



Banff International Research Station for Mathematical Innovation and Discovery



Annual Report

2014-2015



Established in 2003, the Banff International Research Station (BIRS) provides an environment for optimizing opportunities for creative interaction and the exchange of ideas, knowledge and methods within the mathematical sciences and with related sciences and industry.

At The Banff Centre in the heart of the Albertan Rockies, BIRS operates 49 weeks per year, playing host to workshops and research groups that have witnessed countless new breakthroughs as well as long-awaited conclusions in research.



Table of Contents

A message from the Chair of the Board and the Scientific Director...	2
The Board of Directors	3
The Scientific Advisory Board.....	3
Overview of BIRS programs	4
Research and Collaborations	5
Funding Announcement	6
Selected highlights from the year	7
Innovation and Progress.....	8
Participation statistics.....	9
Financials.....	10

BIRS gratefully acknowledges the support of:



Vancouver office (office of the Scientific Director)

Banff International Research Station
University of British Columbia
4176-2207 Main Mall
Vancouver BC V6T 1Z4
Canada

Tel: 604-822-5213
Fax: 604-822-0883

Banff office (research station)

Banff International Research Station
c/o The Banff Centre
Room 103, TransCanada Pipelines Pavilion
107 Tunnel Mountain Drive
Box 1020 Stn 48
Banff AB T1L 1H5
Canada

Tel: 403-763-6999
Fax: 403-763-6990

Scientific Director: Nassif Ghoussoub, PhD
Administrator: Danny Fan (Vancouver)
Station Manager: Linda Jarigina-Sahoo (Banff)

www.birs.ca

Partner universities:



Message *from the Chair and the Scientific Director*

The heart of BIRS is the role it plays as a catalyst of research collaborations and as a multiplier of opportunities that “underscores how international cooperation adds up to more than what any nation could accomplish alone.” These words of a former director of the National Science Foundation (NSF), Rita Colwell, who is now on the Board of Directors of BIRS, go to the heart of this project, since BIRS represents a new level of scientific cooperation in North America bringing together for the very first time Natural Sciences and Engineering Research Council of Canada (NSERC), NSF, Alberta Innovation and Consejo Nacional de Ciencia y Tecnología (CONACYT). A partnership of this scale provides new and exciting opportunities for North American faculty and students and gives them access to their international counterparts at the highest levels and across all mathematical disciplines. All this has contributed to making BIRS a truly international and a remarkably collaborative venture: the only one of its kind in North America.

This collaboration reached a new level in February 2014, when the Government of Mexico awarded an infrastructure grant of 43-million pesos, for the construction of an affiliated research facility in Oaxaca, Mexico, so that BIRS could run an additional 25-30 workshops per year. Just like BIRS, the new facility, Casa Mathematica Oaxaca (CMO) is located in a place of high culture. The international BIRS Scientific Advisory Board applies the same rigorous peer review process when selecting all of its workshops, whether they are running at Banff or at Oaxaca. Operations of CMO-BIRS workshops commenced in June, 2015.



Mr. Doug Mitchell
Chair, BIRS Board of Directors



Dr. Nassif Ghoussoub
BIRS Scientific Director

BIRS is a North American research organization that addresses the imperatives of collaborative research and cross-disciplinary synergy, by facilitating intense and prolonged interactions between scientists from around the world. BIRS' unique infrastructure insures a creative environment for the exchange of ideas, knowledge and methods within the mathematical sciences and their vast array of applications in science and engineering. In September 2012, BIRS made its programs accessible to the world's scientific community in virtual space, via high quality live video streaming and recordings, produced by a state-of-the-art automated production system. In February 2014, the Government of Mexico approved a proposal to build an affiliated facility in Oaxaca to provide additional access to BIRS programs, which were becoming prohibitively competitive. The first of these affiliated workshops began in June, 2015.

Embracing all aspects of quantitative and analytic research, BIRS' programs span almost every aspect of pure, applied, computational and industrial mathematics, statistics, computer science, as well as physics, biology, engineering, economics, finance, psychology and scientific writing.

BIRS represents a new level of development in North American scientific cooperation as it was the first to combine NSERC, the US National Science Foundation (NSF), Alberta Innovation, and Mexico's National Council for Science and Technology (CONACyT) in a partnership of this scale, providing exciting new opportunities for North American faculty and students, and access to their international counterparts at the highest levels and across all mathematical disciplines.



