

2018 2019 An- nual Re- port



Research Centre
**CHU
Sainte-Justine**
Mother and Child
University Hospital Centre

Université 
de Montréal

A man with glasses and a pink lab coat is smiling and holding a detailed anatomical model of a human heart. The background is a laboratory or clinical setting with shelves and equipment.

Today's research creates better care for tomorrow

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Message from the Director

Centre de recherche du CHU Sainte-Justine



Dr. Jacques L. Michaud

Dear Friends and Partners,

I am pleased to present to you the 2018–2019 annual report of the **Sainte-Justine University Hospital Research Centre** which covers the past year's major initiatives, all of which were fuelled by innovation and partnership.

In this fiercely competitive environment, we have focused on recruiting high-level researchers to reinforce our pool of expertise and position ourselves at the very forefront of the medicine of the future. Numerous recruitments have been made in different fields relating to precision medicine. Invigorated by this wave of new talent, we have set our sights on the future.

Our researchers can count on cutting-edge infrastructure to carry out projects that will change the lives of children, youth and mothers-to-be in Quebec and around the world.

Earlier this year, the pediatric rehabilitation teams moved into their new co-creation and innovation spaces following the inauguration of the Technology Centre for Pediatric Rehabilitation. Inspired by the Living Lab model, this project rallies our teams and gives them the resources they need to offer young patients and their families state-of-the-art pediatric rehabilitation care and services.

Another highlight of the last year was the creation of the Quebec Clinical Genomics Centre. The decision to locate this centre in **Sainte-Justine University Hospital Centre** is a testament to our genomics leadership in childhood genetic disorders, which is recognized by the Ministère de la Santé et des Services sociaux du Québec (MSSS). This centre will bolster the innovative work of our staff.

Research is currently undergoing transformative changes. Technological breakthroughs are revolutionizing the way we think and act. Whether these changes are fuelled by big data or artificial intelligence, they allow us to see diseases in a different light and to reach beyond the limits of traditional research.

The **Sainte-Justine University Hospital Research Centre's** aim is to become a leader in applying big data to maternal and pediatric health, not only by recruiting key talent, but also by setting up the future Centre for Mother and Child Data-Driven Science (Centre de valorisation des données sur la santé de la mère et de l'enfant). Given the immense potential of this field, we have made it a top priority.

I want to thank our institutional partners, mainly the Université de Montréal and Polytechnique Montréal, who are precious allies in the race toward excellence. I also want to thank the CHU Sainte-Justine Foundation and its dedicated members, donors and volunteers for their involvement and their trust in us. Thank you for giving us the means to achieve our ambitions. Because of you, even our biggest dreams are poised to become a reality.

A handwritten signature in black ink, appearing to read 'J. Michaud', written in a cursive style.

Jacques L. Michaud
Director of Research
Sainte-Justine University Hospital Centre

Messages from Our Valued Partners



Caroline Barbir

Caroline Barbir, Chief Executive Officer, Sainte-Justine University Hospital Centre

Sainte-Justine University Hospital Centre is the largest mother-child university hospital in Canada; our institutional goal is to continue our quest for excellence and to be among the best institutions dedicated to pediatric and maternal health in the world. As such, we give a prominent place to research. We have the great privilege of having more than 210 researchers and clinician-researchers in our midst. These, well surrounded by their research teams, work tirelessly to develop diagnostic and prognostic biomarkers as well as innovative interventions and therapies that will make the difference in the care of our patients.

We are driven by a common vision: “healthy children and mothers for a healthy future”. The **Sainte-Justine University Hospital Centre** therefore relies on the leadership of its research centre as a strategic partner to accelerate the transfer of knowledge and innovation that will have positive and tangible benefits all the way to the bedside.

Thank you for inspiring us for over 40 years!

Maud Cohen, Chief Executive Officer, CHU Sainte-Justine Foundation

In recent years, we have seen ideas come to life, and dreams come true, before our very eyes. Today, we are humbled and very proud to have contributed to these successes.

We are proud of the new building that houses the current **Sainte-Justine University Hospital Research Centre**, which facilitates collaboration among researchers and bolsters the impact of various undertakings. We are proud of the scholarship recipients and researchers recruited from all around the world, as well as the new equipment platforms that create opportunities to take research even further to deliver more precise and more effective care.



Maud Cohen

The unwavering support of CHU Sainte-Justine Foundation donors has allowed us to prepare for the technological revolution of today and tomorrow. Our donors are aware that science is advancing more rapidly than ever. They know that we are in a period of tremendous change, and they want to help by fostering even closer ties with those who are steering these changes: you!

A lot of impressive milestones were reached this year. Once again, you have shown us that there are no limits that cannot be overcome.

Your determination to improve the outlook for current and future generations gives hope to the children and mothers-to-be of **Sainte-Justine University Hospital Centre**: thank you for showing us that anything is possible.

Marie-Josée Hébert, Vice-Rector, Research, Discovery, Creation and Innovation, Université de Montréal

On behalf of the Université de Montréal, it is with great pleasure and pride that I can count the **Sainte-Justine University Hospital Research Centre** among our closest partners. The Research Centre comprises a unique set of forces promoting research excellence and discoveries to improve mother and child health. National and international impact and outreach of the **Sainte-Justine University Hospital Centre** research teams are growing. This environment plays a major role in achieving the mission of our university, in several fronts both clinical and scientific as well as training.

The application of digital intelligence to the health sector is a subject of global interest. This is why the Université de Montréal, strong in its leadership in this area, created the Digital Health Consortium to ensure coordination and exchanges between organizations throughout its network, including the **Sainte-Justine University Hospital Centre** and its research centre. We are pleased to collaborate in your efforts to recruit key researchers in the fields of digital health and digital intelligence, in partnership with IVADO, and thus continue to develop innovative and responsible leadership for the benefit of health in all stages of life.

We will continue to support your endeavours and contribute to the development of the Research Center and its strategic vision towards precision health in pediatrics.



