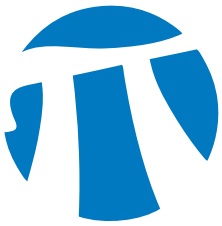


Pacific Institute *for the* Mathematical Sciences

Annual Report 2019

TABLE OF CONTENTS

ANNUAL PROGRESS REPORT

CTRMS-342044-2014

Pacific Institute for the Mathematical Sciences

January 1–December 31, 2019

I. OVERVIEW OF 2019

1. HIGHLIGHTS

1. **Workshop on Mathematical Sciences and Clean Energy Applications (at UBC):** To avoid the worst consequences of climate change, the energy chain of the global economy must be drastically decarbonized. This exploratory workshop built a greater dialogue between those in the mathematical sciences and the clean energy sector. The workshop included first-hand accounts of mathematical scientists working in clean energy projects, introductions to clean energy systems and mathematical tools, graduate student presentations and panel discussions on topics such as challenges in clean energy.

2. **Renewal of Pacific Institute for the Mathematical Sciences (PIMS) as International Research Laboratory #3069 of the Centre national de la recherche scientifique (CNRS):** Our collaboration with CNRS highlights PIMS as a focal point for collaborations between France and Canada. The postdoctoral program offered by PIMS-CNRS has brought young researchers from France to Canada and conversely the universities in our network have hosted a steady stream of CNRS-sponsored visiting mathematical scientists.

3. **PIMS-CANSSI Data Science Bootcamp (at University of Saskatchewan):** Data science is an interdisciplinary field that combines perspectives from mathematics, statistics and computer science. The focus is to extract and communicate meaningful information from complex data using techniques that fall under the umbrella of these three disciplines. The scope of the field is expanding, as learning from data is common practice in all disciplines. With the increasing availability of data with wide ranging characteristics, there is now a high demand for data analysis and hands-on training in software. The Bootcamp topics included data visualization, statistical methods for high-throughput data, introduction to machine learning and data science case studies.

4. **Diversity in Mathematics Summer School:** As part of Diversity in Mathematics, a multi-year, multi-level program geared towards promoting diversity and inclusivity in STEM, between July 22 and August 2, 2019, PIMS hosted the Undergraduate Summer School for female-identifying, non-binary and two-spirit undergraduate students studying mathematics or a related discipline such as computer science, physics or statistics at a university in Canada or in the northwest United States. The purpose of the program was to introduce the undergraduate participants to a wide variety of professions and careers in academia and in industry. The highlights of the annual two- week program include: (a) An interactive math day camp for high school students from groups that are consistently under-represented in the STEM fields. The aim is to increase their representation and retention at post-secondary institutions in STEM fields. (b) A national summer school that inspires talented undergraduate women to specialize in a mathematics-related field at the graduate and post-graduate level and consider career options focused on science and mathematics. (c) A creative forum for mentorship and leadership at all levels, where the undergraduate participants learn to serve as mentors for their younger counterparts.

5. **Etienne Ghys: Vancouver Tour:** The Consulate General of France, in Vancouver, together with PIMS hosted French Mathematician Etienne Ghys during his Vancouver Tour, May 2-3, 2019. Ghys' scientific contributions deal with the geometry and topology of dynamical systems. His first talk was "The Geometry of Snowflakes" held at Telus World of Science. The second talk was "Singularities of planar analytic curves" held at PIMS. Etienne also gave a lecture in French at the French Consulate on "The Geometry of Large Networks".