The Review Process

Ensuring High-Calibre Research

The Scientific Advisory Board

BIRS Board of Directors

Chair: Doug Mitchell
Borden Ladner Gervais LLP

Alejandro Adem
CEO and Scientific Director, Mitacs

Rita Colwell
Chairman, Canon US Life Sciences, Inc.

Juan Ramon de la Fuente
International Association of Universities

Allen Eaves
President, Stemcell Technologies

David Eisenbud
Director, MSRI

Nassif Ghoussoub
Scientific Director, BIRS

Arvind Gupta
President, University of British Columbia

José Antonio Seade Kuri
Director, Instituto de Matemáticas, UNAM

Jacklyn Sturm
VP Technology and Manufacturing Group and GM Global Sourcing and Procurement, Intel Corporation

Nassif Ghoussoub, CHAIR

Non-linear Analysis, Partial Differential Equations

Fred Adler University of Utah

Mathematical Biology

Jerry Bona University of Illinois at Chicago

Fluid Mechanics and Partial Differential Equations

Alex Brudnyi University of Calgary

Applied Mathematics

Jennifer Bryan University of British Columbia

Applied Statistics

Andrei Bulatov Simon Fraser University

Discrete Mathematics

Mónica Clapp Universidad Nacional Autonoma de Mexico

Nonlinear Analysis and Partial Differential Equations

Gerda de Vries University of Alberta

Mathematical Biology

Luc Devroye McGill University

Computer Science and Probability Theory

Steve Evans University of California, Berkeley

Probability

James J. Feng University of British Columbia

Complex Fluids and Interfaces

Peter Glynn Stanford University

Discrete and Stochastic Systems in Management Science and Engineering

Randy Goebel University of Alberta

Machine Learning

Timothy Gowers Cambridge University

Combinatorics

Robert Guralnick University of Southern California

Algebraic Groups

Svetlana Katok The Pennsylvania State University

Dynamical Systems

Kristin Lauter Microsoft Research

Theoretical and Applied Cryptography

Randy LeVeque University of Washington

Scientific Computing and Partial Differential Equations

Elon Lindenstrauss The Hebrew University of Jerusalem

Ergodic Theory

Irena Peeva Cornell University

Commutative Algebra

Sujatha Ramdorai University of British Columbia

Algebraic K-theory, Algebraic Number Theory, Motives, Iwasawa Theory

James Ramsay McGill University

Statistics

Nancy Reid University of Toronto

Statistics

Jose Antonio Seade Universidad Nacional Autonoma de Mexico

Singularity Theory and Complex Geometry

Gordon Semenov University of British Columbia

Particle & Nuclear Physics, Theoretical Physics

Benny Sudakov ETH and University of California, Los Angeles

Combinatorics

Jeff Viaclovsky University of Wisconsin

Geometry and Topology

Shing-Tung Yau Harvard University

Differential Geometry





BIRS Programs

BIRS opens itself to **2-Day Workshops** a few weekends every year. Such workshops are ideal for shorter scientific meetings, professional development programs, and academic-industrial partnership events.

The **5-Day Workshop** is the main program format at BIRS. Workshops run Monday through Friday. In 5-day workshops, participants, who are experts, come together to exchange the latest developments and ideas in their areas. BIRS thus seeks to foster new collaborations and new interdisciplinary interactions, and to provide a forum for vigorous research oriented exchanges. Workshops include both formal talks and considerable amounts of time for discussions in smaller groups.

The **Focused Research Groups** program offers teams of up to 8 researchers the opportunity to live and work at the BIRS facility for periods of 1 to 2 weeks, in order to concentrate on their research, or to finish major projects.

The **Research in Teams** program offers similar opportunities to groups of 2 to 4 researchers.

Summer Schools and **Training Camps**, typically a week long, are pedagogical by definition. They may be aimed at any level, from school-level students and teachers, through to undergraduate and graduate levels, or can be in preparation for Institute thematic programmes.