Marie-Josée Hébert

Overview of the Research Centre

Ensuring the Health of Children and Mothers-to-Be

From research findings to clinical care

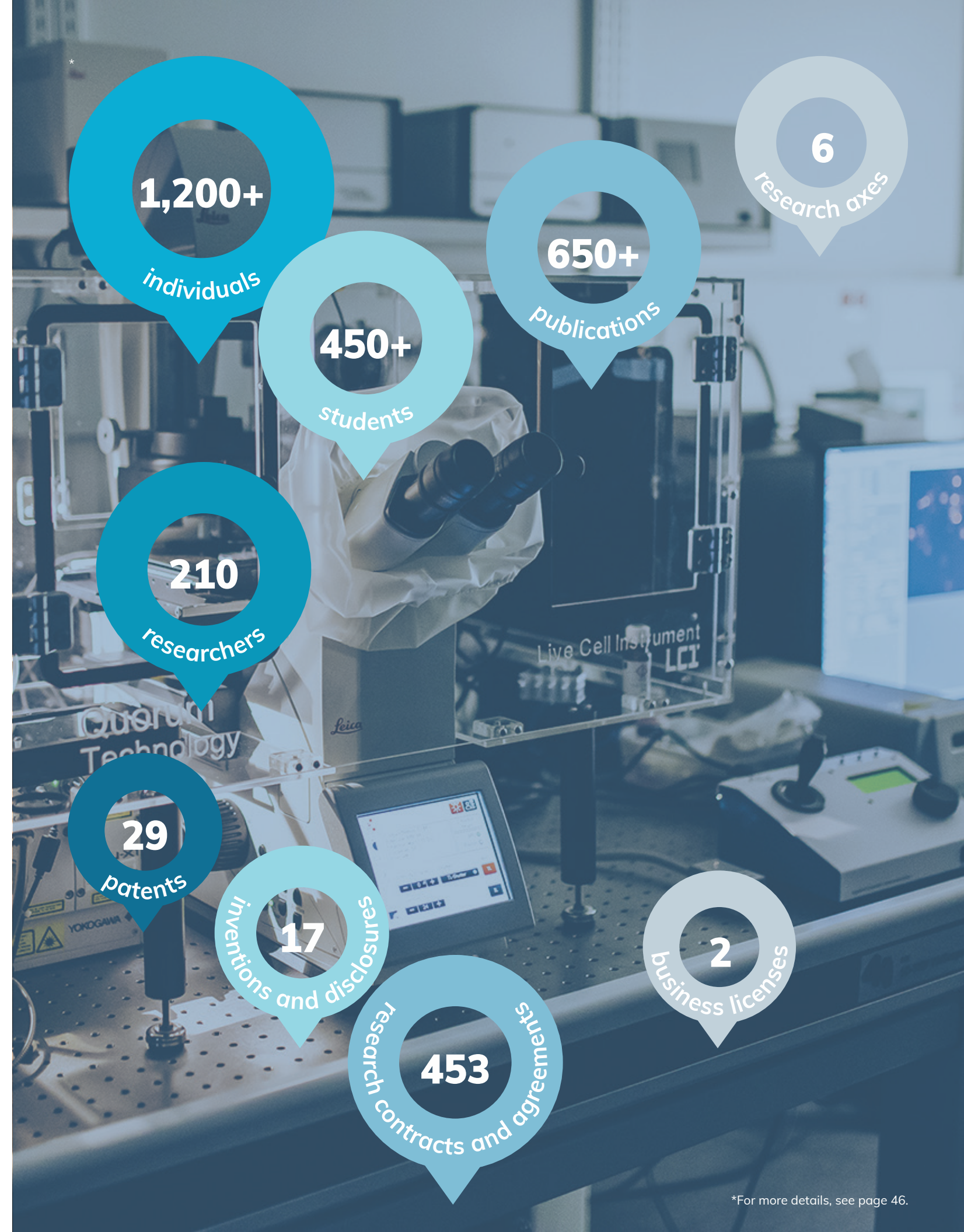
Driven by a passion for excellence, we are committed to making Quebec into a place where the health of mothers-to-be, children and youth ranks among the best in the world. With this in mind, we are intent on advancing knowledge and applying new research findings in order to translate new discoveries into more efficient and less invasive methods and devices aimed at disease prevention, diagnosis, prognosis, treatment and long-term follow-up starting at conception and continuing throughout the journey to adulthood.

In recent years, various sources of government and philanthropic funding have paved the way for new leading-edge infrastructure and the development of large-scale national and international networks, cementing our leadership with regard to innovative, multidisciplinary research in mother-and-child health in Quebec.

Bursting with talent

The **Sainte-Justine University Hospital Research Centre** (Research Centre) boasts a team of over 1,200 individuals, made up of more than 210 researchers (including more than 90 clinicians) and 450 graduate and postgraduate students in a variety of areas of expertise. Working closely with **Sainte-Justine University Hospital Centre's** (Sainte-Justine) healthcare teams, we are dedicated to basic, clinical and translational research across **six research axes**:

- Brain and Child Development
- Immune Diseases and Cancer
- Infectious Diseases and Acute Care
- Fetomaternal and Neonatal Pathologies
- Metabolic and Cardiovascular Health
- Musculoskeletal Health, Rehabilitation and Medical Technologies



Innovation

Fuelling Innovation
to Drive Ideas

Technology Centre for Pediatric Rehabilitation

Far more than a centre of excellence, the centre embodies a better future for Quebec's children and families

Launched in April 2019, the **Technology Centre for Pediatric Rehabilitation** is a world-class facility that brings patient care, research, partnerships, teaching, technology assessment and innovation together all under one roof.

More than a dozen researchers operate within the technology centre, thus forming a veritable rehabilitation powerhouse. The cohabitation of this wide range of expertise is vital to optimizing the autonomy and well-being of young patients with a motor or language impairment in order to help them play an active part in society, achieve a better quality of life and transition to adulthood.

The three main themes are:

1. Musculoskeletal and neuromuscular disorders

Dr . Carl-Éric Aubin, assistant director of research at the technology centre, is a specialist in spine biomechanics. His research in orthopedic engineering bears in part on biomechanics and the computer-assisted design and manufacturing of orthotics to treat scoliosis. His work has led to the development of a simulator to aid in designing orthopedic braces that are optimized for effectiveness and comfort.

Dr. Laurent Ballaz specializes in biomechanical analysis, adapted sports and quantified gait analysis. His research consists in assessing the impact of physical exercise on the functional level of children with motor impairments, particularly in cases of cerebral palsy. He is an expert in developing training programs for patients with motor disorders and in assessing the impact of swimming and active video games on rehabilitation.





Dr. Mickaël Begon works on rehabilitating musculoskeletal disorders of the shoulder and walking function using biomechanical tools such as motion analysis and the examination of the peripheral nervous system (electromyography). His work has led to the design of an innovative dynamic shoulder orthosis, as well as recommendations for individualized rehabilitation protocols to treat patients.

Dr. Carole Fortin is interested in muscle function, balance and brain activity associated with posture-movement coordination in children and youth with neurological and musculoskeletal impairments. She has developed clinical assessment tools and therapeutic intervention models in rehabilitation to improve the quality of life of young patients with idiopathic scoliosis, craniocerebral trauma or cerebral motor deficiencies. She actively participates in knowledge sharing with clinicians.

Dr. Maxime Raison is interested in the quantification of joint and muscle efforts in youth with a cerebral motor deficit, a neuromotor disorder or scoliosis. He has developed new assessment and rehabilitation tools that leverage engineering solutions to address clinical needs, from methods to measure muscle forces to improvements in robotic arms in rehabilitation.

Dr. Martin Lemay's main research interests lie in the assessment of postural control and intervention methods to improve balance in children with cerebral palsy or a neuromuscular disease. In recent years, he has shifted his focus to the use of dance in a therapeutic setting to improve motor, cognitive and psychosocial functions in children and youth with motor impairments.

Dr. Marie-Lyne Nault's major topic of interest in pediatric orthopedics is sports medicine, in particular ankle ligament injuries. She has also led projects on tears of the cruciate ligaments of the knee and on the validation of questionnaires.

2. Psychosocial development

Dr. Jérôme Gauvin-Lepage is interested in the social participation of children and youth who have suffered neurotrauma, as well as interventions that promote the resilience of their relatives using a humanistic care approach.

Dr. Marie Laberge has developed programming for youth who are transitioning from school to active participation in the workplace by leveraging her expertise in ergonomics, occupational therapy and work disability prevention. She is particularly interested in creating conditions to facilitate the workplace integration of youth with disabilities, learning difficulties or adaptation problems, specifically by devising interventions to promote vocational skill development and occupational health.

Dr. Paula Rushton's projects focus on measurement, intervention, knowledge translation and education related to wheeled mobility of both children and adults through an improved wheelchair service provision process. She is particularly interested in wheelchair skills and wheelchair confidence as well as the development of intelligent power wheelchairs.

3. Communication disorders

Dr. Lucie Ménard is an expert in clinical phonetics, biomechanics of speech, speech production and perception, and sensory deprivation. She is interested in cognitive robotics and speech development, as well as the role of sight and hearing in speech production and perception. Her research has led to the development of innovative tools to assist speech language pathologists and second language learners.

Dr. Douglas Shiller performs multidimensional analyses of speech production and perception in children and has a particular interest in stuttering. Using acoustic and kinematic measures, he explores sensory and motor deficits that may contribute to development speech disorders.

Role of precision and preventive medicine in promoting pediatric health

Sainte-Justine is responsible for diagnosing and treating more than half of children with genetic diseases or cancers in Quebec and provides care to a large number of patients. The principal objective targeted by all six axes of the **Research Centre** is to develop more precise diagnostic tools and more effective, personalized therapeutic approaches to treat pediatric illnesses.



