



17 May 2023

Annual Reporting for Faculty Supported Research Centres and Networks



NEUROINFORMATICS & MENTAL HEALTH

NEUROINFORMATIQUE ET SANTÉ MENTALE

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All Centres (provisional Centres; McGill Centres), Research groups and Networks that receive funding from the Faculty of Medicine and Health Sciences (FMHS) are required to provide an annual report to the Committee for Oversight of Research Units ([CORU](#))

The reporting period is May 1, 2022 – April 30, 2023.

Please submit your report to the Research Office, Faculty of Medicine and Health Sciences (riac.med@mcgill.ca) before the following deadline:

May 15, 2023

Continued support from the Faculty is contingent on:

1. the receipt of the reporting documents on time,
2. the evaluation of reported activities by the Faculty's Committee for Oversight of Research Units (CORU),
3. the availability of Faculty funds.

Your strong engagement in the Faculty's mission for continued research excellence and financial stewardship is truly appreciated.



Annual Report of Activities and Outcomes

Name of the Unit: Ludmer Centre for Neuroinformatics & Mental Health

Name of Unit leader & email address: Stéphane Achim, Associate Director of Administration and Operations, Ludmer Centre – stephane.achim@mcgill.ca

If the Unit is a **Senate-approved** McGill Research Centre, indicate date of approval: April 20, 2017

Mission statement of the Unit (~2 sentences):

The Ludmer Centre for Neuroinformatics & Mental Health brings together cutting-edge computational infrastructure, ‘big data’ and transdisciplinary research expertise to advance research in normal and abnormal brain development — neurological disorders and mental illness. Specifically, activities aim to

- I. Develop innovative, interoperable and open-source neuroinformatics infrastructure.
- II. Lead and support the application of big-data approaches to brain research, including the promotion of share-access and, where permitted, open-science datasets.
- III. Mentor and train tomorrow’s transdisciplinary researchers in the application of big-data research.

A new gift to the Ludmer Centre on November 15th, 2022 introduced a new research area for the Ludmer Centre titled: **Single Cell Brain Initiative (SCBI)** which will create a detailed map of the human brain, at a single-cell resolution, using different but complementary strategies.

Total number of Unit members: Thirteen (13) researchers and their teams (over 100 people total). There has been an important change in membership with the addition of the SCBI and the addition of Dr. Gustavo Turecki for the period considered. Dr. Silveira, Dr. Greenwood and Dr. Evans are the scientific co-directors from the first initiative. The Executive Committee meets quarterly and includes the Chair, the Co-Scientific Directors, the Associate Director, important members of the McGill Medicine community and major donors. The ExCom approves the allocation of funds and keeps the community updated on recent achievements, scientific advances, unexpected problems arising, etc.

Number of members affiliated with McGill’s FMHS:

Member List Last, First Name Member Type Joined Trainee Institutional Affiliation(s)

| | Last, First name | Member type | Joined | Trainee | Institutional Affiliation(s) |
|---|-------------------------|------------------------|--------|---------|------------------------------|
| 1 | Evans, Alan (Professor) | Co-Scientific Director | 2013 | | MNI/FoMed |

| | | | | | |
|----|---|--|------|---|--|
| 2 | Turecki, Gustavo (Professor) | Co-Scientific Director | 2022 | | Douglas/FoMed |
| 3 | Greenwood, Celia (Professor) | Co-Scientific Director | 2013 | | LDI-JGH/FoMed |
| 4 | Silveira, Patricia Peluto (Associate Professor) | Co-Scientific Director | 2016 | | Douglas/FoMed |
| 5 | O'Donnell, Kieran (Assistant Professor) | Regular, past interim Sc.Dir.(2018- 2019) | 2016 | 2013-2016 Ludmer PostDoc | Yale University |
| 6 | Bagot, Rose (Assistant Professor) | Regular | 2016 | | FofSC (Psychology), cross appointed in FoMed (Psychiatry) |
| 7 | Poline, Jean- Baptiste (Associate Professor) | Regular | 2017 | | MNI/FoMed |
| 8 | Iturra-Medina, Yasser (Assistant Professor) | Regular | 2018 | 2013-2016 Ludmer PostDoc | MNI/FoMed |
| 9 | Kleinman, Claudia (Assistant Professor) | Regular | 2017 | | LDI-JGH/FoMed |
| 10 | Karama, Sherif (Assistant Professor) | Regular | 2018 | | Douglas/FoMed |
| 11 | Zhang, Tie Yuan (Assistant Professor) | Regular | 2016 | | Douglas/FoMed |
| 12 | Glatard, Tristan (Associate Professor) | Regular | 2016 | 2013-2016 Ludmer Visiting researcher | Concordia, Computer Sc, (TT, 2016) / FoSc (Comp Sc), McGill (Adjunct Prof 2018- 2021) |
| 13 | Nguyen, Tuong Vi (Assistant Professor) | Regular | 2020 | | MUHC/FoMed |