BIRS Research and Collaborations

BIRS Activities, April 1 2013 - March 31 2014



2-Day Workshops

- Apr 18 Alberta Number Theory Days VI
- Apr 25 Ted Lewis Workshop on SNAP Math Fairs 2014
- Jul 11 Algebraic Design Theory with Hadamard Matrices: Applications, Current Trends and Future Directions
- Jul 25 Recent Advances in Survey Sampling Techniques
- Aug 8 The Fourth International Workshop on the Perspectives on High-dimensional Data Analysis
- Aug 29 Canadian Abstract Harmonic Analysis Symposium 2014
- Oct 3 Connecting Women in Mathematics Across Canada
- Nov 7 53rd Cascade Topology Seminar

Research in Teams

- Apr 28 Estimates for Denominators of Pade Approximants and Applications to Diophantine Equations
- Aug 4 Cholera Dynamics on Community Networks
- Aug 10 MSI: Music, Film and Mathematics together
- Sep 1 Multiscale Analysis of Stochastic Spatial Chemical Reaction Networks
- Oct 20 Mathematical Methods for Bar Code Decoding
- Oct 27 Smooth Relaxations of Large-Scale Optimization Problems, with Applications to Sparse Optimization and Semidefinite Programming
- Mar 2 Operator Limits of Random Matrices
- Mar 30 On a System of Hyperbolic Balance Laws Arising from Chemotaxis

Focused Research Groups

- May 5 Network Models of Financial Systemic Risk
- Apr 20 Hyperplane Arrangements, Wonderful Compactifications, and Tropicalization
- Aug 10 Borel Complexity and Classification of Operator Systems
- Oct 26 Geometric Aspects of p -adic Automorphic Forms

Summer Schools

- Jun 22 2014 Summer IMO Training Camp

"The combination of the venue and the range and quality of the presentations on information theory applied to biological systems was a one-two stunning punch. Absolutely the best workshop I have ever attended in my 30 years of professional activity."

Chris Rose, Rutgers University

"...I felt the impact of the video taped lectures even while I was there. I was able to direct [an] emeritus member of the same research community, to lectures on which he was able to provide distinct feedback despite being absent from the conference himself. I look forward to a future visit, if invited I would reflexively accept based on how productive my previous visits have been."

James Wilson, Colorado State University

"I have had the chance to participate in great workshops and conferences in my field in recent years, but this workshop at BIRS stands out among them. Most of the speakers were young mathematicians and the majority were new to me (some are still PhD students). I was impressed by the quality of their work. I was delighted to see breakthroughs in my field and solutions to old problems (which I had tackled myself, but without success). The schedule of the workshop and the facilities offered by BIRS are congenial to discussions, giving the opportunity to know better these young participants and their work. I have started a research project with one of them. The workshop also gave me the opportunity to make some progress on another project with an experienced participant."

Jean Renault, Universite d' Orleans

"This was one of the most interesting conferences I have attended in years, and I believe it might bring some profound insights to my research. I was also able to make contacts with great people and seed new collaborations."

