Banff International Research Station
for Mathematical Innovation and Discovery

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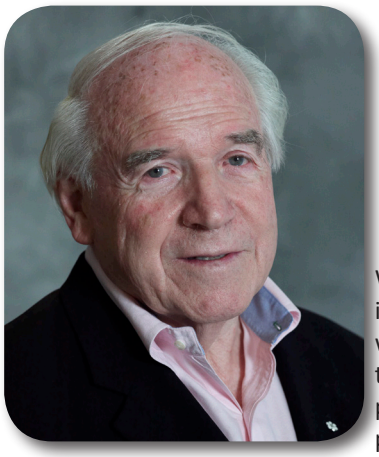
A message from the Chair and the Director



While I have been involved over the years with community service, through various non-profit organizations and public companies, I have to admit that I was quite surprised and intrigued when Nassif, a fellow governor of The University of British Columbia, asked me whether I was willing to chair the Board of Directors of BIRS. I have been proactive in my contributions to the Canadian sports and business communities, but advanced research in the mathematical sciences was far from my interests, expertise and experience, unless one classifies analytical thinking and the search for proofs and evidence in law and jurisprudence as another mathematical exercise. Yet, it didn't take long for me to agree to serve. After all, this remarkably lean enterprise plays a significant role in putting my province, Alberta, and my country, Canada, on the world's scientific map.

The concept of BIRS also meshes with one of my own life long interests, which is to create opportunities for international business executives, academics, government officials and other thought leaders to meet, discuss and debate crucial global economic issues. I founded and still co-chair the Global Business Forum, an independent, not-for-profit corporation that each year, provides an opportunity for 200 prominent personalities from all over the world to do just that. And what drives BIRS, but a very similar ethos of providing opportunities here in gorgeous Banff, to thousands of scientists from all over the world to discuss, debate and hopefully resolve complex and important problems of mathematical sciences, technology and innovation?

One of my first tasks at BIRS was to initiate an international review of the current director of BIRS. I was happy (and reassured) that all Canadian, US and Mexican scientists who were interviewed about Nassif's leadership enthusiastically recommended that the Board ask him to stay on as director for another term. BIRS is currently looking for ways to further expand opportunities for the mathematical sciences and we are extremely fortunate that Nassif has agreed to continue to lead us into this next phase.

Doug Mitchell
Chair, BIRS Board of Directors

In 2012, Karen Prentice completed a three-year term as chair of the Board of Directors of BIRS. During her tenure as chair, Karen supervised the incorporation of the research station, consolidated its governance structure and firmed up its legal framework. She successfully led the renewal of the Station's funding for five years from four partnering governments (Canada, Alberta, US and Mexico) and oversaw the transfer of its lecturing facilities to the beautiful Trans Canada Pipeline Pavilion at The Banff Centre. The thousands of scientists who participate in BIRS activities every year will always be grateful for her selfless service and many contributions to the promotion of the mathematical sciences and their applications.

Doug Mitchell, the new chair of the Board of Directors of BIRS, is committed to supporting and promoting Canadian mathematical sciences through BIRS. This is destined to be a tremendous boon to the world's scientific community. Doug is a pillar of both the Canadian sports and business communities and has spent many years supporting non-profit organizations and public companies lucky enough to have him. And BIRS is now one of them. Thank you Doug.

In 2012, BIRS launched its new live video streaming and high quality recordings in order to fully automate the production, broadcasting and distribution of its lectures (See Page 12). The reaction of the world's scientific community has been overwhelmingly enthusiastic about this new capacity for dissemination. The BIRS Technology Manager, Brent Kearney, who should take all the credit for envisioning and installing this pioneering system, has been busy lately trying to help many sister institutions, acquire and implement similar systems.

Last but not least, our Mexican colleagues have been working hard to develop another supporting facility for BIRS in the state of Oaxaca, Mexico (See Page 11). BIRS — and eventually the world's scientific community — will forever be grateful to Juan Ramón de la Fuente, Elias Micha, Alberto Sanchez Lopez, José Antonio De la Peña, Carlos Arámburo, Onesimo Hernandez-Lerma, Maria Emilia Caballero, Daniel Juan and Javier Bracho for their great efforts in making this exciting initiative a reality. We are hoping to host the first expanded BIRS program at both Banff and Oaxaca as soon as 2015.

Nassif Ghoussoub
BIRS Scientific Director

BIRS Scientific Advisory Board

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Financial Mathematics
Alberto Verjowski Solá Universidad Nacional Autónoma de México
Dynamical Systems , geometric topology, theory of real and complex foliations
Cédric Villani l'Institut Henri Poincaré
Partial Differential Equations
Michael Vogelius Rutgers University
Applied Mathematics
Michael Ward University of British Columbia
Applied Partial Differential Equations and Asymptotic Analysis
Shing-Tung Yau Harvard University
Differential Geometry

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Michael Waterman University of Southern California
Peter Winkler Dartmouth College
Margaret Wright New York University
Jianhong Wu York University
Efim Zelmanov University of California San Diego

The Review Process

Ensuring High-Calibre Research

Key to the success of BIRS is its ability to attract top scientific proposals and then to have a selection process by peer review at international standards, balanced across all areas of the mathematical sciences. To represent the mathematical sciences in their entirety, the Scientific Advisory Board consists of 30 internationally recognized experts representing as broad a spectrum of the mathematical sciences community as possible.