Dr. Étienne Caron

Recruiting key new talent to accelerate the development of innovative healthcare solutions

Dr. Étienne Caron joined forces with the **Research Centre** in September 2018. During his studies at the Université de Montréal, the EMBL/CRG Systems Biology Research Unit (Spain) and the Institute of Molecular Systems Biology (Switzerland), he not only developed extensive expertise in the development of new mass spectrometry approaches to study the complexity of the human immune-peptidome, but he also became a world leader in the field, founding and chairing the Human Immuno-Peptidome Project, an international initiative bringing together top leaders in mass spectrometry and immunology.

His goal is to **advance the field of cancer immunotherapy by developing and applying next-generation mass spectrometry technologies to study the proteome and immunopeptidome of cancer and immune cells in different types of cancers, in particular melanoma and acute myeloblastic leukemia.** He has received funding from the Fonds de recherche du Québec – Santé (FRQS) (Research Scholar, Junior 1), the John R. Evans Leaders Fund from the Canadian Foundation for Innovation (CFI) and the Cole Foundation.

Dr. Alexandre Dubrac joined the **Research Centre** in September 2018. He completed his doctoral studies at the University of Bordeaux I (France) and his postdoctoral studies at the Yale School of Medicine (U.S.). He **studies the molecular and cellular mechanisms of angiogenesis during development and in ischemic diseases.**

These issues have major implications for a range of conditions, including the formation of the blood-brain barrier, eye disorders, pulmonary hypertension and vascular malformations. His initial focus will be on the retina, but he also intends to investigate the signals governing blood vessel formation in other organs, in particular the kidney, heart and brain. He has received funding from the FRQS (Research Scholar, Junior 1) and the Canadian Institutes of Health Research (CIHR).

Artificial intelligence and big data

Emerging technologies that are revolutionizing medicine

Dr. Vincent Ferretti joined the **Research Centre** in June 2018 as part of a partnership with IVADO (the Institute for Data Valorization), Génome Québec and the Université de Montréal Faculty of Medicine. Before joining the **Research Centre**, he was principal investigator and director of genome informatics at the Ontario Institute for Cancer Research (OICR) in Toronto, where he participated in many large-scale international projects in cancer genomics. He led infrastructure development for the International Cancer Genome Consortium (ICGC), the NCI Genomic Data Commons and the Cancer Genome Collaboratory. During this same period, he was the co-director of the Maelstrom Research program in epidemiology at the Research Institute of the McGill University Health Centre (RI-MUHC).

His research interests lie in the **development of new bioinformatic methods and software that aim to identify and characterize genetic variations causing diseases.** His team develops advanced informatics tools for processing, searching and visualizing at-scale genomic data in cloud-based computer environments and is currently building various clinical and research assets, including the NIH-supported Gabriella Miller Kids First Data Resource Center (Children's Hospital of Philadelphia) and the Quebec Genomic Data Centre.

Centre for Mother and Child Data-Driven Science

Guided by the expertise of **Drs. Vincent Ferretti and Philippe Jovet**, the **Research Centre** has set its sights on creating a big data centre focusing on maternal and child health, which will lead to huge strides in pediatric precision medicine through the development of innovative data analysis approaches, software and calculations. This new centre will be able to leverage all of the data available within our organization, including data of a clinical, research, administrative and financial nature. The ultimate goal of this endeavour is to develop diagnostic and prognostic tools and interventions that will improve the health of children and mothers-to-be in Quebec and around the world.

This big data centre, which will serve as a one-stop portal for researchers, clinicians and managers, has the **following objectives:**

- **Create and run a research discovery and data sharing platform** that integrates and harmonizes large datasets from multiple clinical and specialized research databases.
- **Develop a synergy** between the centre's software developers, data scientists and AI team.
- **Develop concrete clinical applications** through academic and industry partnerships.

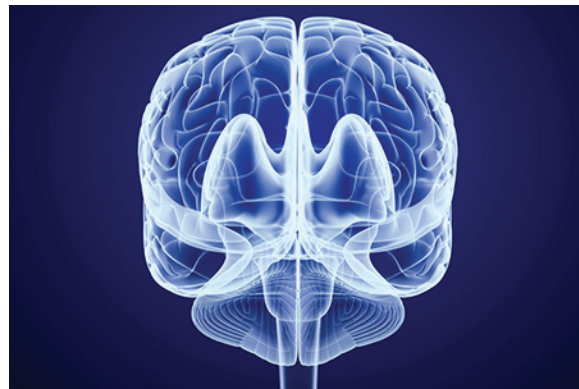
Breakthroughs

New therapeutic targets and more accurate diagnoses

Major advances in Rasmussen's encephalitis

Rasmussen's encephalitis, also known as Rasmussen syndrome, is a rare and devastating inflammatory brain disease that can lead to the destruction or removal of a part of the affected child's brain. Through experiments on humanized mice, the team of **Dr. Elie Haddad**, in collaboration with Dr. Alexandre Prat from the Centre hospitalier de l'Université de Montréal (CHUM), has proven that the disease is autoimmune, meaning that it attacks patients using their own immune system. The results have been published in the *Journal of Clinical Investigation*.

The team also proved that experimenting on humanized mice allows for a more accurate diagnosis of this disease. This is especially helpful since there are no biological markers for Rasmussen's encephalitis, which makes diagnosing it difficult in certain children. These models can also be useful for testing various treatments to determine the best one for each individual patient.



To create these humanized mice, the team introduced immune cells from patients with Rasmussen's encephalitis into the mice. Because the mice do not have an immune system, they are unable to reject the cells. The team then observed the mice, which developed the same symptoms as the patients, that is, violent convulsions and brain necrosis. Biopsies of the mice's brains revealed immunological damage that was practically identical to that in human patients, thus proving the disease's immunological origins.

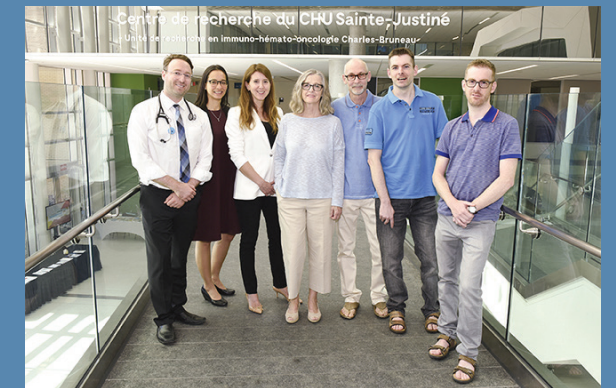
The hope inspired by this research on humanized mice stems from the newfound possibility of using these animals for making diagnoses as early as possible and selecting the best treatment for each patient. If they receive the proper treatment early, it is possible to avoid the cognitive decline brought on by the disease and forestall the need for brain surgery.

Discovery of a new gene associated with a rare childhood movement disorder

Primary dystonia, a neurological disorder diagnosed in children that is characterized by painful, involuntary muscle contractions, affects approximately 300,000 people in North America. Treatment options have traditionally been limited. Though the underlying cause of the muscle contractions remains poorly understood, an international team of researchers has discovered a new gene thought to be responsible for the complex disorder: a recessive mutation in the VPS13D gene. The findings of this study, led by **Dr. Philippe Campeau**, in collaboration with Drs. **Inge Meijer** and Guy Rouleau, were published in the *Annals of Neurology* in 2018. This discovery paves the way to new avenues for treatment and a better understanding of the underlying mechanisms of the disorder.

With the support of an international network of clinicians and researchers who share an interest in the same genes and conditions, the research team was able to identify four other families whose children were affected by muscle dystonia and mutations in the VPS13D gene. These similar observations in five unrelated families supported the starting hypothesis. The team was also able to observe other movement disorders in these patients, including a slow neurological deterioration before age 12, suggesting the involvement of the VPS13D gene. This clinical and genetic evidence led the researchers to consider mutations in the VPS13D gene to be the cause of a progressive neurological disorder characterized by a delay in motor developments and movement disorder.