2. WHAT'S NEW

- **Kristine Bauer became Site Director at University of Calgary. Terry Gannon became Site Director at University of Alberta. Nathan Ng became Site Director at University of Lethbridge.**
- **PIMS welcomed CNRS visitors Filippo Nuccio and Raphael Chetrite.**
- **Marni Mishna became PIMS Deputy Director:** Professor Mishna is an expert in combinatorics. Her research investigates interactions between discrete structures and many diverse areas such as representation theory, functional equations, and algebraic geometry. Her specialty is the development of analytic tools to study the large-scale behavior of discrete objects.
- **Callysto: Building Tomorrow's Digital Leaders:** Through this Callysto project, Cybera (a non-profit organization which oversees Alberta's cyberinfrastructure) and PIMS will deliver modern digital frameworks, tools, and training to students and teachers in grades 5-12 to help address the growing digital skills gap. Our approach uses computational thinking learning concepts (e.g. algorithms, abstraction, decompositionandpatternrecognition),and data science and artificial intelligence approaches and tools, to create curriculum-based content in the math, science and humanities subject areas. The content is easily accessible through any modern web browser. We bring together teachers and students for learning sessions, and offer hands-on support with data science and artificial intelligence experts. Callysto has received $3M in funding through the Government of Canada's Cancode program.
- **PIMS-Germany Collaboration:** This is a series of events over two years designed to initiate a long-term systematic collaboration between PIMS and a collection of universities in Germany. In 2019, two events were held in Germany. The Canadian-German Workshop on Modeling and Analysis of PDEs for Biological Applications brought together experts in the PDE modeling and analysis of organizing principles of multiscale biological systems including cell assemblies, tissues and populations, and the collective dynamics of cells. The PIMS Germany Workshop on Numerical Methods took place at the Mathematics Center Heidelberg (MATCH) which is a research centre for bridging between different areas of mathematics and applied computer sciences. The collaboraton will continue in 2020 with the PIMS-Germany Summer School on Eigenvarieties at UBC July 27 to August 8.
- **bcdata Colloquium:** The bcdata initiative is a collaborative effort to build a vibrant community intertwining people from government, industry, universities and not-for-profits toward sharing knowledge and identifying opportunities emerging from the data explosion. Avigilon (a Motorola Solutions Company) and PIMS sponsor the monthly bcdata colloquium series in Vancouver. These are networking events with presentations on various data science topics such as: Data Challenges and Solutions for Autonomous Vehicles, Mapping the Internet, and Data-driven Control and Optimization in the Wind Industry.

3. PROGRAMS, ACTIVITIES AND NUMBER OF USERS

PIMS has built an international reputation for excellence and has transformed the conditions of mathematical research in Canada. PIMS funds Collaborative Research Groups, Postdoctoral Fellowships, the Postdoctoral Training Centre in Stochastics as well as individual events and focus periods on a competitive basis.

- **Collaborative Research Groups:** Collaborative Research Groups (CRGs) consist of researchers with a common interest and a desire to collaborate in developing aspects of their research programs for 3-4 years. Groups organize focus periods,

including workshops, summer schools and seminars. They make joint postdoctoral fellowship (PDF) appointments, and develop joint graduate training programs. CRGs are designed to promote and support long-term, multi-event, multi-site coordinated activities. In 2019 our CRG in High Dimensional Data Analysis had two postdoctoral fellows, ran a minicourse on uncertainty quantification of PDEs with random coefficients and held a summer school on deep learning for computational Mathematics. Our CRG on Geometric Analysis had two postdoctoral fellows and ran a Geometric Analysis workshop. Our CRG on Geometric Cohomological Methods in Algebra had one postdoctoral fellow and ran the Algebraic Geometry Seminar Series. In 2020 we will launch two new CRGs. One will be Quantum Topology and its Applications. The other will be Novel Techniques in Low Dimension.