Every year, an international call solicits proposals for workshops from every field of the mathematical sciences and its applications. A proposal template requires a summary of the present state of the field, a discussion of the leading questions that motivate the proposal and a justification for the timeliness and appropriateness of the workshop. A preliminary list of potential participants is also requested.

To date, proposals outnumber available spots by a ratio exceeding 3:1, with no sign of relief – in fact, quite the reverse. As such, the competition is strong and the committees are never short of excellent proposals from which to choose. All proposals are made available to the members of the SAB who then make their comments online. The Scientific Director also solicits additional reviews from outside experts for certain proposals so that by the end of the process each proposal has had at least five reviews.

The Program Committee meets in November to make the final selection. At the meeting, the committee first reviews each category, linearly ranking the proposals within it. Proposals are then selected by running across the categories. In this way, so long as there are first-rate proposals in each area, a distribution across the mathematical sciences is maintained. The BIRS Program Committee ranks proposals by scientific excellence and relevance alone, without regard for the geographical origin of the proposal. The commitment of the organizers is also a key criterion in the selection process. In return, the limited number of allowed participants forces the organizers to continue adhering to the highest standards.

All of these factors combine to make BIRS a unique centre of excellence, with a substantial scientific return on the investment by its four sponsor governments.

The BIRS Board of Directors

"At The Banff Centre, our founding objectives included creating a gathering place for the top artistic, scientific, business and community development minds from all around the world. We congratulate BIRS on its strong track record of success and we look forward to an enhanced partnership in the years to come. Together, we will create conditions to address some of the world's most challenging opportunities in Banff."

Jeff Melanson
President,
The Banff Centre

Brzustowski Steps Down After Critical Role on BIRS Board

Dr. Thomas Brzustowski has completed a three-year term as Deputy Chair of the BIRS Board of Directors and has decided to step down. He wrote, "I'm retiring from the University of Ottawa at the end of September this year (2012). I have just finished a book on innovation in Canada, and expect that to come out at about the same time. I expect to continue at Waterloo for a while longer, but I have decided to start shedding various other affiliations now. One of those is BIRS."

During his term on the Board, Tom teamed up with Karen Prentice to help BIRS structure its governance under a sound legal framework. Brzustowski played a crucial role in the latest round of renewal of BIRS grants from various North-American foundations.

His close relationship with the Canadian mathematical community precedes BIRS. First, as provost at the University of Waterloo and later, as President of NSERC from 1995 to 2005, he will always be connected with the explosive development of the mathematical sciences in Canada, which flourished under his watch during the past 20 years.

"I understand Tom's decision to start shedding some of his responsibilities, but still it is a sad juncture for me," said Nassif Ghoussoub, BIRS' Director. "I find it incredible how much he has done for us as a discipline and as a community over the years. BIRS was born in 2003 because of him and is currently well and thriving thanks to him."

Brzustowski completed his Ph.D. in Aerospace Engineering at Princeton in 1963. He was a professor in Mechanical Engineering at Waterloo from 1962 to 1987 — teaching and carrying out research in thermodynamics and combustion — and was Waterloo's Vice-President, Academic from 1975 to 1987. After that he served as Deputy Minister in the Government of Ontario from 1987 to 1995, first in the Ministry of Colleges and Universities, and later in the Premier's Council. He was President of NSERC from 1995 to 2005. He is an Officer of the Order of Canada and a Fellow of the Canadian Academy of Engineering and of the Royal Society of Canada, and holds honorary doctorates from numerous Canadian universities. For the last seven years, he has been RBC Professor at the Telfer School of Management (U of Ottawa). He is currently the Chair of the Board of the Institute for Quantum Computing at the University of Waterloo. His recent book, *Innovation in Canada*, demystifies innovation and presents its many aspects in one big picture. It proposes the elements of a supportive government innovation policy and outlines the different design principles for the needed government assistance programs.

In the name of the BIRS community we express our sincere gratitude and immense appreciation to Dr. Brzustowski, a special colleague, a friend, a mentor to many and an academic leader we came to value and respect greatly.