From now on, clinicians and healthcare professionals will be able to consider this gene when diagnosing not only primary dystonia, but also other childhood-onset movement disorders, such as Leigh syndrome, spastic paraparesis and spastic ataxia.



Dr. Philippe Campeau, Dr. Inge Meijer, Julie Gauthier, PhD, Richard family

Cannabis

The long-term consequences of recreational cannabis use

Early age of cannabis use onset and the risk of addiction

A study led by Dr. Natalie Castellanos Ryan and published in the *Canadian Journal of Psychiatry* has established a **link between the age of onset of cannabis use and the risk of drug abuse later in life**. The study found that youth who started smoking marijuana in early adolescence had a 68% risk of having a drug abuse problem at the age of 28, and that the risk fell to 44% for those who began smoking marijuana between the ages of 15 and 17.

According to the research findings, the younger the youth were when they started using cannabis, the more likely they were to have a drug problem in adulthood. Although this depended, in part, on the frequency with which they consumed cannabis and other drugs, those who started before age 15 were at higher risk regardless of how often they consumed.

In light of the finding that early-onset cannabis use, between ages 13 and 15, increases the odds of developing a drug problem later in life, the researchers stressed that it is all the more important to prevent or reduce cannabis use as early as possible.

Cannabis and vulnerability to psychosis

A study led by Dr. Patricia Conrod in the *JAMA Psychiatry* showed for the first time that **onset or increase in cannabis use in any given year during adolescence predicted increases in psychotic symptoms that year or one year later**. These relationships could not be accounted for by any pre-existing common vulnerability to cannabis use or psychosis proneness.

These findings demonstrate that the link between cannabis and vulnerability to psychosis can be observed at a population level and not only in individuals at risk for psychosis. The team's analyses showed that cannabis use always preceded an increase in psychotic symptoms, but psychotic symptoms rarely preceded increases in cannabis use.

Although the team showed an effect only on psychotic symptoms and not on transition to major psychiatric conditions, elevated and persistent psychotic symptoms are associated with an increased risk for psychotic disorders, such as acute psychotic episodes, bipolar disorders and schizophrenia.

These findings may suggest that effective prevention of cannabis use could potentially reduce the risk for major mental health conditions in the population, but this must be further investigated.

Teen cannabis use not without risk to cognitive development

A second study led by Dr. Patricia Conrod published in the *American Journal of Psychiatry* showed that, beyond the role of cognition in vulnerability to substance use, the **concurrent and lasting effects of adolescent cannabis use can be observed on important cognitive functions and appear to be more pronounced than those observed for alcohol**. The study showed that vulnerability to alcohol and cannabis use in adolescence was associated with generally lower performance in all cognitive domains.

Further increases in cannabis use, but not alcohol consumption, showed additional concurrent and lagged effects on cognitive functions, such as perceptual reasoning, memory recall, working memory and inhibitory control. Some of these effects are even more pronounced when consumption begins earlier in adolescence.

Toward a better understanding of cannabis

With the legalization of cannabis has come a series of rules designed to protect users from harm. The standard is based on the notion of "potency" which, in the current legislation, is not associated with the pharmacodynamic concept rooted in the theory of receptors, but rather to the proportion of delta-9-tetrahydrocannabinol (THC) in cannabis extracts or dried flowers.

The definition of potency is at the core of a national risk prevention program. Controlling levels of THC in cannabis products was initially seen as a public policy matter; however, by

focusing solely on THC levels, we ignore the possibility that other factors may also be the root cause of the harmful effects of cannabis. The goal of Dr. Graciela Piñeyro's team is to **create a translational chain of analysis that can assess the harmful potential of cannabis products**.

Teenagers are at a particularly high risk of experiencing the harmful effects of cannabis, including addiction, anxiety, depression and neurological impairments that are similar to those found in people with schizophrenia, autism and mood disorders. These disorders are associated with changes in the cellular phenotypes that lead to dysfunctional cortical activity.

Her team is building on this knowledge to characterize the effects of cannabinoids on different cells in the frontal cortex of adolescents using mouse models. The team have found that repeated exposure to THC, synthetic cannabinoids or cannabis extracts reduces the mitochondrial respiratory chain complexes in the neurons and microglia of this area of the brain.

The team is currently interested in using gene expression downregulation of cortical respiratory complexes as a preclinical *in vivo* criterion for potential cannabis-induced damage to the frontal cortex in order to develop an *in vivo* strategy for screening cannabis products with the potential to produce this type of cortical damage.

By correlating the distinct *in vivo* cortical effects of different products to *in vitro* pharmacodynamic measures, the team will produce a preclinical chain to identify the cannabis extracts that are the most likely to harm cortical neurons and glia.

Awards and Distinctions

Recognition of Our Researchers' Expertise

Three Canada Research Chairs to support excellence and innovation



Dr. Miriam Beauchamp

Miriam Beauchamp to become Canada Research Chair in Pediatric Traumatic Brain Injury (Level 2)

Dr. Miriam Beauchamp is investigating the cognitive and social consequences of pediatric brain injuries and trying to determine how to predict outcomes. She is also exploring what changes occur in the integrity of the brain during a traumatic brain injury (TBI) and how individual psychological (e.g., stress) and biological (e.g., genetics) predispositions affect a person's recovery. These findings will inform the development of immersive, technological, game-based treatment tools that are engaging for young people.

Dr. Beauchamp has been recognized by the International Brain Injury Association (IBIA) with the **Early Career Investigator Award**, which is given to an early-career scientist for their important contributions to neuropsychology research.

Sylvain Chemtob renews his Canada Research Chair in Translational Research in Vision (Level 1)

Dr. Sylvain Chemtob has focused his research on the mechanisms involved in ischemic retinopathy, in particular retinopathy in premature babies, which is the leading cause of blindness in children, as well as other conditions that lead to inflammation, including preterm labour. His work has also shed light on the processes involved in macular degeneration.



Dr. Sylvain Chemtob



Dr. Patricia Conrod

Patricia Conrod to hold a Canada Research Chair in Preventative Mental Health and Addiction (Level 1)

Dr. Patricia Conrod studies the biological, personal and cognitive risk factors associated with the development and maintenance of drug abuse, as well as the factors that mediate the co-occurrence of addictive behaviours with other mental disorders. Her experimental research focuses on factors that make people more susceptible to seeking out behavioural reinforcement from habit-forming drugs.

Her research on prevention-based interventions against addiction in adolescence has been cited in the U.S. Surgeon General's Report on Addiction, as well as in reports by the United Nations Office on Drugs and Crime (UNODC) and the joint publication by the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Health Organisation (WHO) and the United Nations Office on Drugs and Crime (UNODC) on evidence-based addiction prevention responses.



Dr. Richard E. Tremblay

Richard E. Tremblay promoted to Officer of the Order of Canada

Dr. Richard E. Tremblay, Professor Emeritus at the Université de Montréal, has been promoted to **Officer of the Order of Canada** for his **scientific contributions to psychology and psychiatry as a child development specialist**.

In 2017, Dr. Tremblay was the first Canadian to receive the Stockholm Prize in Criminology, which is awarded by the Queen of Sweden.

An honorary doctorate from Aix-Marseille University for Carl-Éric Aubin

Dr. Carl-Éric Aubin has received an **honorary doctorate** from the prestigious Aix-Marseille University for his outstanding career achievements and contributions to science.

His research focuses on the **study and biomechanical modelling of the spine for different pathological deformities (scoliosis, spondylolisthesis) and degenerative conditions (sacroiliitis, postural problems), as well as the assessment, design and optimization of orthopedic treatments (braces, surgical instruments, implants) to make them more effective and less invasive.**



Dr. Carl-Éric Aubin

Caroline Quach-Thanh, FRQS Research Scholar Emeritus

Her research interests lie in **immunization as well as a broader understanding of the risk and prevention factors for nosocomial (health care-associated) infections and the prevention of antibiotic resistance**, in particular in vulnerable populations (premature babies, immunocompromised individuals, individuals with cystic fibrosis).

