poster award for his work on the identification of new components of the ERAD system.

Group photo of the Workshop participants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