- **Conferences and Workshops:** PIMS organizes and funds a variety of meetings around the world each year. These range from small one-day workshops to multi-week conferences involving hundreds of participants. PIMS also hosts or cosponsors various meetings by professional societies.
- **Summer Schools:** Every year PIMS runs a number of topical summer schools. They are intended to educate graduate students and early career researchers on current developments.
- **Focus Periods:** These intensive activities may occur as part of a CRG or on their own depending on current mathematical trends and collaborative prospects. Each covers a specific but substantial area of research of current importance to Canada, with participants ranging from students to world experts in the mathematical sciences.
- **Lecture and Seminar Series:** PIMS supports various seminar series at member universities and industrial centres throughout the year. Some of these are for specialists, while others are geared towards the general public, with the goal of inculcating in the citizenry the importance of mathematical research and its applications.
- **PIMS Syzygy Platform:** Together with Compute Canada and Cybera, PIMS launched a computational platform based on Jupyter notebooks in 2017. As of the end of 2019, this platform was available at 22 Canadian higher education institutions and has more than 25,000 users. The service delivers Jupyter notebooks to faculty, staff and students at Canadian universities using single-sign-on (SSO) via their university user account. By eliminating the requirement to install customized software on personal computers, syzygy.ca makes it easier for research teams to collaborate using the right tools for their investigations. The platform elivers an interactive coding environment for literate programming in Python 2, Python 3, R (and sometimes Julia, Octav, Sage and other languages). PIMS is leveraging syzygy.ca and other tools to develop expertise in scientific computing, data science, machine intelligence, optimizations, etc. PIMS is currently hosting the largest JupyterHub in the world and it continues to grow.
- **Federal Cancode Grant:** The Callysto project, launched by PIMS and Cybera, is closely related to Syzygy and leverages many of the same tools aiming to help today's youth become tomorrow's digital leaders. It is an all-in-one educational program, combining a computational platform with curriculum-based learning and skill development materials, all accessible from any device with an internet connection. An important component of the Callysto project is the partnership between higher education and the K-12 community, which produces a rich library of open -access materials for teaching computational learning. By using a train-the-trainers approach, PIMS and Cybera have introduced Callysto to nearly 45,000 students and teachers. In 2019 there was a shift towards holding events where students and teachers could have hands-on experience with the Jupyter notebooks that had been created during the first Cancode grant.

Activity	2017		2018		2019		2020	
	Activities	Users	Activities	Users	Activities	Users	Activities	Users
Conferences/Workshops	34	4,251	42	4,294	43	4,391	38	4,200
Summer Schools	3	202	4	198	3	192	3	250
Collaborative Research Groups	6		6		3		3	
Lecture-Seminar Series	21	893	37	1,285	29	1,143	29	1,100
Industrial Activities	6	280	6	217	2	190	2	150
Syzygy	12	3,500	11	13,750	22	25,000	23	26,000
Callysto			82	24,206	26	20,223	28	27,000
Other	7	1,130	7	960	8	898	8	900

Figure 1: Numbers of each type of activity supported by PIMS by year.

II. ACCESS TO THE RESOURCE

1. COMMUNICATIONS PLAN

This plan identifies communication objectives, key messages, identifies stakeholders and sets out the strategies and tools that will be used.

Objectives and communication priorities:

- Build a consistent communications framework to raise the profile of PIMS in the global scientific community.
- Demonstrate to existing and potential new sponsors, as well as the global scientific community that PIMS has given thought and priority to communicating with them.
- Place education as a top priority in terms of gathering funding, program organization and awareness raising.
- Build the PIMS community through regular, consistent and targeted formal and informal communications.

Key messages:

- PIMS is a leading mathematical institute in North America, with worldwide influence on research and industry. It has established innovative programs that have had a transformative impact on the mathematical sciences and the training of HQP.
- The PIMS community is inclusive; from K-12 to research faculty. PIMS' distributed structure throughout the Pacific Northwest enables all who are engaged to do so locally, while still benefitting from all of PIMS' resources.
- PIMS is nurturing the pipeline of younger generations in Western Canada, including those with Aboriginal backgrounds. PIMS promotes numeracy as an integral part of development and learning.
- PIMS encourages and promotes diversity in mathematics

Strategies:

- Create and manage the consistency, clarity and regularity of communications.
- Become more proactive and opportunistic in promoting PIMS to stakeholders. Respond to the needs of stakeholders as to how they would like to receive information.
- Add a more human touch, include photos, personal stories and testimonials.
- Increase internal and external community building opportunities.

Tools:

- Websites and electronic
  - **PIMS website:** The PIMS website (*www.pims.math.ca*) offers easy global access to information on all PIMS activities, recent news and resources.
  - **Mathtube.org:** A dedicated site containing PIMS written, video and audio media. *mathtube.org* was created to meet the increasing demand to see footage of past PIMS lectures. It provides global exposure to PIMS events and gives event attendees the chance to review. For others, it offers a chance to see what they've missed.
  - **PIMS Connection, monthly e-newsletter:** This brief email includes links to upcoming events, updates and new items. Its circulation is over 3,600.
  - **Social Media**: PIMS now uses Twitter, Facebook, LinkedIn and Medium to connect with and provide all of our updates and news to the PIMS community. These posts cover a range of content from event photo highlights to weekly event updates and more.
  - **Pi in the Sky**: A hardcopy publication aimed at high-school students and teachers, with the main goal of providing a cultural landscape for mathematics. It has a natural extension to junior high school students

and undergraduates, with articles that put curriculum topics in a different context. Pi in the Sky is produced once a year and mailed to various institutes and private subscriptions throughout Canada and the world (estimated circulation is 1,700) and can be downloaded from the PIMS website: *www.pims.math.ca/resources/publications/pi-sky*.