Due to the antivaxxer movement and its impact on public health, her expertise on the subject has received a great deal of media attention in an attempt to set the record straight. Among the programs she has appeared on is the popular Radio-Canada TV show *Tout le monde en parle*.



Dr. Caroline Quach-Thanh

ERA-NET NEURON: A high success rate International cooperation projects

ERA-NET NEURON JTC 2018 (Mental Disorders)

Some £12.3 million has been allocated to 14 transnational research consortiums under the umbrella of NEURON JTC 2018 (Mental Disorders). In total, 62 research groups from 11 European countries, Canada and Israel have collaborated on these projects. **Of the 14 projects funded, two have been carried out in partnership with researchers from our Research Centre:**

- **ADORE Project** aims to describe the neural and cognitive functions involved in adolescent-onset depressive symptoms and their impact on the transition to major depression and treatment response. This will lead to novel cognitive and/or neural intervention components for at-risk youth, using a targeted and neurodevelopment-oriented framework. **Dr. Patricia Conrod** is involved in this project, which is a joint undertaking of researchers in Canada, France, Italy and Romania.
- **DECODE! Project** aims to develop preclinical models to study the cell- and circuit-specific effects of CDH13 deficiency. **Dr. Graziella Di Cristo** is involved in this project, which is the result of a collaboration between Germany, Canada, France and the Netherlands.



Dr. Sébastien Jacquemont

ERA-Net for Research Programmes on Rare Diseases (ERA-Net E-Rare)

- **RAinRARE Project:** The main objective of this endeavour is to achieve a better understanding of the underlying mechanisms of rare progressive motor and cognitive impairments associated with mutations in retinoic acid receptor beta (RAR-beta). This project, led by **Dr. Jacques L. Michaud**, is the result of a collaboration between Canada, France and Switzerland.

Funding from the prestigious National Institutes of Health

Dr. Sébastien Jacquemont has received funding from the **National Institutes of Health (NIH)** for two projects:

- **NIMH CAMP (CNVs and Major Psychopathology):** Project on rare genetic variations, such as copy number variations (CNVs), that are strongly associated with psychiatric disorders and could provide a lens through which to study the underlying mechanisms of these conditions.
- **The International Consortium on Brain and Behavior Copy Number Variants (IBBC-CNVs)** is the collaborative endeavour of nine institutions with complementary experience and expertise in phenomics and genomics. Adopting a “genetics first” approach for identifying patients based on known homogeneous genetic etiologies will make it possible to overcome obstacles raised by the genetic and phenotypic complexities of idiopathic neuropsychiatric developmental disorders.

New recruits to solidify our expertise in clinical research

<p>Brain and Child Development</p>	<p>Dr. Baudouin Forgeot d'Arc is a psychiatrist and holds a doctorate in neuroscience from the Université Pierre-et-Marie-Curie (France, 2019) and a fellowship in psychiatry at Université Paris Diderot, Hôpital Universitaire Robert-Debré (France).</p> <p>His work centres on social influence, the social judgment of faces, gaze direction detection and theory of mind, based on behavioural experiences, visual attention analysis and brain imaging. Dr. Forgeot d'Arc also contributes to research designed to identify the genetic causes of autism.</p>
<p>Infectious Diseases and Acute Care</p>	<p>Dr. Laurence Ducharme-Crevier earned her medical degree from the Université de Montréal in 2008 and undertook a residency in critical care at Sainte-Justine from 2011 to 2014. She then did a pediatric neurocritical care fellowship at Northwestern University in Chicago. An intensivist at Sainte-Justine since 2016, she also holds a master's degree in biomedical science, with a major in clinical research, from the Université de Montréal.</p> <p>Her research looks into the role that sleep plays in critical care and its effects on the recovery process. In addition to this, she is also the lead on a project focusing on heart rate variability and the prevention of secondary injuries. Her goal is to help reduce the psychological distress in families with a child who has undergone severe trauma.</p>



Dr. Geneviève Du Pont-Thibodeau graduated from the Université de Montréal medical school in 2008. After completing a pediatric residency at the Montreal Children's Hospital (McGill University), she specialized in pediatric critical care at **Sainte-Justine**. With master's degree in biomedical science followed by a fellowship in pediatric neurocritical care at the Children's Hospital of Philadelphia.

Her research deals with transfusion medicine, brain protection during intensive care and the development of a clinic to provide follow-up care for young survivors of a critical disease.

Dr. Niina Kleiber obtained her medical degree from the University of Lausanne (Switzerland) in 2002. This was followed by a pediatric residency at Lausanne University Hospital. She then attended the Université de Montréal to complete a master's degree in biomedical science. She subsequently earned a PhD in clinical pharmacology at Erasmus University in the Netherlands, where her thesis focused on the use of analgesedatives in pediatric intensive care.

In her capacity as a clinical pharmacologist, Dr. Kleiber is working toward the personalization of pharmacology. **Her research program primarily explores how pain is treated, especially in terms of the rationale used to determine the dosage and means of administration of analgesic drugs.**

Dr. Nathalie Orr Gaucher completed her training in pediatric emergency medicine at the Université de Montréal in 2010. She followed this up with a PhD in biomedical science in 2016, during which she specialized in bioethics. She is a member of the clinical ethics bureau of the Université de Montréal Faculty of Medicine. She is also in charge of the ethics workshops provided to specialty residents and serves on the **Sainte-Justine** Clinical Ethics Unit.

Her particular research interests are **healthcare partnerships, teaching of clinical ethics, narrative ethics, palliative care and pediatric emergency medicine, and anxiety and pain in emergency situations.**

Fetomaternal and Neonatal Pathologies

Dr. Ramy El-Jalbout was awarded his medical degree from the American University of Beirut in Lebanon in 2004. He subsequently did his residency in pediatric radiology, followed by a fellowship in the same specialty at the Alberta Children's Hospital. He then completed a master's degree in biomedical science and clinical research at the Université de Montréal, where his thesis explored the potential of vascular elastography in detecting heart disease in children.

His research interests include the **thickness of carotid artery intima-media, liver imaging, elastography and the imagery of the consequences of obesity in children.**



Dr. Geneviève Du Pont-Thibodeau

Key Achievements and Partnerships

Teaming Up to Make a Difference

Creation of the Quebec Clinical Genomics Centre

On August 19, 2018, the **Ministre de la Santé et des Services sociaux du Québec** announced the creation of the **Quebec Clinical Genomics Centre** on site at **Sainte-Justine** to meet the current and future needs of the healthcare system in terms of providing personalized solutions to treat rare diseases and cancers. “The creation of the Quebec Clinic Genomics Centre will help us pool Quebec genomics expertise and know-how to help patients. This initiative will support our efforts to help develop personalized medicine and, at the same time, generate significant savings by performing analyses within our own network rather than sending them outside of Quebec,” said the minister.



The Centre will be an important component of the new **Réseau québécois de diagnostic moléculaire** (Quebec Molecular Diagnostics Network) which will include organizations responsible for supraregional medical biology clusters and Génome Québec. The creation of this network will bring hope to thousands of people living with rare genetic diseases or cancer. The collaborative efforts will make it possible to expedite the development of personalized medicine.

Fast, accurate diagnostics are the key to developing strategies aimed at preventing and managing disease and to building a better future for our patients.

In addition to benefiting the entire healthcare system, this positioning will strengthen Quebec’s leadership in the international arena for molecular diagnostics and personalized health care.

Creation of North America’s first Mother and Child Infectious Diseases Centre

Transmitted from mother to child during pregnancy or immediately after birth, infections caused by viruses or bacteria such as HIV, hepatitis B and C, cytomegalovirus (CMV), rubella, syphilis and Zika, pose multiple challenges for obstetric gynecologists and pediatricians.