BIRS Salutes Art Nutt as he Retires from TBC

Art Nutt, Vice President and Chief Financial Officer (VP/CFO) of The Banff Centre (TBC), will be retiring at the end of his term on September 30, 2013. TBC President, Jeff Melanson, said of Art:

"Over the past 12 years Art has been able to guide and inspire our institution on all levels and played a key role in creating financial stability and in the revitalization of our stunning and exciting campus. Art's unrelenting passion and strong fiscal stewardship through these challenging times, have with your help, positioned The Banff Centre as a strong and stable institution and a beacon for Inspiring Creativity in arts and culture throughout the world, and a great place to work. Art will be missed for his sound day-to-day leadership, sage advice as well as his wonderful sense of humor."

We should add that Art is also very special to BIRS. He was one of very few who understood early and deeply the special relationship between BIRS and The Banff Centre. He always saw the programs of BIRS as an integral part of the creative forces that continually converge on The Banff Centre, be they in art, music or leadership and he worked hard to make the BIRS-TBC partnership smooth and beneficial to both institutions and to the intellectual communities they serve.

We shall miss Art, and we wish him all the best in his retirement!

Doug Mitchell succeeds Karen Prentice as chair of BIRS Board of Directors

In 2012, BIRS welcomed Douglas Mitchell as its new chair of Board of Directors. Mitchell is a pillar of the Canadian sports and business communities who has contributed greatly to non-profit organizations and public companies.

Mitchell is National Co-Chair of Borden Ladner Gervais LLP. His law career is highlighted by specialties in Corporate and Commercial Law, as well as Commercial Real Estate and Sports Law. His current firm is a leading full-service national law firm.

He has served as Chair of the Calgary Airport Authority, is Co-Chair of the Banff Global Business Forum, Director of ParticipAction and a member of the University of British Columbia (UBC) Board of Governors. He is also past chair of the Alberta Economic Development Authority, SAIT Polytechnic's Board of Governors and a past President of the Calgary Chamber of Commerce.

Mitchell has been an important member of the Canadian sports community. He attended Colorado College on a hockey scholarship before completing his degree in Law at UBC and playing professional football for the BC Lions. He served as a member of the National Hockey League Board of Governors (1980-1984) and as Commissioner of the Canadian Football League (CFL) from 1984 to 1989.

In 2009, a substantial donation was pledged to UBC for the Doug Mitchell Thunderbird Sports Centre in recognition of his extraordinary contribution to Canadian amateur sports. The Centre served as a hockey and sledge hockey host venue for the Vancouver 2010 Olympic and Paralympic Winter Games and is a central landmark on UBC's Vancouver campus.

Doug Mitchell's contributions have been recognized with many honors including the Order of Canada and the Alberta Order of Excellence. He was named one of Calgary's 12 Most Influential Business People by the Calgary Herald and in 2010, was recognized as one of the Power 50 of Canadian sports by the Globe and Mail.

First Nations Math Education

Almost every year, BIRS hosts a workshop that is totally dedicated to First Nations Math and Science Education, and 2012 was no exception. Organized by Melania Alvarez (PIMS' BC Education Coordinator), Genevieve Fox (Fox Consulting), Sharon Friesen (Vice Dean, Faculty of Education, University of Calgary) and Cynthia Nicol (University of British Columbia), this workshop brought together Elders, mathematicians, math educators and teachers. The ultimate objective was to find ways to improve mathematics education among aboriginals, while at the same time acknowledging the importance of and preserving traditional culture.

The workshop contributed to the creation of resources that are sound, interesting and mathematically challenging, with a factual and rich cultural context, as well as making these resources available to various venues of instruction in order to supply a more balanced curriculum where aboriginal culture can take its rightful place.

"I hope that BIRS will continue to host such workshops, which bring First Nations people into better contact with mathematics, and contribute indirectly to mathematical research, since they begin at the roots, in schools, where we are very much in need of help and stimulus. I found this particular workshop very encouraging... there were many people present who were keen to spread the word, and clearly able to do so."

Richard Guy, *University of Calgary*

Submitting a Proposal

Proposals should be submitted using the online form at *https://www.birs.ca/proposals.* Please review BIRS' Guidelines for Proposals in order to accurately prepare your submission *https://www.birs.ca/applicants/guidelines.*

Program Descriptions

5-Day Workshops:

- BIRS' basic program format. These run Monday through Friday (arrival Sunday afternoon).
- Accommodation, use of BIRS facilities (lecture halls, Internet etc.) and meals are provided at no cost to participants.
- Since late 2011, BIRS workshops have had access to live-streaming and teleconferencing technology.
- The maximum number of participants is 42. However, a small number of half-workshops with 20-22 people will be considered.

2-day Workshops:

- These run Saturday and Sunday (arrival Friday afternoon).
- The maximum number of participants is 25.
- Accommodation and use of BIRS facilities (lecture halls, Internet etc.) are provided at no cost to the participants. Meals are the responsibility of the organizers and participants.

Focused Research Groups:

- This program offers teams of up to 8 researchers the opportunity to live and work at BIRS facilities for periods of 1 to 2 weeks. Accommodation and meals are provided.
- Teams should consist of individuals from different institutions.
- Proposals should detail the project, list the team members and their institutions and justify the case for using BIRS facilities.