Unit's website:

Please note the website needs to feature:

- all sources of funding support (including the FMHS logo), <http://ludmercentre.ca/about-us/our-donors/>
- the list of Members and their institutional affiliation with appropriate links, <http://ludmercentre.ca/research/research-membership>

- the activities supported by the Unit: <http://ludmercentre.ca/research/> and <http://ludmercentre.ca/about-us/>
- all previous Annual Reports : <http://ludmercentre.ca/about-us/annual-reports/>
- **Note:** the website is under construction on a new platform. The actual website is hosted on a WordPress platform and it is in the midst of being transferred to the McGill WMS platform. The Annual Reports and all recent and upcoming activities with all our partners will be posted on the new McGill WMS platform as soon as it is activated in the coming months.

Website address (URL): <http://ludmercentre.ca/>

Please respect the page limits, where indicated.

(minimum font size of 11 pts, use lay language)

- **Explain the significance of the Unit's mission at McGill and beyond** (1/2 page max.)

Our goal is to minimize the impact of mental illness and neurodegenerative disease across Canada and on a global scale. The significance of our mission has shown how important the collective mental health was affected during the pandemic and new challenges have emerged since the end of the COVID-19. Our members researchers will thus be even more solicited to help solving two of the major illnesses of the 21st century; anxiety and depressive disorders, and dementia.

Most importantly, an important aspect of our approach is to build data infrastructure and processing capabilities that reach far beyond our own needs. We provide neuroinformatic tools (such as LORIS, cBRAIN, EPSclusters, and more) and knowledge to the Canadian scientific community that will benefit the McGill community at large, and researchers from each of the Canadian provinces. An important example of that is the Canadian Open Neuroscience Platform (CONP), for which the Ludmer Centre just renewed its commitment of support for 3.5 years (\$1.36M). More data will be available to the community

- **Alignment with the [Faculty's Strategic Research Plan](#)** (1/2 page max.)

Like other Units, The Ludmer Centre focuses on one of the four priority diseases areas identified in the 2017 Strategic Research Plan: Neurosciences. However, it is most likely the only one prioritizing mental illness. The Ludmer Centre is thus an essential component in occupying this research area. Moreover, we address several of the prioritized themes by concentrating on genetic and environmental determinants of neurological diseases and mental illness. With the new gift of \$15.3 million of Mr. Ludmer in November 2022, the new Single-Cell Brain Initiative will create a detailed map of the human brain, at a single-cell resolution, using different but complementary strategies. This pioneering research will be the cornerstone of the next chapter of excellence of the Ludmer Centre, which together with McGill University and its hospital partners, will become the global reference in the emerging field of single-cell brain neurobiology and families for whom traditional treatments have been lacking.

Members of the Ludmer Centre are world leaders in system approaches to large dataset analyses to elucidate health research questions and elaborate and test personalized medicine strategies. The Ludmer Centre is a champion for open-source, open access data management platforms and knowledge dissemination in the field of neuroimaging and neuroinformatics. Finally, the Ludmer Centre is an environment facilitating the growth of the next generation of thought leaders in those fields.

- **Highlight the top-5 accomplishments of the Unit over the past 12 months** (1/2 page max., use bullets).