Guy David, Universite Paris XI

5-Day Workshops

- April 6 Complex Monge-Ampère Equations on Compact Kähler Manifolds
- April 13 Subfactors and Fusion Categories
- April 20 WIN3: Women in Numbers 3
- April 27 Recent Advances and Trends in Time Series Analysis: Nonlinear Time Series, High Dimensional Inference and Beyond
- May 4 Dynamics in Geometric Dispersive Equations and the Effects of Trapping, Scattering and Weak Turbulence
- May 11 Mathematical Finance: Arbitrage and Portfolio Optimization
- May 18 Imaging and Modeling in Electron Microscopy - Recent Advances
- May 25 Geometric Aspects of Semilinear Elliptic and Parabolic Equations: Recent Advances and Future Perspectives
- June 1 The Future of Trace Formulas
- June 8 Integrability in Holography
- June 8 Programming with Chemical Reaction Networks: Mathematical Foundations
- June 15 Quantum Curves and Quantum Knot Invariants
- June 22 Emerging Statistical Challenges and Methods For Analysis of Massive Genomic Data in Complex Human Disease Studies
- June 29 Entropy Methods, PDEs, Functional Inequalities, and Applications
- July 6 New Directions in Financial Mathematics and Mathematical Economics
- July 13 Stochastic Network Models of Neocortex (a Festschrift for Jack Cowan)
- July 20 Spin Glasses and Related Topics
- July 27 Statistics and Nonlinear Dynamics in Biology and Medicine
- August 3 Approximation Algorithms and the Hardness of Approximation
- August 10 Recent Progress in Dynamical Systems and Related Topics
- August 17 Mathematical Modelling of Particles in Fluid Flow
- August 24 Communication Complexity and Applications
- August 31 Front Propagation and Particle Systems
- September 7 Mathematics of the Cell: Integrating Genes, Biochemistry and Mechanics
- September 14 Probability on Trees and Planar Graphs
- September 21 Multiscale Models of Crystal Defects
- September 21 Rigorously Verified Computing for Infinite Dimensional Nonlinear Dynamics
- September 28 Vojta's Conjectures
- October 5 Sparse Representations, Numerical Linear Algebra, and Optimization
- October 12 Optimal Cooperation, Communication, and Learning in Decentralized Systems
- October 19 Dynamics and C^* -Algebras: Amenability and Soficity
- October 26 Biological and Bio-Inspired Information Theory
- November 2 Geometric Scattering Theory and Applications
- November 9 Particle-Based Stochastic Reaction-Diffusion Models in Biology
- November 16 Algorithms for Linear Groups
- November 23 Algebraic and Model Theoretical Methods in Constraint Satisfaction
- November 30 Families of Automorphic Forms and the Trace Formula
- November 30 Motivic Integration, Orbital Integrals, and Zeta-Functions
- December 7 Cohomological Realizations of Motives
- January 11 Modern Applications of Complex Variables: Modeling, Theory and Computation
- January 18 Random Dynamical Systems and Multiplicative Ergodic Theorems
- January 25 Mathematics of Communications: Sequences, Codes and Designs
- February 1 Partial Differential Equations in Cancer Modelling
- February 8 Discrete Geometry and Symmetry
- February 15 Advances in Numerical Optimal Transportation
- February 22 Hypercontractivity and Log Sobolev Inequalities in Quantum Information Theory
- March 1 Between Shannon and Hamming: Network Information Theory and Combinatorics
- March 8 Computability, Analysis, and Geometry
- March 15 Distribution of Rational and Holomorphic Curves in Algebraic Varieties
- March 22 Laplacians and Heat Kernels: Theory and Applications

"BIRS is such a gem to host guests from out of country. The two weekend conferences that I co-organized at BIRS (Unsolved K-12 and Integer Sequences K-12) have been the top two professional experiences of my life. How influential they will be is still up in the air, but a core group is working to make sure there is a legacy. Today I tried out some of the integer sequences in Kindergarten through grade 6 and will be communicating their successes and failures to the other attendees as we hone in on the final selection of 13 Integer Sequences - one for each grade K-12. The Julia Robinson Mathematics Festival was scheduled for immediately after the conference. It was the ideal opportunity to bring this festival to Canada for the first time because I had so many awesome math educators on hand. This festival was a direct side effect of the BIRS weekend. It ended up as the top news story on the Calgary Board of Education web site."

Gordon Hamilton, *MathPickle*

2014-2015 Selected Highlights

Statistics and Nonlinear Dynamics in Biology and Medicine

The past decade has seen a massive increase in data recorded from environmental and public health monitoring, medical equipment and scientific experiments. These data allow scientists, doctors and public health professionals to examine in detail the way systems change over time in response to their own state and the environment around them.

While there are many mathematical models that purport to describe the systems that are now being monitored, attempts to reconcile these models with data have only recently been undertaken in earnest.

This workshop brought together statisticians, mathematicians, ecologists and biologists to develop new methods to understand how this new wealth of data can inform and improve mathematical models in these fields and how these models, in turn, can affect how the data is collected and measured.

WIN3: Women in Numbers 3

Number theory has its roots in the study of the integers, but the great variety of tools and techniques motivated by these ancient questions are now allowing us to address questions intimately connected to a wide variety of fields, from geometry to physics and information theory. This workshop was a continuation of the previous two successful BIRS workshops for women in numbers (2008 and 2011). It brought together women at all stages in their research careers, from senior faculty to graduate students, to do new research in some of the most important and vibrant areas of modern number theory, and to continue to build a thriving community of women working in the area.

"The WIN workshops are among the most useful mathematics conferences in which I have ever participated, both in terms of fostering research collaborations and mentorship. This third edition has certainly lived up to such standards."

Matilde Lalin, Université de Montréal

"I was very impressed with the Banff campus—it is like a self-sustaining world. I think that residential workshops like the one I just attended at BIRS are the gold standard for mathematical gatherings: because everyone lives and dines together, mathematicians of all ranks naturally mingle professionally and socially in a way that would never be possible at a typical conference venue at a university or city auditorium."