Research in Teams:

- This program offers teams of up to 4 researchers the opportunity to live and work at BIRS facilities for periods of 1 to 2 weeks. Accommodation and meals are provided.
- Each team is provided with its own private workspace and computer terminals.
- Teams should consist of individuals from different institutions.
- Proposals should detail the project, list the team members and their institutions and justify the case for using BIRS facilities.

Summer Schools:

- BIRS welcomes proposals for schools of 1-2 weeks in duration.
- Schools and Training Camps are pedagogical by definition, but may be aimed at any level from elementary or high school students or teachers, through undergraduate and graduate levels or preparation for Institute thematic programs, etc. Summer Schools typically run Sunday through Sunday (arrival Sunday afternoon).
- The maximum number of participants is 25.

Important Information

- Deadlines:
  - Proposals for 5-day workshops and Summer Schools are normally due in late September or early October, 15 months before the programming year. For more specific information visit *http://www.birs.ca/applicants/deadlines.*
  - Proposals for 2-day Workshops, Focused Research Groups and Research in Teams events must be received a minimum of 4 months before the proposed start of the event.
- Special needs:
  - BIRS and The Banff Centre are both wheel chair accessible.
  - The Banff Centre dining facility can provide special meals on request.
- Submission
  - All proposals should be submitted online at *https://www.birs.ca/proposals.*

BIRS and The Mathematics of Planet Earth

"*Mathematics is often referred to as the queen of science and as such is a critical and essential element for understanding and finding solutions to our many challenges. Mathematics touches every aspect of our lives every single day. With an emphasis on science, technology and engineering as well as mathematics education, this type of initiative helps ensure that Canada remains prosperous and globally competitive. I encourage my colleagues in the House to join me in lauding this significant initiative*" (Susan Truppe, Conservative MP for London North Centre).

Mathematics of Planet Earth 2013 (MPE2013) is a brainchild of Canada's mathematical sciences institutes (CRM, Fields and PIMS) and the Banff International Research Station. Coordinated by Christiane Rousseau, MPE2013 was born from the desire of the mathematical community to engage the challenges faced by our planet, to identify and learn more about the underlying mathematical problems and to accelerate the research effort on these issues.

What's math got to do with planet earth? The applications of mathematics to MPE problems are essentially infinite. As for the long-term problems in which mathematics will play a role, we mention the challenges of quantifying uncertainty in climate change, of constructing more accurate predictions of natural disasters including earthquakes, volcanoes, and tsunamis, of trying to adapt ecosystems to climate change, of devising sustainable economic models and of contributing to the preservation of biodiversity.

BIRS is proud to participate in the MPE2013 and is hosting ten workshops in 2013 that contribute to this important project:

January 13 to 18: New Perspectives on the N-body Problem
February 17 to 22: Probabilistic Approaches to Data Assimilation for Earth Systems
May 19 to 24: Non-Gaussian Multivariate Statistical Models and their Applications
May 12 to17: Impact of Climate Change on Biological Invasions and Population Distributions
June 30 to July 5: Water Waves: Computational Approaches for Complex Problems
September 22 to 27: Uncovering Transport Barriers in Geophysical Flows
September 27 to 29: Mathematical Modeling of Indigenous Populations Health
October 6 to 11: The Role of Oceans in Climate Uncertainty
October 20 to 25: Managing fire on populated forest landscapes
November 10 to 15: Current Challenges for Mathematical Modelling of Cyclic Populations

Mathematics: Muse, Maker, and Measure of the Arts

"I'm just back from the Banff International Research Station for Innovative Mathematics and Discovery. I feel like a kid impressing her classmates with news of a trip to Disneyland," wrote Poet Laureate Alice Major in her must-read blogpost, *Math and trap doors* (*http://www.alicemajor.com/2011/12/math-and-trap-doors*), before adding, "I toss the name off as if I could actually tell a Gaussian distribution curve from a Faustian one."

Major had just returned from the BIRS workshop, *Mathematics: Muse, Maker, and Measure of the Arts*, held December 4-9, 2011, which brought together mathematicians and people in the art communities who would otherwise be less likely to interact due to the distances in their respective fields of expertise.

"The workshop will have a significant impact on my work both as a mathematical artist and as a designer of The Museum of Mathematics, which will open next year in New York City," wrote George W. Hart.

Artistic beauty and mathematical complexity have a history of interaction as long as civilization itself: The golden ratio and the pyramids, Alhambra's tessellations and the Penrose tiling, Dali, Esher, and of course, Da Vinci and various minimalist and abstract schools of art, all of which have their roots in mathematics.