To provide more effective care for mothers, children and youth at risk or suffering with these infections, **Sainte-Justine** will open North America’s first **Mother and Child Infectious Diseases Centre (CIME)**, co-run by **Dr. Isabelle Boucoiran** and **Fatima Kakkar**. The centre groups together in a single location all of **Sainte-Justine**’s experts involved in treating mothers and children either at risk or afflicted with congenital infections.

Leading expertise

Sainte-Justine is recognized nationwide for the excellence of care and services provided in the field of materno-fetal infections. Materno-fetal infections are here to stay, with others likely to emerge in the future. By pooling our strengths and resources from the triple standpoint of care, research and teaching, we will be in a better position to step up prevention and avoid transmission from mother to child. We should also be able to provide for the early detection of greater numbers of cases and implement care and service strategies based on leading-edge knowledge.

CIME seeks to become an authority in the field of materno-fetal infections for all matters pertaining to care, prevention, research and teaching. The centre will endeavour to develop closer ties with professionals from across the healthcare network in Quebec, while enhancing the sharing and transfer of knowledge.





MUSCO

For a better quality of life for patients and their families

The MUSCO Initiative is a collaborative approach spearheaded by **Sainte-Justine** and its **Marie Enfant Rehabilitation Centre (CRME)**, the Montreal Children's Hospital and Shriners Hospitals for Children – Canada, thanks to a generous \$10-million donation from the Mirella & Lino Saputo Foundation. It aims to revolutionize patient management and care to help children with musculoskeletal disorders requiring complex care and offer more support to their families. **This collaboration will make it possible to:**

- **Re-evaluate procedures and tools** to facilitate a patient's trajectory through our four institutions and to improve the patient experience
- **Recruit key people** (patient navigator) to accompany patients and their families ensuring they receive the right care, at the right time and at the right place
- **Build infrastructure and buy state-of-the-art medical equipment and technology** enabling patients in our system access to the best and latest care and diagnostic techniques
- **Create spaces encouraging innovation and discussion** to share best practices and develop new protocols
- **Organize events and help centres** to offer patients and families the best information possible
- **Train medical professionals** to offer a better bedside manner
- **Include patients and families** as partners.



Angélique and Dr. Stefan Parent

Host of the 2nd Provincial Congress of Mother-Child Research

Quebec's four major pediatric research centres came together at **Sainte-Justine** for the 2nd Provincial Congress of Mother-Child Research on May 24 and 25, 2018. More than 220 researchers, students, laboratory workers and clinical research nurses took part in the two-day event to learn from one another, become familiar with various research areas and work to improve the future of children and mothers-to-be across Quebec.

The carefully developed scientific program shed light on the most recent data on clinical care and mother-and-child research at the clinical and molecular levels, including mouse models. The various oral and poster presentation sessions and directed workshops showcased the latest research breakthroughs aimed at improving diagnosis, prognosis, therapeutic approaches and findings for children, youth and mothers-to-be.

Our sincere thanks go out to the provincial organizing committee from the **Sainte-Justine**, CHU de Québec, CHU Sherbrooke and MUHC research centres, as well as the Foundation of Stars, which made it possible for us to present six presentation awards to some very talented students.

We are pleased with the success of the event and we hope that it was a source of interesting ideas and networking opportunities for one and all.

Night Lab – Forest of Mysteries

For the third year in a row, the **Research Centre** welcomed over 850 “night owls” to the **Night Lab – Forest of Mysteries**, as part of the Nuit blanche à Montréal event, presented in collaboration with Casino de Montréal and organized by MONTRÉAL EN LUMIÈRE.

Healing hearts one cell at a time: A dream on the verge of coming true

Guests immersed themselves in the world of cardiovascular genetics in Dr. Gregor Andelfinger's lab. His research team is studying the genetics of congenital heart disease in an attempt to better understand normal and abnormal heart development at the molecular level and to develop innovative treatments for children and adults with congenital heart diseases. This was also a unique opportunity to observe a thin section of heart tissue under a microscope.

And that's not all! Participants of all ages were encouraged to become researchers for a night, testing our lab tools, trying to outsmart the emotion reader, examining banana DNA, measuring the electrical activity in the brain and taking part in many more exciting and educational activities.



Congratulations to the winner of the photo contest, **Silvana Jananji**, MSc, from Dr. Gilles Hickson's laboratory, for her captivating look at HeLa cells used in cancer research.

Academic Achievements

The Leaders of Tomorrow

Spotlight on...

Gabriel Dayan: Featured in *La Presse* as the “Person of the Week”

At the tender age of 14, **Gabriel Dayan** had already earned top honours at the Expo-sciences provincial science fair when he put forward the idea that cells could be modified to generate an immune response to an attack by cancer and other cells. A few months later, he walked into **Dr. Elie Haddad**'s lab at **Sainte-Justine** to start working on a research project related to this very subject. Under Dr. Haddad's supervision, he spent several years developing an immunotherapy model for cancer patients – and was awarded the silver medal at the 2018 Canada-Wide Science Fair. The project entailed genetically modifying a patient's immune cells, reinjecting them into the body to fight the cancer and then making sure these injected cells could self-regenerate. Gabriel is now a medical student at the Université de Montréal and hopes to further his research in the years to come. He was voted *La Presse*'s “Person of the Week” in May 2018.

Mathieu Nadeau-Vallée named to the Canadian Medical Hall of Fame

Mathieu Nadeau-Vallée was still in school when he started making a name for himself in Canadian and international research circles. He has a bachelor's degree in biomedical science and a PhD in pharmacology from the Université de Montréal. His research in preterm birth, under the supervision of **Dr. Sylvain Chemtob**, has helped to synthesize the RYTVEL molecule to prevent or slow the inflammation of the uterine lining, a condition that can alter fetal organ development and result in premature birth.

His PhD work earned him the **Jim Glionna Award**, one of the most prestigious honours given out by the Canadian Medical Hall of Fame. This award is presented to graduate-level medical students who show leadership and perseverance and whose efforts are helping to advance healthcare knowledge.



Mathieu Nadeau-Vallée

Aymeric Guy interviewed by *La Presse* +

Aymeric Guy is a PhD candidate in Polytechnique Montréal's biomedical engineering program, which comprises an international studies component. His mission is clear: he wants to improve orthopedic braces for young scoliosis patients. He is very passionate about the development of this type of brace and, as such, chose to work with **Dr. Carl-Éric Aubin**, who is widely respected for his expertise in the field, as well as his methodical approach and the freedom he gives his students to pursue their research interests. A recipient of a scholarship from the TransMedTech Institute, Aymeric is working with digital simulations and collaborating directly with **Sainte-Justine** surgeons to eliminate the discomfort typically associated with conventional braces. He hopes to make his solution available to the public within five years, once the regulatory hurdles have been overcome. *La Presse* + ran a special report on his work in January 2019.

Vanier Canada Graduate Scholarship for Marilyn Ahun

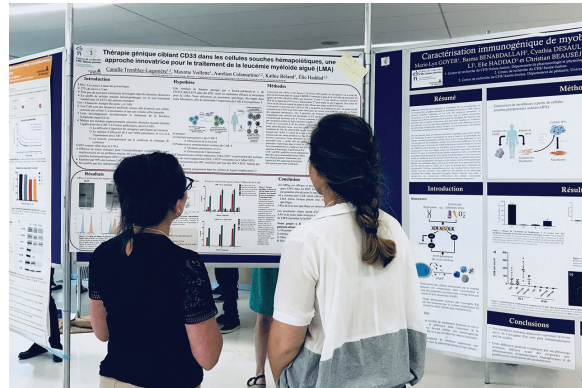
Marilyn Ahun, a PhD student working under **Dr. Sylvana Côté**, has received a **Vanier Canada Graduate Scholarship** for her project entitled “Why do children of depressed mothers have poorer cognitive outcomes? The role of nature and nurture.” Each Vanier scholarship is valued at \$50,000 per year over a three-year period for PhD-level students. They are designed to attract the best and brightest minds from across the country and around the world to establish Canada as a global centre of excellence in research and higher learning.