- **Advertising:** PIMS-funded events and opportunities are advertised both electronically and in print. We advertise through websites and publications at institutions such as AMS, CMS, and SIAM and by offering custom-designed event posters that are distributed to the major mathematical departments and institutes in Canada and the US, as well as an annual poster highlighting all of PIMS main events for the year, which is distributed to over 200 of the top scientific institutions worldwide.
- **Reports:** Conference proceedings, abstracts, lecture notes, websites and final event reports are all made available for download from the PIMS website in .pdf format. (See *www.pims.math.ca*). Conference materials are attached to the corresponding event, which are listed chronologically and are searchable by keyword for ease of access. PIMS also produces an annual report which can be viewed at *www.pims.math.ca/resources/publications/annual-reports*.
- **Open Source:** PIMS shares all source code for the syzygy.ca and Callysto projects as open software projects on Github. The educational resources developed as part of the Callysto project are also shared openly on Github.
- **Audio/Video Facilities:** PIMS offers seminar organizers and affiliated researchers a selection of technologies to help them include participants at remote sites. The selection included traditional videoconferencing as well as software-based alternatives such as bluejeans, vidyo and zoom.
- **Distributed Courses:** Professor Brian Marcus taught a graduate course in functional analysis from UBC-Vancouver that included a remote audience of students at UBC-Okanagan.

III. CONTRIBUTIONS TO RESEARCH

More information about PIMS can be obtained under "PIMS News/Press" at pims.math.ca and in our annual report *www.pims.math.ca/resources/publications/annual-reports*.

IV. DISTRIBUTION OF USERS*

*The distribution of users reported here does not include the syzygy.ca or Callysto projects. Syzygy has delivered an interactive computing service to more than 25,000 users at 22 universities. Callysto has reached more than 45,000 students and teachers.

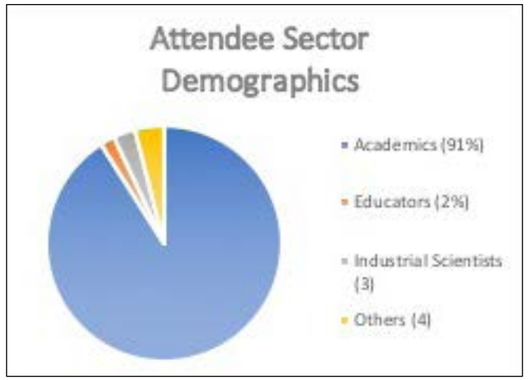
In 2019, the total number of attendees was 6,814.

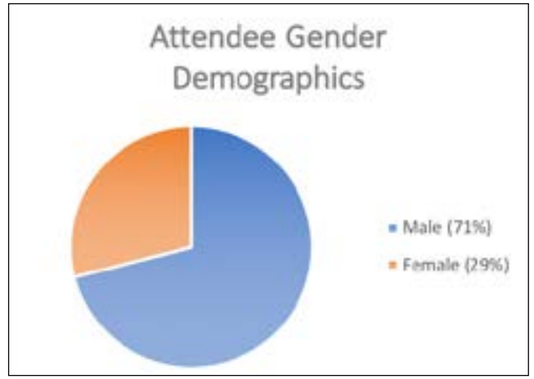
71% were from Canadian institutions, of which:

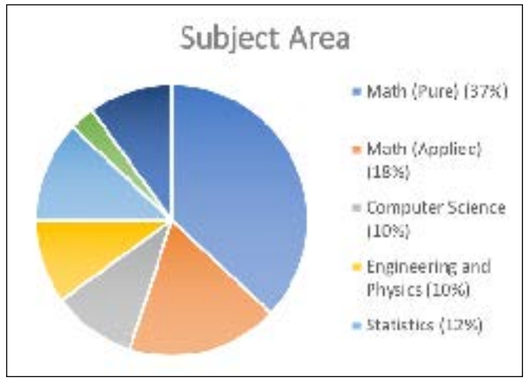
28% were from Alberta,
41% were from British Columbia,
3% were from Manitoba,
3% were from Atlantic Provinces,
20% were from Ontario and Quebec, and
5% were from Saskatchewan.