1) 2022 Ludmer/QLS Lectures: • Satrajit Ghosh. October 18, 2022 : In collaboration with the Desautels Faculty of Management, the lecture was organized during the visit of Dr. Ghosh from MIT. Dr. Ghosh uses neuroimaging, speech communication and machine learning to improve assessments and treatments of mental health.

2) HiBall; funded by the HBHL, the 6th BigBrain Workshop as an in-person event took place on October 25-27, 2022 in Zadar, Croatia. Researchers from our global network (and beyond) did present their work and discussed future prospects of the BigBrain data and tools, in particular, to discuss how to better leverage high-performance computing (HPC) and artificial intelligence (AI) to create multimodal, multiresolution tools for the high-resolution BigBrain and related datasets.

3) This article has been highlighted in the News and Views: *Nature Genetics* 2022;54,1770–1771. [Jessa S[^]](#), [Mohammadnia A[^]](#), [Harutyunyan AS[^]](#), [Hulswit M](#), [Varadharjan S](#), [Lakkis H](#), [Kabir N](#), [Bashardanesh Z](#), [Hébert S](#), [Faury D](#), [Vladoiu MC](#), [Worme S](#), [Coutelier M](#), [Krug B](#), [Faria Andrade A](#), [Pathania M](#), [Bajic A](#), [Weil AG](#), [Ellezam B](#), [Atkinson J](#), [Dudley R](#), [Farmer JP](#), [Perreault S](#), [Garcia BA](#), [Larouche V](#), [Blanchette M](#), [Garzia L](#), [Bhaduri A](#), [Bandopadhyay P](#), [Taylor MD](#), [Mack SC](#), [Jabado N*](#), **Kleinman CL***. K27M in canonical and noncanonical H3 variants targets distinct oligodendroglial precursor-like cells in brain midline gliomas *Nature Genetics*. 2022; 54, 1865–1880. doi: 10.1038/s41588-022-01205-w.

4) Another paper of note : Tianyuan Lu, Vincenzo Forgetta, Celia M.T. Greenwood, Sirui Zhou, J. Brent Richards (2022). Circulating Proteins Influencing Psychiatric Disease: A Mendelian Randomization Study. *Biological Psychiatry* in press. doi: 10.1016/j.biopsych.2022.08.015.

5) Canadian Consortium on Neurodegeneration in Aging (CCNA); funded by the Canadian Institutes of Health Research (CIHR) The Data Coordinating Centre at MCIN (Dr. Evans' lab) has been fully funded at \$550,000 CAD for Phase II, Y3 of the project (04/2022-03/2023). The process of the renewal of the above mentioned grant for the fiscal period 04/2023-03/2024 and beyond was initiated.

September 2022: CBRAIN abstract for the Big Data Neuroscience Workshop was accepted for both a poster and lightning talk at the University of Texas, Austin on September 15 – 16, 2022.

- **Major joint publications over the past 12 months** (including shared software, data repositories; with links). Please only feature the article co-authored by at least two PI members of the Unit:

Top papers co-authored by at least 2 members, one of them being senior author:

1. Stefan Drakulich, Arseni Sitartchouk, Emily Olafson, Reda Sarhani, Anne-Charlotte Thiffault, Mallar Chakravarty, **Alan C Evans**, **Sherif Karama**. [General cognitive ability and pericortical contrast](#). *Intelligence*, Vol 91, 2022.
2. Budhachandra Khundrakpam, Linda Booi, Seun Jeon, **Sherif Karama**, Jussi Tohka, **Alan C Evans**. [Individualized prediction of future cognition based on developmental changes in cortical anatomy](#). *Neuroimage: Reports*. 2022.
3. Kimia Shafiqhi, Sylvia Villeneuve, Pedro Rosa-Neto, AmanPreet Badhwar, Judes Poirier, Vaibhav Sharma, **Yasser Iturria-Medina**, **Patricia P Silveira**, Laurette Dube, David Glahn, Danilo Bzdok, 2023. Social isolation is linked to classical risk factors of Alzheimer's disease-

related dementias. *PloS One*; 18(2):e0280471. doi: 10.1371/journal.pone.0280471. eCollection 2023.