Marilyn Ahun has a bachelor's degree in psychology from McGill University and a master's degree in public health from the Université de Montréal.



Marilyn Ahun

Key events to elevate and enrich academic life



33rd Annual Research Congress June 8, 2018

Every year, the **Research Centre**, in collaboration with the **student association**, organizes the **Congress of Graduate and Postdoctoral Students in Research at CHU Sainte-Justine**. Roughly 250 people attended the event in 2018, which featured 11 oral presentations and 135 poster presentations. It was an opportunity for students, interns, fellows, clinical research staff and laboratory personnel to showcase their research progress in a wide variety of fields. This hub of intellectual activity is a unique opportunity to share ideas and network.

21 presentation competition winners in 2018

- Oral presentations: Aurélien Colamartino, Thomas Lejeune et Xiya Ma
- Poster presentations: Rachid Abaji, Sabrina Beaulieu-Gagnon, Sandrine Bourgeois-Tardif, Sabrya Carim, Elodie Da Costa, Alyson Deprez, Hanie Edalati, Paul Fabre, Marisol Lavertu-Jolin, Maximilien Laviolette-Brassard, Lisa-Marie Legault, William Lemieux, Gabriela Lopez Arango, Gabrielle McInnes, Émilie Normand, Jessica Piché, Daniela Ravizzoni Dartora and Mahsa Taherzadeh

Open house October 17, 2018

In order to attract the best candidates and accelerate the development of knowledge in maternal, child and adolescent health, the **Research Centre** held an open house for students seeking independent study projects at the master's, PhD and postdoctoral level.



More than **20 laboratories** were on hand at the event, which featured over **80 research projects** in **approximately 30 fields of study**. Visitors were also welcome to take a guided tour of the **Research Centre's** state-of-the-art facilities.

2nd annual Work in Progress (WiP) sessions

Work in Progress (WiP) sessions are bimonthly events held during the fall and winter terms. Every two weeks, two students from different laboratories and research axes are asked to present the progress they have made in their work to their peers. The platform is highly instructive, giving students the chance to obtain immediate, relevant feedback and improve their presentation skills.



The first scheduling slots are set aside for summer interns. For most, this is their first experience presenting in front of an audience consisting exclusively of scientists. It helps round out academic qualifications for those who choose to pursue their higher education.



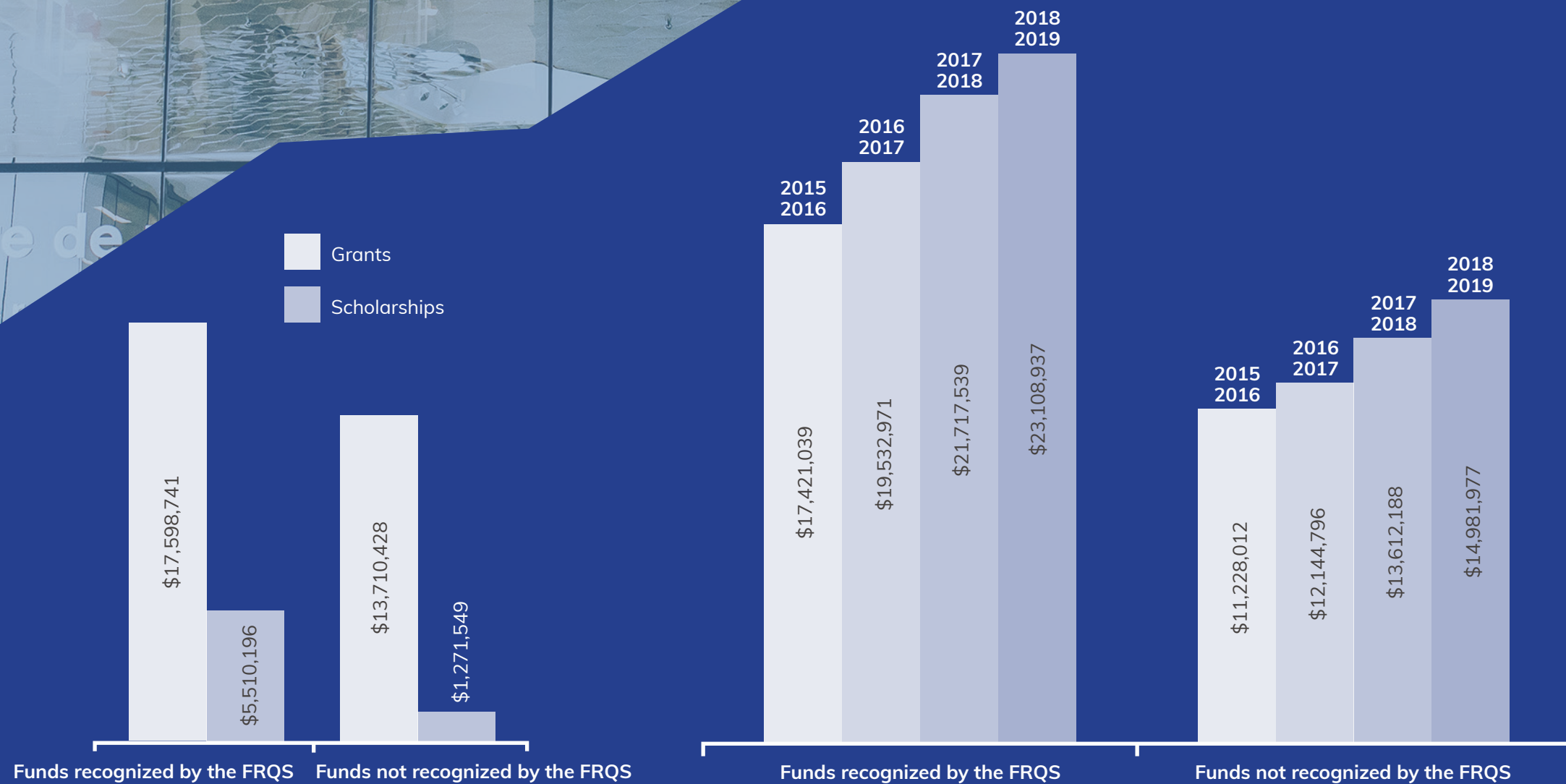
Summer internships

The **Summer Internships Program** is aimed at **undergraduate students** who wish to acquire practical biomedical research experience in a clinical, basic or translational research laboratory.

It is an opportunity to gain first-hand experience with one of 200 teams at the **Research Centre**. Interns can see what graduate studies are like, interact with researchers and contribute to advancing the multidisciplinary projects in one of six research axes.