Lillian Pierce, Hausdorff Center for Mathematics

Mathematical Modelling of Particles in Fluid Flow

Mathematics of financial markets is one of the most active and exciting areas of contemporary applied mathematics. It provides the mathematical community with a rich source of challenges, which, in turn, enrich the society's understanding of the financial system and help both regulators and the financial industry make better and more informed choices. Its proximity to practice, in addition to its purely mathematical appeal, makes this field especially attractive to young mathematicians. Moreover, it provides for wider employment opportunities both within the academic world and outside of it.

One of the most challenging areas within mathematical finance, namely its foundations, aims to understand the basic structure shared by all financial markets.

This workshop brought together a group of experts on two of the pillars of mathematical finance - arbitrage theory and portfolio optimization - in order to foster a free interchange of ideas and facilitate sharing of some of the recent results in this challenging field.



The Inaugural Scientific Program at BIRS Affiliate Casa Matemática Oaxaca (CMO)

In November 2014, BIRS released the first schedule of workshops at the new BIRS-affiliated mathematics research centre, Casa Matemática Oaxaca (CMO), located in Oaxaca, Mexico. The schedule includes 21 workshops in 2015, operating out of the Hotel Hacienda Los Laureles, Hotel Angel Inn and Las Cúpulas, in the city of Oaxaca, while construction begins on a dedicated CMO facility.



BIRS and UBC Collaborate to Create Mathematical Video Archive

BIRS and The University of British Columbia's (UBC) Library announced their collaboration on a project to preserve, archive and diffuse the lecture videos from BIRS' weekly workshops at UBC Library's digital repository, cIRcle.

BIRS is a place where the imperatives of collaborative and cross-disciplinary research in the mathematical sciences are addressed. Another one of its unique features is that it provides a fully-automated live video broadcasting and recording system for most of its scientific activities. On average, researchers record 20 lectures per week for 48 weeks of the year, totaling 1,000 files per year – all of which are freely available on the BIRS website.

BIRS' collaboration with cIRcle provides robust and long-term preservation for these videos, as well an enhanced accessibility for scholarly researchers worldwide through UBC's online library service. Their digital archival system will guarantee the content is discoverable and indexed in popular search engines, thus helping to increase the global reputation of BIRS. The end result is the first large-scale project to digitally preserve and disseminate mathematical science research output in video format. BIRS is one of the world's most prominent mathematical science research institutions.

To view the current inventory of BIRS videos in cIRcle, visit <https://circle.ubc.ca/handle/2429/47157>

BIRS Announces Day Care Support for Workshop Participants



Since 2006, BIRS has welcomed participants with young children – providing family suites for approved participants and recommending certified local day care providers. The Station is happy to announce that, as of January 1, 2015, it will provide financial support for workshop participants who are travelling with children and require day care services. BIRS' day care support will extend to day care facilities within the town of Banff, but also to individuals hired by workshop participants to care for their children on the BIRS premises.

Participation Statistics

BIRS provides equal access to the world's research community regardless of geographic origin or scientific expertise, as long as it 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.

The overwhelming response of the scientific community during the first years of operations led BIRS to expand the North American partnership by involving the Mexican mathematical community in its scientific management, and has led to the substantial increase from 40 weeks of programming in 2003, to the current 49 week schedule. Continued growth in demand for the unique service that BIRS provides has led to the aforementioned announcement of the additional affiliate facility in Oaxaca, Mexico, the results of which will be reported on in forthcoming annual reports.

The station now receives over 2,000 visits by researchers every year from hundreds of institutions in more than 60 countries who 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.

Resident states of BIRS participants, 2011-2015



Statements of Financial Position

(Unaudited)

Year ended March 31, 2015

	March 31, 2015	March 31, 2014
ASSETS		
Current		
Cash – restricted		
Uncommitted (Note 4)	\$ 2,498,661	\$ 2,020,840
Committed to projects	1,020,702	893,771
	3,519,363	2,914,611
LIABILITIES		
Current		
Accounts payable and accrued liabilities	5,000	5,000
Deferred receipts (Note 5)	1,020,702	893,771
	1,025,702	898,771
NET ASSETS	\$ 2,493,661	\$ 2,015,840

Statements of Operations and Changes in Net Assets

(Unaudited)