4. **Poline, J.-B.**, Das, S., **Glatard, T.**, Madjar, C., Dickie, E. W., Lecours, X., Beaudry, T., Beck, N., Behan, B., Brown, S. T., Bujold, D., Beauvais, M., Caron, B., Czech, C., Dharsee, M., Dugré, M., Evans, K., Gee, T., Ippoliti, G., ... **Evans, A. C.** (2023). Data and Tools Integration in the Canadian Open Neuroscience Platform. *Scientific Data*, 10(1), Article 1. <https://doi.org/10.1038/s41597-023-01946-1>
5. Sokołowski, A., Bhagwat, N., Chatelain, Y., Dugré, M., Hanganu, A., Monchi, O., McPherson, B., Wang, M., **Poline, J.-B.**, Sharp, M., & **Glatard, T.** (2023). *Longitudinal brain structure changes in Parkinson's disease: A replication study* (p. 2023.04.28.538743). bioRxiv. <https://doi.org/10.1101/2023.04.28.538743>
6. Wang, Q., Aljassar, M., Bhagwat, N., Zeighami, Y., **Evans, A. C.**, Dagher, A., Pike, G. B., Sadikot, A. F., & **Poline, J.-B.** (2023). Reproducibility of cerebellar involvement as quantified by consensus structural MRI biomarkers in advanced essential tremor. *Scientific Reports*, 13(1), 581.
7. Barry A, Bhagwat N, Misic B, Poline JB, Greenwood CMT (2022). Asymmetric influence measure for high dimensional regression. *Communications in Statistics – Theory and Methods* 51 (16), 5461-5487. doi: 10.1080/03610926.2020.1841793.
8. Sanz-Robinson, J., Jahanpour, A., Phillips, N., **Glatard, T.**, **Poline, J.-B.**, 2022. NeuroCI: Continuous Integration of Neuroimaging Results Across Software Pipelines and Datasets. BioRxiv. <https://www.biorxiv.org/content/10.1101/2022.05.30.494062v1>.
9. Wang, Q., Aljassar, M., Bhagwat, N., Zeighami, Y., **Evans, A.C.**, Dagher, A., Pike, G.B., Sadikot, A.F., **Poline, J.-B.**, 2023. Reproducibility of cerebellar involvement as quantified by consensus structural MRI biomarkers in advanced essential tremor. *Scientific Reports* 13, 581.
10. Jiang L, Greenlaw K, Ciampi A, Canty AJ, Gross J, **Turecki G**, **Greenwood CMT.** (2022) A Bayesian hierarchical model for improving measurement of 5mC and 5hmC levels: towards revealing associations between phenotypes and methylation states. *Genetic Epidemiology* 46(7): 446-462. doi: 10.1002/gepi.22489.
11. Bhatnagar S, Lu T, Lovato A, Olds DL, Kobor M, Meaney M, **O'Donnell K**, Yang A, **CMT Greenwood.** (2023) A sparse additive model for high-dimensional interactions with an exposure variable. **Computational Statistics & Data Analysis.** 179, 107624, p1-15. Doi.org/10.1016/j.csda.2022.107624.
12. Picher-Martel V, Blais M, Bostwick B, Bubela T, Das S, Dionne A, Dubey S, **Evans AC**, Genge A, Greiner R, **Iturria-Medina Y**, Johnston W, Jones K, Kaneb H, Karamchandani J, Koyan B, Levy O, Magnussen C, Moradipoor S, Parasoglou P, Robertson J, Rogaeva E, Taylor D, Van de Velde C, Yunusova Y, Zinman L, Kalra S, Dupré N (2022) **CAPTURE ALS: The Comprehensive Analysis Platform To Understand, Remedy and Eliminate ALS Amyotrophic Lateral Scler Frontotemporal Degener 23: 1-7**
13. Levitis E, Vogel J, Funck T, Hachinski V, Gauthier S, Vöglein J, Levin J, Gordon BA, Benzinger T, **Iturria-Medina Y**, **Evans AC**, DIAN, ADNI (2022) *Differentiating amyloid beta spread in autosomal dominant and sporadic Alzheimer's disease* **Brain Comms 4(3): fcac085**
14. Dubé L, **Silveira PP**, Nielsen DE, Moore S, Paquet C, Cisneros-Franco JM, Kemp G, Knauper B, Ma Y, Khan M, Bartlett-Esquilant G, **Evans AC**, Fellows LK, Armony JL, Spreng RN, Nie JY, Brown ST, Northoff G, Bzdok D (2022) *From precision medicine to precision convergence for multilevel resilience -The aging brain and Its social isolation* **Front Public Health 10: 720117**