The workshop built upon this rich history of interaction; it was about modern science and the future of such interactions. For example, Stylometry analysis of literary style, which was initiated by the English logician, Augustus de Morgan, in the mid 1800's as a way to settle questions of authorship by finding patterns in the length of words used by various authors. While stylometric analysis of literature is now a well-established field, stylometric analysis to determine the authenticity of art is a nascent one as it requires much more sophisticated mathematical and statistical techniques, such as wavelet analysis, hidden Markov trees, and sparse coding. To learn more, view Shannon Hughes' lecture on *Visual Stylometry on Impressionist Paintings for Artist Identification and Dating* at *http://www.birs.ca/events/2011/5-day-workshops/11w5070/videos*.

The processing power of modern computers allows mathematicians and non-mathematicians to visualize complex and often visually stunning mathematical objects such as the Mandelbrot set and other fractal sets. The study of dynamical systems, information theory and other areas of mathematics has opened up the field of generative arts as well as other mathematically aided art-making such as origami. Stylometry analysis now employs sophisticated mathematical and statistical techniques to determine the authenticity of art. Increasingly, advanced techniques in differential equations and optimization are being used to enhance and restore old work of art.

The organizers wrote that, "It is through workshops such as this that mathematics can become an important and lasting component of the study of arts as it has been for science and engineering."

Women's Workshop on Communications and Signal Processing

The BIRS mandate calls for addressing the need to increase diversity in the STEM (science, technology, engineering and math) fields. Every year, the Station sponsors several events in support of this effort. One of the 2012 events was a workshop developed, organized and attended by more than 25 women engineers. BIRS provided a venue for younger communications and signal processing engineers to meet female role models who are IEEE Fellows, full professors, Editors-in-Chief and active volunteers within their professional society and learn from them how to achieve their professional goals. Such workshops foster the mentoring and networking that can make a real difference in a career.

"I found the event extremely interesting and helpful, primarily for three reasons. Firstly, the technical presentations from experts in their respective areas gave me a lot of new ideas, some of which I am certain I will be able to consolidate through collaborations. Secondly, this was an extremely useful networking event that gave me the chance to meet important female figures in the IEEE community. Finally, I just had a really great time!"

Arsenia Chorti, *Princeton University*

The two-day workshop included state-of-the-art technical seminars and career panel discussions by the senior participants, poster sessions for the more junior ones, and a final panel discussion led by the junior women to define their most pressing career issues. The meeting stimulated new research avenues for both senior and junior attendees and created new research networks among all participants. Several participants have identified paths for future joint research.

Women in Numbers (WIN) at BIRS: The Sequel

In 2012 BIRS welcomed back the community of women in number theory in a workshop that brought together researchers at various stages of their careers (from graduate students to senior mathematicians) in order to create a fertile ground for research collaboration and mentorship. Its goals included: highlighting research activities of women in number theory; training female graduate students in number theory and related fields; strengthening the research network of potential collaborators in number theory and related fields and providing information on women in number theory with an inclusive approach.

"BIRS provides a phenomenal environment for doing research, especially in small collaboration groups, so it was ideal for the format of our workshop. At this workshop I co-led a new collaboration group to address an open problem in arithmetic intersection theory. Our group consisted of myself and two NSF postdocs and two graduate students from Harvard, MIT, and Brown. We were trying to prove that the Bruinier-Yang and Lauter-Viray arithmetic intersection formulas agree."

Kristin Lauter, *Microsoft Research*

Towards a New BIRS Site at Oaxaca, Mexico

Each year, the BIRS Director performs the unpleasant task of writing to more than 120 workshop applicants around the world to inform them that their proposals to run a research workshop at BIRS were unsuccessful. “Many of these declined proposals were excellent” says Ghoussoub. The problem is that BIRS received over 170 applications in 2012 (more than double the number of the 2003 competition) for the available 48 weeks of programming.

To address the demand for more workshops, BIRS is actively pursuing the addition of 20-25 workshops at a new station in Oaxaca, Mexico. The status of the new research station at Oaxaca is still awaiting final commitments from various private and public sponsors, however, BIRS aims to have the facility open and ready to host an augmented program as soon as 2015.

In order to preserve the coherence of the BIRS vision, it was important to secure a facility that is located in a place of high culture. A place which draws in artists, students, intellectual leaders and other creative forces, who would interact with the international community of mathematical scientists participating in the BIRS programs.

Centro de las Artes de San Agustín Etla, also known as CASA, is located at San Agustín Etla, a town that lies in a picturesque canyon in the foothills of the Sierra de San Felipe seventeen miles north of the city of Oaxaca. CASA, which opened its doors on March 21, 2006, was founded by Francisco Toledo, a prominent Mexican painter and graphic designer. It is committed to being a public space, where education, artistic creation and experimentation can thrive.

According to their official website (*http://www.casanagustin.org.mx*), “CASA is comprised of a set of spaces providing for artistic initiation and creation. It has spaces equipped for the production of digital graphics, traditional graphic and dyeing workshops and textile design, photographic developing and organic printing. Under the assumption that the interaction with people from different lands stimulates creativity, promotes tolerance and strengthens a community, CASA invites artists to perform residencies giving priority to projects of ecological and community care.”