Year ended March 31, 2015

	2015	2014
RE CEIPTS		
ASRA	\$ 563,271	\$ 612,155
CONACYT	50,000	50,000
Contributions	19,024	18,711
Mprime Network Inc.	428,151	223,379
NSERC	676,194	579,478
NSF	761,836	771,750
UBC	50,000	50,000
Other	2,164	1,911
	2,550,640	2,307,384
EXPENDITURES		
Conferences		
Equipment	2,756	3,123
Infrastructure support	7,972	9,204
Premises and accommodation	1,625,002	1,607,145
Scientific support	40,215	41,130
Administration		
Research support	25,000	25,000
Office and miscellaneous	4,006	7,553
Professional fees	9,160	3,454
Salaries and benefits	354,191	331,006
Travel	4,517	6,350
	2,072,819	2,033,965
EXCESS OF RECEIPTS OVER EXPENDITURES	477,821	273,419
NET ASSETS, BEGINNING OF YEAR	2,015,840	1,742,421
NET ASSETS, END OF YEAR	\$ 2,493,661	\$ 2,015,840

Statements of Financial Position**(Unaudited)****Year ended March 31, 2015**

	2015	2014
Cash Provided by (Used in) Operating Activities		
Cash received from grants and other income	\$ 2,677,571	\$ 2,558,961
Cash disbursed for conferences	(1,675,945)	(1,660,602)
Cash disbursed for administration	(396,874)	(373,363)
INCREASE IN CASH	604,752	524,996
CASH, BEGINNING OF YEAR	2,914,611	2,389,615
CASH, END OF YEAR	\$ 3,519,363	\$ 2,914,611

Notes to the Financial Statements

(Unaudited)

Year ended March 31, 2015

1. OPERATIONS

Banff International Research Station was incorporated as a non-profit corporation under the Canada Corporation Act on June 12, 2009 and extra provincially in Alberta on October 7, 2009 and British Columbia on October 23, 2009. The Banff International Research Station for Mathematical Innovation and Discovery was inaugurated in 2003, and is a joint Canada-US-Mexico initiative. In 2005, the National Council for Science and Technology (CONACYT Mexico) joined Alberta Innovation (ASRA Alberta, Canada), the National Science Foundation (NSF USA) and Natural Science and Engineering Research Council (NSERC Canada) as sponsors and funders.

The purpose of the organization is facilitating collaborative and cross-disciplinary research with a focus on the application of mathematical sciences in the sciences and in industry. It operates a dedicated facility, located in Banff, Alberta, where it conducts residential programs for research and discussion of all aspects of the mathematical, computational and statistical sciences, from the most fundamental challenges of pure and applied mathematics, theoretical and applied computer science, statistics and mathematical physics to financial and industrial information technology and life science mathematics.

Banff International Research Station and The Banff International Research Station for Mathematical Innovation and Discovery are collectively referred to in these financial statements as "BIRS". These financial statements include the operations of BIRS for the years ended March 31, 2015 and 2014. BIRS received all of its revenue from the funders described in the preceding paragraph and may not be able to maintain the operations described in these financial statements should this funding be significantly reduced or ended.

2. BASIS OF PRESENTATION

Statement of Compliance

These financial statements have been prepared in accordance with Canadian accounting standards for not-for-profit organizations ("ASNPO").

Basis of Presentation

These financial statements have been prepared on the historical cost basis, except for certain financial instruments which are measured at fair value, as explained in the accounting policies set out in Note 3.

3. SIGNIFICANT ACCOUNTING POLICIES

Accounting Estimates and Judgements

The preparation of these financial statements requires management to make estimates and judgments and to form assumptions that affect the reported amounts and other disclosures in these financial statements. The estimates and associated assumptions are based on historical experience and various other factors that are believed to be reasonable under the circumstances. The results of these assumptions form the basis of making the judgments about carrying values of assets and liabilities that are not readily apparent from

other sources. Actual results may differ from these estimates under different assumptions and conditions.

The estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates are recognized in the period in which the estimate is revised if the revision affects only that period or in the period of the revision and further periods if the review affects both current and future periods.

Critical accounting estimates are estimates and assumptions made by management that may result in material adjustments to the carrying amount of assets and liabilities within the next financial year. Critical estimates used in the preparation of these financial statements include, among others, the recoverability of accounts receivable and estimation of accrued liabilities.

Cash and Cash Equivalents

Cash and cash equivalents comprise cash at banks and short-term deposits with an original maturity of three months or less which are readily convertible into a known amount of cash.