15. Ozlen H, Pichet Binette A, Köbe T, Meyer P-F, Gonneau J, St-Onge F, Provost K, Soucy J-P, Rosa-Neto P, Breitner J, Poirier J, Villeneuve S, Tam A, Labonté A, Faubert A-M, Mathieu A, Madjar C, Carrier CE, Dansereau C, Kazazian C, Lepage C, Picard C, Maillet D, Michaud D, Couture D, Dea D, Cuello C, Barkun A, **Evans AC**, Courcot B, Tardif C, Debacker C, Fontaine D, Knopman D, Multhaup G, Near J, Leoutsakos J-M, Maltais J-R, Brandt J, Pruessner J, Morris J, Cheewakriengkrai L, Münter L-M, Collins L, Chakravarty M, Sager M, Dauar-Tedeschi M, Eisenberg M, Rajah N, Aisen P, Toussaint P-J, Bellec P, Kostopoulos P, Etienne P, Tariot P, Orban P, Sperling R, Hoge R, Thomas R, Gauthier S, Craft S, Montine T, Nair V, Bohbot V, Venugopalan V, Fonov V, **Iturria-Medina Y**, Khachaturian Z, Teigner E, Anthal E, Yu E, Ferdinand F, Pogossova G, Mayrand G, Duclair G, Gagne G, Newbold-Fox H, Leppert I, Vallee I, Vogel J, Tremblay-Mercier J, Frenette J, Frappier J, Kat J, Miron J, Wan K, Mahar L, Carmo L, Theroux L, Dadar M, Dufour M, Lafaille-Magnan M-E, Appleby M, Savard M, Tuwaig M, Petkova M, Rioux P, El-Khoury R, Gordon R, Giles R, Das S, Wang S, Tabrizi S, Mathotaarachchi S, Dubuc S, Lee T, Beaudry T, Gervais V, Page V, Ayranci G, Pascoal T, Desautels R, Benbouhoud F, Saint-Fort EF, Verfaillie S, Farzin S, Salaciak A, Tullo S, Vachon-Presseau E, Daoust L-A, Spreng N, McSweeney M, Nilsson N, Pishnamazi M, Bedetti C, Hudon L, Greco C, Chapleau M, St-Onge F, Boutin S, Geddes M, Ducharme S, Jean G, Sylvain E, Élie M-J, Leblond-Baccichet G, Bailly J, Mohammediyani B, Chen Y, Remz J, Weiner MW, Peterson R, Jack CR, Jagust W, Trojanowki JQ, Toga AW, Beckett L, Green RC (2022) *Spatial extent of amyloid- β levels and associations with tau-PET and cognition* **JAMA Neurol 79(10): 1025-35**
16. Strikwerda-Brown C, Hobbs DA, Gonneau J, St-Onge F, Pichet Binette A, Ozlen H, Provost K, Soucy J-P, Buckley RF, LS Benzinger TLS, Morris JC, Villemagne VL, Doré V, Sperling RS, Johnson KA, Rowe CC, Gordon BA, Poirier J, Breitner JCS, Villeneuve S, Tam A, Labonté A, Faubert A-M, Mathieu A, Madjar C, Carrier CE, Dansereau C, Kazazian C, Lepage C, Picard C, Maillet D, Michaud D, Couture D, Dea D, Cuello C, Barkun A, **Evans A**, Courcot B, Tardif C, Debacker C, Jack C, Fontaine D, Knopman D, Multhaup G, Near J, Leoutsakos J-M, Maltais J-R, Brandt J, Pruessner J, Cheewakriengkrai L, Münter L-M, Collins L, Chakravarty M, Sager M, Dauar-Tedeschi M, Eisenberg M, Rajah N, Aisen P, Toussaint P-J, Rosa-Neto P, Bellec P, Kostopoulos P, Etienne P, Tariot P, Orban P, Hoge R, Thomas R, Gauthier S, Craft S, Montine T, Nair V, Bohbot V, Venugopalan V, Fonov V, **Iturria-Medina Y**, Khachaturian Z, Teigner E, Anthal E, Yu E, Ferdinand F, Pogossova G, Mayrand G, Duclair G, Gagne G, Newbold-Fox H, Leppert I, Vallee I, Vogel J, Tremblay-Mercier J, Frenette J, Frappier J, Kat J, Miron J, Wan K, Mahar L, Carmo L, Theroux L, Dadar M, Dufour M, Lafaille-Magnan M, Appleby M, Savard M, Tuwaig M, Petkova M, Rioux P, El-Khoury R, Gordon R, Giles R, Das S, Wang S, Tabrizi S, Mathotaarachchi S, Dubuc S, Lee T, Beaudry T, Gervais V, Page V, Ayranci G, Pascoal T, Desautels R, Benbouhoud F, Saint-Fort EF, Verfaillie S, Farzin S, Salaciak A, Tullo S, Vachon-Presseau E, Daoust L-A, Kobe T, Spreng N, McSweeney M, Nilsson N, Pishnamazi M, Bedetti C, Hudon L, Greco C, Chapleau M, Boutin S, Geddes M, Ducharme S, Jean G, Sylvain E, Élie M-J, Leblond-Baccichet G, Bailly J (2022) *Association of elevated amyloid and tau PET signal with near-term development of AD symptoms in older adults without cognitive impairment* **JAMA Neurol 79(10): 975-85**