Research by the Numbers
Research Grants and Scholarships

Total funds for year 2018-2019
\$38,090,914



Major Publications



Brain and Child Development

CHUSJ Researcher	Journal	Paper title
CARMANT, Lionel	<i>Lancet Neurology</i>	Rare coding variants in genes encoding GABAA receptors in genetic generalised epilepsies: an exome-based case-control study
CONROD, Patricia; JACQUEMONT, Sébastien	<i>JAMA Psychiatry</i>	Measuring and estimating the effect sizes of copy number variants on general intelligence in community-based samples
CÔTÉ, Sylvana; TREMBLAY, Richard E.	<i>JAMA Psychiatry</i>	Association of childhood irritability and depressive/anxious mood profiles with adolescent suicidal ideation and attempt
DI CRISTO, Graziella	<i>Progress in Neurobiology</i>	KCC2, epileptiform synchronization, and epileptic disorders
CONROD, Patricia	<i>Molecular Psychiatry</i>	Distinct brain structure and behavior related to ADHD and conduct disorder traits
ROSSIGNOL, Elsa	<i>Brain</i>	PHACTR ^{ing} in actin: actin deregulation in genetic epilepsies
AUDIBERT, François; CAMPEAU, Philippe; DAL SOGLIO, Dorothée; FRASER, William; KIBAR, Zoha; LEMYRE, Emmanuelle; MICHAUD, Jacques L.; PATEY, Natalie	<i>Genetics in Medicine</i>	Genomic study of severe fetal anomalies and discovery of GREB1L mutations in renal agenesis



Immune Diseases and Cancer

CHUSJ Researcher	Journal	Paper title
BARREIRO, Luis B.	<i>Nature</i>	Microbial signals drive pre-leukaemic myeloproliferation in a Tet2-deficient host
RAYNAL, Noël J.-M.	<i>Cell</i>	Targeting CDK9 reactivates epigenetically silenced genes in cancer
BARREIRO, Luis B.	<i>Immunity</i>	Holy Immune Tolerance, Batman!
CARMANT, Lionel; HADDAD, Elie	<i>Journal of Clinical Investigation</i>	Humanized mouse model of Rasmussen's encephalitis supports the immune-mediated hypothesis
LAVERDIÈRE, Caroline; LECLERC, Jean-Marie; TRAN, Thai Hoa	<i>Blood Advances</i>	Prognostic impact of kinase-activating fusions and IKZF1 deletions in pediatric high-risk B-lineage acute lymphoblastic leukemia
SINNETT, Daniel	<i>Blood Advances</i>	Mutational dynamics of early and late relapsed childhood ALL: rapid clonal expansion and long-term dormancy
BEAUSÉJOUR, Christian; HICKSON, Gilles R.	<i>Stem Cell Reports</i>	INK4a/ARF expression impairs neurogenesis in the brain of irradiated mice



Infectious Diseases and Acute Care

CHUSJ Researcher	Journal	Paper title
GOUIN, Serge	<i>New England Journal of Medicine</i>	Multicenter trial of a combination probiotic for children with gastroenteritis
DUCHARME, Francine M.	<i>The Lancet</i>	After asthma: redefining airways diseases
FARRELL, Catherine-Ann	<i>Journal of the American Medical Association</i>	Effect of a pediatric early warning system on all-cause mortality in hospitalized pediatric patients: the EPOCH randomized clinical trial
GRAVEL, Jocelyn	<i>JAMA Pediatrics</i>	Natural progression of symptom change and recovery from concussion in a pediatric population
QUACH-THANH, Caroline	<i>International Journal of Epidemiology</i>	Early predictors of Guillain-Barré syndrome in the life course of women
DUCHARME, Francine M.; GRAVEL, Jocelyn; QUACH-THANH, Caroline	<i>Pediatrics</i>	Respiratory viruses and treatment failure in children with asthma exacerbation
KAKKAR, Fatima; SOUDEYNS, Hugo	<i>Journal of Infectious Diseases</i>	Leukocyte telomere length at birth and during the early life of children exposed to but uninfected with HIV after in utero exposure to antiretrovirals

Fetomaternal and Neonatal Pathologies

CHUSJ Researcher	Journal	Paper title
ANDELFINGER, Gregor U.	<i>Physiological Reviews</i>	Role of epigenetics in cardiac development and congenital diseases
BÉRARD, Anick	<i>Annals of the Rheumatic Diseases</i>	Leflunomide use during pregnancy and the risk of adverse pregnancy outcomes
DUBRAC, Alexandre	<i>Nature Communications</i>	NCK-dependent pericyte migration promotes pathological neovascularization in ischemic retinopathy
NUYT, Anne Monique; WEI, Shu Qin	<i>JAMA Pediatrics</i>	Association between vitamin D supplementation during pregnancy and offspring growth, morbidity, and mortality: a systematic review and meta-analysis
LODYGENSKY, Gregory A.	<i>JAMA Pediatrics</i>	Mild neonatal encephalopathy-how, when, and how much to treat?
NUYT, Anne Monique; LUU, Thuy Mai	<i>Hypertension</i>	Kidney size, renal function, Ang (angiotensin) peptides, and blood pressure in young adults born preterm
AUDIBERT, François; FRASER, William; LEVY, Emile; NUYT, Anne Monique; WEI, Shu Qin	<i>Journal of Clinical Endocrinology and Metabolism</i>	Large-for-gestational-age may be associated with lower fetal insulin sensitivity and β -cell function linked to leptin





Metabolic and Cardiovascular Health

CHUSJ Researcher	Journal	Paper title
BARNETT Tracie; DUCHARME, Francine M.	<i>Journal of Allergy and Clinical Immunology</i>	The obeseasthma phenotype in children: An exacerbating situation?
JOYAL, Jean-Sébastien	<i>Progress in Retinal and Eye Research</i>	Retinal energy demands control vascular supply of the retina in development and disease: The role of neuronal lipid and glucose metabolism
PSHEZHETSKY, Alexey V.	<i>Brain</i>	A novel adeno-associated virus capsid with enhanced neurotropism corrects a lysosomal transmembrane enzyme deficiency
CAMPEAU, Philippe; LABERGE, Anne-Marie	<i>Brain</i>	BCL11B mutations in patients affected by a neurodevelopmental disorder with reduced type 2 innate lymphoid cells
LABERGE, Anne-Marie	<i>Genetics in Medicine</i>	Recommending inclusion of HFE C282Y homozygotes in the ACMG actionable gene list: cop-out or stealth move toward population screening?
PSHEZHETSKY, Alexey V.	<i>Molecular Metabolism</i>	Neuraminidase 1 activates insulin receptor and reverses insulin resistance in obese mice
KRAJINOVIC, Maja; MARCIL, Valérie; LAVERDIÈRE, Caroline; LEVY, Emile; SINNETT, Daniel	<i>Metabolism</i>	Insight from mitochondrial functions and proteomics to understand cardiometabolic disorders in survivors of acute lymphoblastic leukemia

Musculoskeletal Health, Rehabilitation and Medical Technologies

CHUSJ Researcher	Journal	Paper title
CAMPEAU, Philippe	<i>Nature Communications</i>	CHD3 helicase domain mutations cause a neurodevelopmental syndrome with macrocephaly and impaired speech and language
CAMPEAU, Philippe	<i>Nature Communication</i>	BAFopathies' DNA methylation epi-signatures demonstrate diagnostic utility and functional continuum of Coffin-Siris and Nicolaides-Baraitser syndromes
CAMPEAU, Philippe; MEIJER, Inge; MICHAUD, Jacques L.; ROSSIGNOL, Elsa	<i>Annals of Neurology</i>	Recessive mutations in >VPS13D cause childhood onset movement disorders
CAMPEAU, Philippe	<i>American Journal of Human Genetics</i>	Mutations in PIGS, encoding a GPI transamidase, cause a neurological syndrome ranging from fetal akinesia to epileptic encephalopathy
MAC-THIONG, Jean-Marc	<i>Canadian Medical Association Journal</i>	Recent opioid use and fall-related injury among older patients with trauma
ALOS, Nathalie; RAUCH, Frank	<i>Journal of Bone and Mineral Research</i>	Bone morbidity and recovery in children with acute lymphoblastic leukemia: results of a six-year prospective cohort study
BEAUSÉJOUR, Marie; MAC-THIONG, Jean-Marc	<i>Journal of Neurotrauma</i>	Early predictors of global functional outcome after traumatic spinal cord injury: a systematic review



About this Report

Funds of research	Represent the fiscal year from April 1, 2018, to March 31, 2019. Represent grants, scholarships, career grants, and foundation funding.
Researchers	Regular researchers or clinical-researchers as defined by the FRQS.
Publications	Represent publications from January 1, 2018, to December 31, 2018.
Staff	Research and administrative staff located at the CHU Sainte-Justine or the Marie Enfant Rehabilitation Center.

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