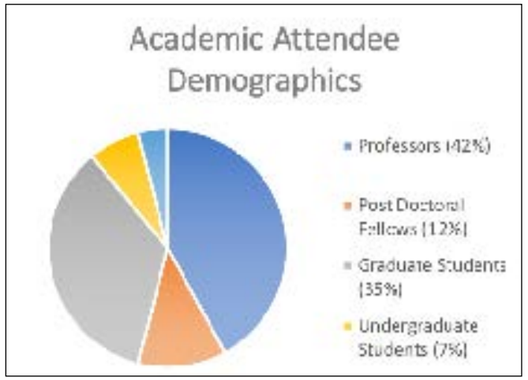
19% were from other North American institutions,

10% were from elsewhere.









V. TRAINING AND DEVELOPMENT OF HIGHLY QUALIFIED PERSONNEL

1. POSTDOCTORAL FELLOWS & CNRS/PIMS SCIENTISTS

PIMS sponsors numerous postdoctoral fellows (PDFs) – 40 in 2019, 41 in 2018 and 49 in 2017 – attracting outstanding young scientists who contribute to PIMS research programs, many of whom later become faculty members at leading Canadian universities. They are distributed throughout PIMS sites on a competitive basis. Postdoctoral candidates from institutions in France are eligible for CNRS/PIMS fellowships. In the case of CRG or Postdoctoral Training Centre in Stochastics PDFs, they are inducted into appropriate research groups. PIMS PDFs receive $25,000 per year from PIMS in salary and this amount must be matched by the site. Fellowships are for two years. PIMS Central holds yearly one-day workshops on professional development topics such as Postdoc/Grad Student Job Forum.

2. PIMS POSTDOCTORAL TRAINING CENTRE IN STOCHASTICS (PTCS)

This year PIMS held the fifth Annual PTCS Retreat at the Banff International Research Station (BIRS). The purpose of the retreat was to enable the PDFs in the program and supervising faculty to get acquainted as well as to give the young researchers an opportunity to present their work to the Western Canadian probability community.

VI. PARTNERSHIPS AND OUTREACH

1. NATIONAL

PIMS has a national mandate to support the mathematical sciences in Canada. To this end, in partnership with the Fields Institute (FI) and the Centre de Recherches Mathematiques (CRM), it has created major programs such as the Atlantic Association of Research in the Mathematical Sciences (AARMS). Together with the Mathematical Sciences Research Institute (MSRI), PIMS created the Banff International Research Station (BIRS) which is now the premier mathematical research station in North America.

PIMS coordinates with AARMS, BIRS, CRM and Fields to support a number of Canadian activities such as meetings of the societies (CAIMS, CMS and SSC), the Seminaire de Mathematiques Superieres in Montreal, and the regularly scheduled Canadian Discrete and Algorithmic Mathematics and CNTA meetings.

PIMS, together with the other institutes, invested significant resources to create the Canadian Statistical Sciences Institute (CANSSI). Joint activities have been underway for several years.

PIMS and Mitacs, a national not-for-profit research and training organization, have partnered to see graduate and postdoctoral researchers solve challenges using mathematical sciences in collaboration with industry and not-for profit organizations. Through internships, the program provides companies in Alberta, British Columbia, Manitoba and Saskatchewan with access to top mathematical scientists in order to support the development of technologies and services in all sectors. Graduate students and postdoctoral fellows will have opportunities to transfer their skills from theory to real-world application, while companies gain competitive advantages by accessing high-quality research expertise.

2. INTERNATIONAL

Part of the PIMS mandate is to establish international partnerships in order to provide mechanisms for Canadian researchers to participate in activities outside Canada and attract visitors from abroad. The establishment of the Centre National de la Recherche Scientifique (CNRS) International Research Lab at PIMS (the first in North America) has led to year-long visits by more than 38 researchers from France since 2007, fully funded by CNRS. Similarly, the leadership role played by PIMS in establishing the Pacific Rim Mathematical Association (PRIMA) has provided ample opportunities for Canadian exchanges with countries in this region. PIMS will host the next PRIMA Congress in Vancouver in 2021. Our connections with Latin America have led to joint events (Canada-Mexico meetings), as well as facilitating the existing North American partnership at BIRS, to the benefit of the entire community.