- **Major joint research projects funded over the past 12 months** (involving at least two PI members of the Unit:

In 2021/2022, the Ludmer Centre was at the beginning of a new cycle in terms of funding new research. It saw the birth of the Sievers Initiative (\$5M), EEGNet (\$1.8M) through the Vera Gross Fund (\$2.5M), and an evolution for the Montreal Antenatal Wellbeing Study through the Chamandy Foundation (\$300k).

CBRAIN and LORIS grants (RS3-031 and RS3-050); funded by CANARIE Inc :

Both grants have successfully concluded their development phase (04/2020-03/2021) and have been approved by CANARIE for another year of funding (04/2021-03/2022). These two grants are expected to be renewed for the fiscal year 04/2022-03/2023. The Healthy Brain and Child Development (HBCD). The study has been officially approved and funded by the NIH. The MCIN (Dr. Evans' lab) sub-budget of \$2,279,640 USD (09/2021- 08/2026) has been approved. Dr. Evans' team is in the process of finalizing the resourcing and setup of the project. The HBCD study will establish a state-of-the-art, longitudinal data set of unprecedented scope and scale that will identify critical periods of neurodevelopment in infancy and childhood and address essential questions regarding the impact of high-risk environments, including prenatal substance exposure, on health, brain, and behavioural trajectories. In the first five years of this initiative, these efforts will focus on the neurodevelopmental window which begins prenatally and extends through the fourth year of life. Data collected through this project will be fundamental to establishing links between early environmental and biological factors, both adverse and protective, and subsequent health and behavioural outcomes. This information is critical for informing policies and designing interventions to promote well-being and resilience in all children.

This year in November 2022, we had an unprecedented gift of \$15.3 million from the Ludmer Family Foundation, which will develop a new arm to our activities with the Single-Cell Brain Initiative and the addition of up to 9 new members over the next 5-7 years, new staff and most importantly, millions of dollars for new research. Part of the gift is \$1.25 million allocated towards the Neuroinformatics pillar. Also, \$450 000 is allocated to Communications which lead to the hiring of the much needed and anticipated Communication Officer in January 2023 with Ms.Naghmeh Shafiei.