Financial Assets and Financial Liabilities

Financial instruments are composed of cash and cash equivalents, accounts receivable, accounts payable and accrued liabilities, and deferred receipts.

BIRS makes its fair value measurements based on a three-level hierarchy:

- Level 1 – inputs are unadjusted quoted prices in active markets for identical assets or liabilities;
- Level 2 – inputs other than quoted prices in Level 1 that are observable for the asset or liability, either directly or indirectly; and
- Level 3 – inputs for the asset or liability that are not based on observable market data.

Transaction costs directly attributable to the acquisition or issue of a financial asset or financial liability that will be measured subsequently at amortized cost are added to the carrying amount of the financial asset or financial liability.

Contributions from Funders

Contributions from funders are recorded as “receipts” at the time all criteria established between the organization and the funders are satisfied. The criteria for each grant or fund determines the appropriate disbursement of these contributions. Contributions received but not disbursed at the end of a fiscal period are recorded as “deferred” and are transferred to “receipts” when disbursed during a subsequent fiscal period.

Income Taxes

BIRS, as a non-profit organization, is not subject to Federal or Provincial income taxes.

4. RESTRICTED CASH

BIRS plans its program at least one year in advance, which may be before funding can be confirmed. The Board of Directors has authorized BIRS to build a reserve fund of up to \$2,000,000 from the uncommitted cash to meet its estimated operating commitments for one year.

This reserve is a restricted fund to be only used for specific purposes, such as infrastructure improvement, necessary capital projects, information technology, legally mandated labour settlements. It can also be used as a contingency fund to meet contractual obligations.

5. DEFERRED RECEIPTS

Deferred receipts represent contributions received from funders but not disbursed at the end of the year, which are composed of:

	2015	2014
NSERC MFA	\$ 44,881	\$ 61,266
ASRA (UA)	516,524	384,360
ASRA (UC)	459,297	448,145
	\$ 1,020,702	\$ 893,771

6. COMMITMENTS

BIRS is committed, under the terms of a five-year contract with the Banff Centre for Continuing Education for its conference facilities, to annual payments of approximately \$1,472,000 for the use of the facilities for 49 weeks in each of the first three years (2011, 2012 and 2013) of the contract. There will be a national CPI adjustment to the rates for years 2014 and 2015. The national CPI adjustment to the rates for year 2014 was 1.1% and for 2015 is 2.0%.

7. FINANCIAL RISK

BIRS's activities expose it to a variety of financial risks, which include credit risk and liquidity risk. BIRS's risk management program focuses on the unpredictability of financial markets and seeks to minimize the risk to its assets and its ability to meet its mandate.

(a) Credit risk

Credit risk is the risk of financial loss to the organization if a counterparty to a financial instrument fails to meet its contractual obligations, and arises mainly from its cash. BIRS limits its exposure to credit risk arising from these instruments by only depositing cash in major Canadian universities and financial institutions and holding only financial instruments of institutions with the highest credit rating.

(b) Liquidity risk

Liquidity risk is the risk that BIRS will not be able to meet obligations associated with financial liabilities and commitments as they come due. Accounts payable and accrued liabilities are due within the current operating period. BIRS manages this risk through its capital management programs (Note 8).

(c) Currency risk

Currency risk is the risk of a loss due to the fluctuation of foreign exchange rates and the effects of these fluctuations of foreign currency denominated monetary assets and liabilities. BIRS currently budgets expenditures based on commitments from granting agencies, one of which is in US dollars. Therefore,

BIRS is affected by changes in exchange rates between the Canadian dollar and the US dollar.

A change in the value of the US dollar by 1% relative to the Canadian dollar would affect the US dollar amounts receivable from non-Canadian funders by approximately \$7,800 (2013 \$7,400). Should there be a reduction in the total amount of the grant on the conversion from US dollars, BIRS will request a corresponding increase in the grant. If the additional funding is not received, BIRS does not expect a significant impact on its operations.

8. CAPITAL MANAGEMENT

BIRS's capital management objectives are to meet the requirements of the funders providing grants and to safeguard its ability to continue as a going concern in order to pursue the advancement of its mandate. BIRS considers its capital for these purposes to be its available received and committed grants, as disclosed on the statement of net assets. BIRS manages its capital by preparing annual expenditure budgets, which are revised periodically based on current commitments and available funds, and potential additional funding which it may be actively pursuing. Annual and materially updated budgets are approved by the Board of Directors.