The PIMS-Germany collaboration, started in 2019, provides opportunities for students and researchers from both countries to attend meetings of mutual interest.

The PIMS-CNRS Fellowships have the goal of developing and supporting research collaborations between mathematical scientists at PIMS member universities and researchers across France. Fellowship awardees receive CAD $5,000 to facilitate long-term visits to France of at least 2 months, but preferably longer.

The PIMS-Globalink Student Mobility Program, in partnership with Mitacs, supports visits by students from Mitacs partner countries to carry out research at PIMS member universities and for Canadian students from PIMS member universities to study in Mitacs partner countries. This award provides CAD $6,000 for senior undergraduates, graduate students and postdoctoral fellows to conduct 12-24 week research projects in the host country.

3. EDUCATION AND OUTREACH

PIMS has a mandate to promote mathematics vigorously in Canada and takes upon itself the mission to help provide the elements for success that are necessary for current and future generations of teachers, scientists and engineers. In addition, the educational programs at PIMS advocate strongly for the participation of people of all backgrounds in mathematics. PIMS is actively involved in promoting mathematical outreach events in schools throughout Western Canada, either directly or through Math Mania events or Science Fairs. These involve students, teachers and parents and seek to convey the excitement of discovery and learning that underlies mathematics and its applications.

PIMS has developed partnerships with Aboriginal schools in western Canada. The activities under this program include summer camps for students and teacher training sessions.

Many teachers, especially in in elementary schools, do not have the necessary knowledge or experience to feel comfortable teaching mathematics. To address this, PIMS developed a 4-week Summer School for In-service Teachers. The goal is to create a team of teachers at each school that could foster a cultural and academic shift with respect to the learning and enjoyment of mathematics.

Colleges and universities within the BC, Alberta, Saskatchewan and Manitoba post-secondary systems that do not qualify for regular membership in PIMS may become PIMS Education Associates. The PIMS educational network allows for the exchange of successful practices in outreach, teaching, and professional development amongst its members. Currently PIMS has 17 educational associates.

The Callysto project is an important part of our education outreach. This partnership between higher education and the K-12 community promotes the teaching of computational learning.

VII. CONSULTATION MECHANISMS AND COLLABORATIVE ACTIVITIES WITH AARMS AND CANSSI

As part of a national mandate, PIMS supports mathematical activities in the Maritime Provinces in conjunction with the Atlantic Association for Research in the Mathematical Sciences (AARMS). Together they co-sponsored the following activities in 2019 (PIMS' financial contribution to each activity is listed in parentheses):

- AARMS Summer School 2019 ($16,475). Courses included: Rough Paths Theory, Fractals, q- series in Analysis and Combinatorics, and The Mathematics and Science of Chaos.
- Postdoctoral Fellow ($16,475)

PIMS also supports statistical activities throughout Canada through CANSSI. In 2019 these included:

- Postdoctoral Fellows ($140,835), Research Assistants ($74,529) and Scientific Coordinator ($56,993).
- Scientific Events ($44,731) including: Variational Analysis & Optimization, Diversity in Math, Big Data Analysis Workshop, Regression Modeling, SSC/CSSC Meetings, ICSA, IMS New Researchers Conference, and Summer School on Mathematical and Statistical Model Uncertainty.