Toledo is convinced that mathematical scientists from all over the world can, and should, be part of these interactions in order to help stimulate another level of creativity. As such, he has offered to donate a plot of land adjacent to CASA on which a facility could be built where BIRS programs could run.

The international BIRS Scientific Advisory Board will continue to apply the same rigorous and uniform peer review process when selecting all of its workshops.

In Memory of Hugh C. Morris

Hugh C. Morris, business leader, mining executive and philanthropist, passed away on December 22, 2012. Morris was the Chair of the Board of The Pacific Institute for the Mathematical Sciences (PIMS), during the period when then PIMS Director (and current BIRS Director), Ghoussoub, was developing BIRS in collaboration with Robert Moody and David Eisenbud.

Morris received his PhD in mining geology in Johannesburg, South Africa. He spent 50 years in the mineral industry with Cominco Ltd., Imperial Metals Corporation, Eldorado Gold Corporation, Pacific Northern Gas Ltd., Diamondex Resources Ltd. and Eureka Resources Inc.

"I remember vividly the message of Barry McBride, who was then Dean of Science at UBC," says Ghoussoub. "'I want you to meet someone who may be exactly the person you're looking for.' PIMS was still barely an idea then, a good one though, but it had no serious funding, no national status and hardly any buy-in from the universities or the community-at-large."

Ghoussoub was instantly impressed by Morris. "I mentioned timidly our plans for an institute, awkwardly soliciting his help. He must have been a great friend of McBride, since he didn't dismiss the idea outright and proceeded to suggest that we discuss it over lunch sometime in the next few weeks."

Morris chaired the Board of PIMS from 1997 till 2003. Under his guidance, PIMS became a major national institution. In 1998 when PIMS, the Fields Institute and the Centre de recherche mathematiques partnered in the development of the MITACS Network of Centres of Excellence, Morris was asked to be the first Chair of its Board of Directors. When PIMS and the Berkeley-based Mathematical Science Research Institute (MSRI) collaborated on the creation of BIRS, Morris was asked by MSRI to be on its Board of Trustees. He again obliged.

"No one could resist Hugh's dashing charm, his commitment to the tasks he undertakes, his dedication to service and community" says Ghoussoub. "And Hugh couldn't resist saying yes to any call for duty... I really hope he passed knowing how much his friendship, his leadership and his contributions were appreciated by not only me but also by many generations of researchers and scholars."

BIRS Hosts Canada's 2012 IMO Dream Team

Every year, BIRS hosts a training camp for the team representing Canada at the International Mathematical Olympiad (IMO). Strengthening the problem solving skills of these mathematical athletes in preparation for the competition is obviously the main objective of this exercise, but the BIRS camp also provides an indispensable opportunity for them to bond before the competition and allows the trainers to acquaint the members of the team with some of the essential competition rules.

And this year's results were stellar for Team Canada. At the IMO in Mar del Plata, Argentina, July 4 - 16, the team received an outstanding six medals (three gold, one silver and two bronze), an impressive overall standing of fifth place overall in the world and an unprecedented achievement for Canada.

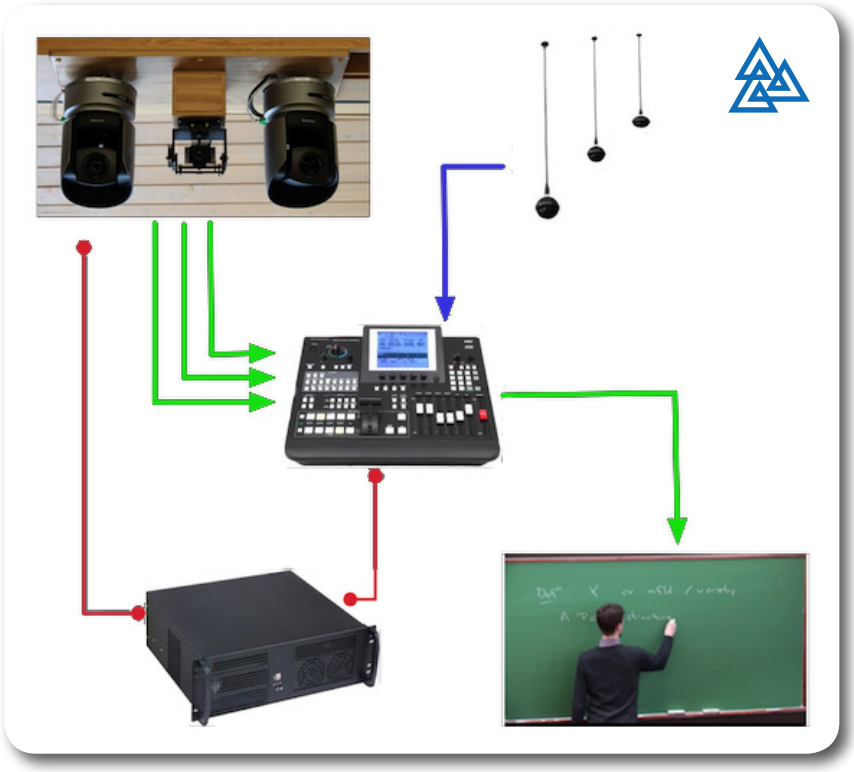
The winning team consisted of: Matthew Brennan (Gold Medal) (Upper Canada College); Calvin Deng (Gold Medal) (NC School of Science and Math); James Rickards (Silver Medal) (Colonel By Secondary School Ottawa); Alex Song (Silver Medal) (Phillips Exeter Academy Waterloo); Daniel Spivak (Bronze Medal) (Bayview Secondary School); Kevin Sun (Kennedy Jr. High) and Kevin Zhou (Bronze Medal) (Woburn C.I. Markham). The camp at BIRS was organized by Gertrud Jeewanjee (Canadian Mathematical Society) and Robert Morewood (YWorld.com).