VIII. MANAGEMENT AND BUDGETS

Resource Revenues ***(collected during the period Jan. 1 to Dec. 31, 2019)***

a)	User Fees (Registration Fees collected)	159,583
b)	Contributions from Partner Universities	
	UBC	378,354
	Simon Fraser University	80,000
	University of Alberta	77,700
	University of Calgary	67,710
	University of Victoria	66,600
	University of Saskatchewan	50,000
	University of Regina	35,000
	University of Washington	14,682
	University of Lethbridge	35,000
	University of Manitoba	50,000
	Portland State University	5,243
	UNBC	5,000
c)	Private Donations	28,558
d)	Other Contributions	
	CRM/AARMS support for Diversity in Math	11,600
	A. Adem Research Support for Arithmetic Topology	18,458
	AARMS support for Clean Energy	2,500
	UM Various Depts	8,000
	UBC Various Depts	15,710
	Other Miscellaneous	34,292
e)	Callysto Grant	107,306
f)	NSERC CTRMS Grant /Connect	1,357,611
g)	Carried Forward from Dec. 31, 2018	1,411,589
TOTAL REVENUES (Jan. 1 to Dec. 31, 2019)		**4,020,496**
	Revenue less Expenses	**963,853**

PIMS CTRMS NSERC Activity Report Jan. 1 to Dec. 31, 2019

	Use of the resource (i.e. PIMS) Paid from ALL revenue sources Jan. 1 to Dec. 31, 2019	Planned use of CTRMS funds Jan. 1 to Dec. 31, 2020
Resource Expenditures		
1) Salaries & Benefits		
a) Administrative Staff	515,596	
b) Directors & Site Directors Teaching Releases/Stipends	129,281	
c) Scientific Support Personnel	197,489	185,000
d) Postdoctoral Fellows (inc. CRG PDFs)	699,966	550,000
e) Technical/Professional Assistants (inc. Education)	39,300	
f) Graduate Students	20,015	
2) Equipment or Facility		
a) Purchase or Rental	32,504	
b) Operation and Maintenance Costs	22,029	
3) Materials & Supplies		
a) Office supplies and expenses	23,591	
4) Meetings/Collaborations/Misc. Travel		
a) PIMS Meetings (SRP, PDF, Board, Admin, Exec)	51,482	
b) Staff/PDF/Prize Winner/Globalink travel	89,598	
c) Director Research Support and Scientific Consultation	60,643	
5) Dissemination Costs		
a) Publication Costs	10,878	
b) Advertising & Networking	4,398	
6) Scientific Activities (inc. CRGs and IGTC)		
a) Conferences/Symposia	369,738	130,393
b) Summer Schools	78,735	46,000
c) Workshops/Seminars/Colloquia	207,466	72,000
d) Distinguished Visitors/Chairs/Speakers	57,318	18,000
7) Education Initiatives		
a) General activities	54,444	
b) Callysto	42,134	
8) AARMS Activities		43,000
a) Summer Schools	16,475	
b) PDF	16,475	
9) CANSSI		219,900
a) Scientific Meetings	44,731	
b) Scientific Coordinator	56,993	
c) Postdoctoral Fellow	140,835	
d) Research Assistant	74,529	
TOTAL EXPENDITURES	**3,056,643**	**1,264,293**

GLOSSARY OF ACRONYMS

PIMS	Pacific Institute for the Mathematical Sciences
AARMS	Atlantic Association of Research in the Mathematical Sciences
AMS	American Mathematical Society
BIRS	Banff International Research Station
CAIMS	Canadian Applied and Industrial Mathematics Society
CANSII	Canadian Statistical Sciences Institute
CMS	Canadian Mathematical Society
CNRS	Centre National de la Recherche Scientifique
CNTA	Canadian Number Theory Association
CRG	Collaborative Research Group
CRM	Centre de Recherches Mathématiques
IMA	Institute for Mathematics and its Applications
IPSW	Industrial Problem Solving Workshop
MMIW	Mathematical Modeling in Industry Workshops
MSI	Mathematical Sciences Institute
MSRI	Mathematical Sciences Research Institute
NSERC	National Sciences and Engineering Research Council
PDF	Postdoctoral Fellow
PRIMA	Pacific Rim Mathematical Association
PSU	Portland State University
PTCS	PIMS Postdoctoral Training Centre in Stochastics
SFU	Simon Fraser University
SFU-V	Simon Fraser University-Vancouver
SIAM	Society for Industrial and Applied Mathematics
SRP	Scientific Review Panel
SSC	Statistical Society of Canada
UA	University of Alberta
UBC	University of British Columbia
UBC-O	University of British Columbia–Okanagan
UC	University of Calgary
UL	University of Lethbridge
UM	University of Manitoba
UR	University of Regina
US	University of Saskatchewan
UV	University of Victoria
UW	University of Washington