To view the full results visit: *http://www.imo-official.org/team_r.aspx?code=CAN&year=2012*.

Technological Innovation at BIRS

In 2012, BIRS relocated its meeting space to the beautiful TransCanada Pipelines Pavilion, a building now used exclusively for BIRS scientific activities at The Banff Centre. BIRS then proceeded to make its new physical meeting space accessible to the scientific community in virtual space, via live video streaming and high quality video recordings, produced by a state-of-the-art automated video production system.

BIRS participants now have the ability to record and broadcast their lectures at the touch of a button, and we encourage all lecturers to make use of this opportunity to contribute their talk. We have been testing automated recording for the past few weeks, and the vast majority have opted in. You can watch their lectures live on the BIRS website, at: *http://www.birs.ca/live*. Recordings also appear on the BIRS home page a few minutes after the lecture ends.



BIRS Live Stream

Through a system of cameras, microphones, and automation technology in BIRS' main lecture room, the production, recording, broadcasting and distribution of high-quality lecture videos have become fully automated.

Automated Lecture Capture

The main lecture room at BIRS is equipped with state of the art automated lecture capture (video recording) technology. We have made it extraordinarily simple for BIRS participants to record and publish their talks on the BIRS website. Additionally, recorded talks are streamed live, allowing researchers to watch lectures remotely, in real-time.

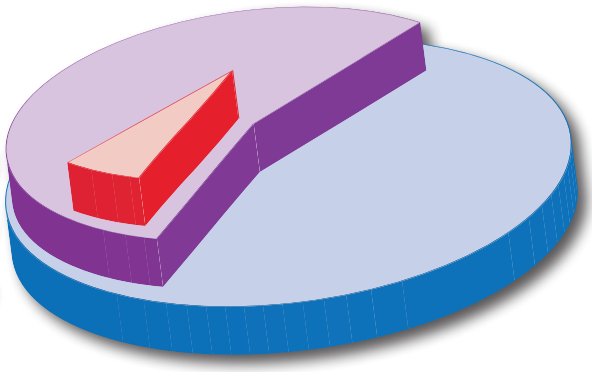
BIRS and our participants, in choosing to record and broadcast lectures online, are providing a valuable resource and contributing to educational and scientific progress.

Statistics (as of May 2013)

600+ hours of viewing

6375+ unique visitors

10260+ visitors



"Your automatic video machine at BIRS has definitely been noticed here in the USA. People at the IAS are asking 'Why can't we do the same thing??' All three virtues of this setup are impressive, (a) the automatic camera that zooms in on the blackboard to give you an image that you can actually read, (b) the automatic broadcast and posting of the lecture in real time, and (c) the idiot-proof method whereby almost anyone can operate the system."

Mark Goresky, *Institute for Advanced Study (IAS)*

Adding up the Numbers: Participation Statistics

BIRS provides equal access to the world's research community regardless of geographic origin or scientific expertise, as long as the scientific submission is anchored on solid mathematical, statistical or computational grounds. Applications are selected on a competitive basis, using the criteria of excellence and relevance, by a scientific panel of experts drawn from across the entire breadth of the mathematical sciences and related areas.

Total number of visitors to BIRS in 2011-2012	4201
The United States	1639
Canada	1068
Central/Western Europe	1119
Asia	265
Eastern Europe	99
Latin America	56
Oceania	50
Africa	5

The overwhelming response of the scientific community during BIRS' first years of operation led to the expansion of the North American partnership by involving the Mexican mathematical community in its scientific management, and to increase BIRS opportunities by extending the program from 40 weeks in 2003, to 44 in 2006, to 48 in 2007 and 49 in 2011.

The station now receives over 2,000 visits every year. Researchers come from hundreds of institutions in more than 60 countries and participate in over 70 different programs spanning almost every aspect of pure, applied, computational and industrial mathematics, statistics, computer science, physics, biology, engineering, economics, finance, psychology and scientific writing.

The extraordinary reaction to the opportunities at BIRS has led to extremely high quality competitions, with over 170 proposed activities competing for the 48 available weeks in 2014.

Resident states of BIRS participants (2011-2012)

BIRS-TBC Upcoming Public Lecture Series

In fall 2013, The Banff Centre and BIRS announced an exciting new collaborative lecture series for the general public.

These events will capitalize on the presence of several high profile scientists at BIRS who are motivated to also present their research, and that of others, to the general public. The initiative illustrates BIRS' commitment to work with the other creative forces at The Banff Centre towards enhancing scientific communication. It also serves to engage the general public with the imperatives of advanced research in the mathematical, computational and statistical sciences, as well as the role they play in our everyday lives.

The first scheduled lectures are:

September 18, 2013

Inverse Problems and Harry Potter's Cloak

Gunther Uhlmann (University of Washington)

November 13, 2013

Megadisasters: The Science of Predicting the Next Catastrophe

Florin Diacu (University of Victoria)

BIRS Participates in the 34th Banff Centre Midsummer Ball

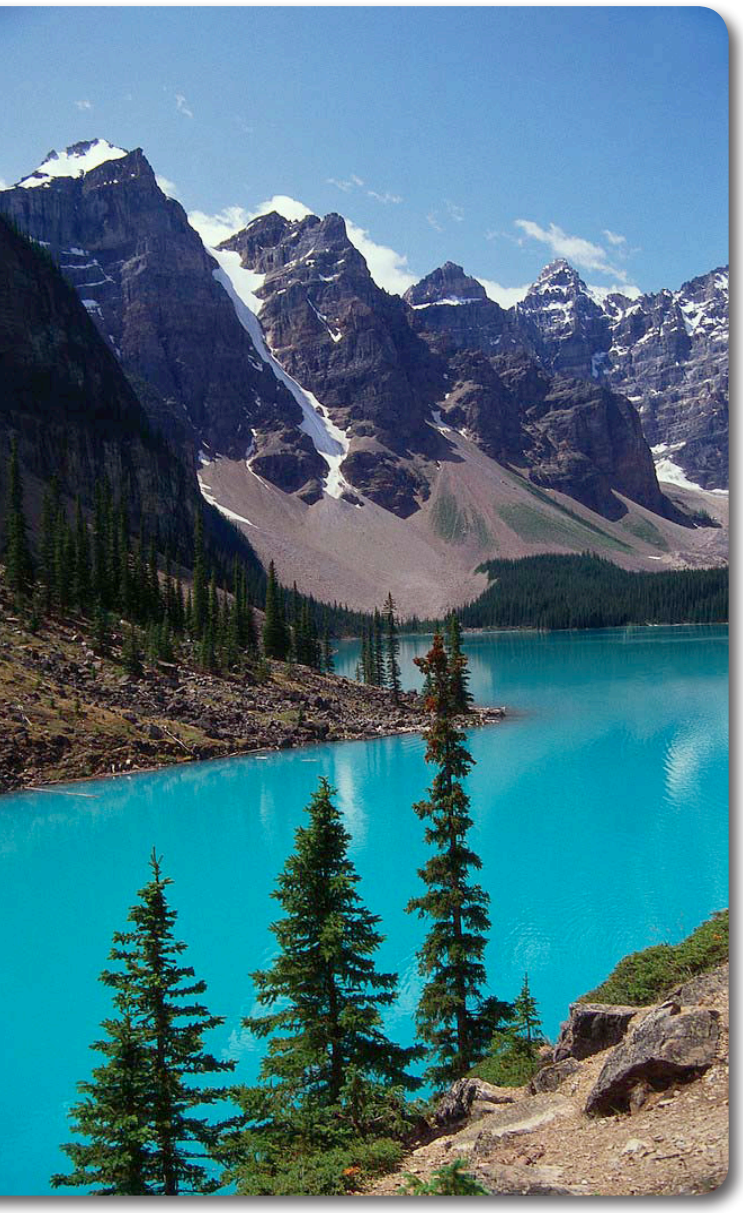
Art + Ideas Spotlight: Big Bang! The Intersection of Creativity & Science

July 20, 2013

This year's Banff Centre Midsummer Ball featured a new exciting event that highlighted the intersection of creativity and science, while ushering a new strategic direction for the Centre under its new president, Jeff Melanson. The speakers, the moderator and Jeff took the attendance on a fascinating exploratory journey, that showcased how the multidisciplinary centre creates the ideal conditions for the highest level of problem solving to occur.

BIRS Presentation:
Ivar Ekeland, Université Paris-Dauphine

CIFAR presentation:
J. Richard Bond, CITA, the University of Toronto and CIFAR



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BIRS wishes to thanks Brenda Williams for eight years of tremendous service as BIRS Station Manager. We wish her the best in her new role!

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