- **Major outreach activities** (e.g., seminar series, general public events):

- Environmental Adversity, Neurodevelopment and Mental Health Theme-based group, Special Seminar Series “Social Buffering of Stress During Development” – Invited speaker Megan R. Gunnar (Regents Professor and a member of the University of Minnesota’s Distinguished Academy of Teachers) – Douglas Research Centre, online, January 2023.
- Special Seminar “Mind mapping with words” – Invited speaker Prof. Sidarta Ribeiro (Professor of Neuroscience at the Brain Institute of the Federal University of Rio Grande do Norte, Brazil) – Douglas Research Centre, Montreal, August 2022.
- Symposium “Dopamine as a mechanism linking early life adversity to psychopathology” with Cecilia Flores (McGill University), Catherine Peña (Princeton Neuroscience Institute) & Zisis Bimpisidis (Istituto Italiano di Tecnologia) – Dopamine Meeting, Montreal May 2022.
- EEGNet; funded by Brain Canada Funds are available since April 2021, Budget \$1,844,900 (02/2021-01/2024). The EEGNet kick-off was held on Sep. 15th. 2021 with opening remarks by Dr. Evans (PI, McGill), Mme. Sabina Antonescu (Brain Canada) and Mr. Irving Ludmer (Ludmer Centre), followed by scientific and project committees' presentations. **Update:** September 2022: Ms.Christine Rogers (EEGNet research manager) and Dr. Bosch (EEGNet research scientist) from MCIN participated on the ICCN International Conference of Clinical Neurophysiologists in Geneva, Switzerland from Sep. 4 th . To 8 th, 2022, with posters, talks and exhibitions, showcasing the EEGNet and the Ludmer/Sievers’ centre scientific achievements. <https://ifcn.site-ym.com/mpage/ProgrammeOverview>.

- HiBall; funded by the HBHL, the 6th BigBrain Workshop as an in-person event took place on October 25-27, 2022 in Zadar, Croatia. Researchers from our global network (and beyond) did present their work and discussed future prospects of the BigBrain data and tools, in particular, to discuss how to better leverage high-performance computing (HPC) and artificial intelligence (AI) to create multimodal, multiresolution tools for the high-resolution BigBrain and related datasets. The BigBrain Workshop was organized as a symposium, with both invited speakers and contributed talks as well as a poster and demo session. Event website: <https://events.hifis.net/event/301/>

- September 2022: CBRAIN abstract for the Big Data Neuroscience Workshop was accepted for both a poster and lightning talk at the University of Texas, Austin on September 15 – 16, 2022.

- **Major training activities** (e.g., summer schools, co-supervision of trainees, practical workshops):

1) Dr.Hervé Abdi. 03 May, 2022 Professor at the University of Texas at Dallas, School of Behavioral and Brain Sciences. Dr. Abdi's main research interests are advanced multivariate statistics, quantitative models, memory and cognition, sensory evaluation, neuroimaging, and genomics. The event took place in person at the de Granpré Communications Centre (MNI) in front of 25 people with approximately 45 online attendees. Dr. Greenwood, Dr. Poline and LDS co-organized that day, featuring meetings with Neuro researchers, postdoctoral fellows and students. The visit will lead to new collaborations and discussions.

2) "Unpacking the Speech Chain: a Window of Scientific & Technological Opportunities" 18 October 2022 – Montréal.

- Dr.Satrajit Ghosh, Assistant Professor at Harvard Medical School/MIT came for a week and he gave a seminar in Quantitative Life Sciences (QLS) on October 18, 2022. He then met with the QLS students afterwards, participated in a hackathon with Dr. Jean-Baptiste Poline & students, and also participated in a working group with (Precision Convergence) Laurette Dubé.

3) MiCM workshops were in development by a student group under the mentorship of Professor of Human Genetics, Guillaume Bourque with the previous Ludmer Centre Associate Director: to be revisited for progress update.

- If applicable, **list new members** who joined the Unit in the past 12 months (indicate: Name, title, full/associate member, affiliation):

Dr.Gustavo Turecki, Scientific Director at Douglas Research Centre, Chair Dpt of Psychiatry McGill University

- If applicable, **list members who have left the Unit** in the past 12 months (indicate: Name, title, full/associate member, affiliation):

- Dr.Michael Meaney, Director, Translational Neuroscience programme, Singapore Institute for Clinical Sciences, Singapore. Founding Scientific Co-Director, Ludmer Centre , James McGill Professor, departments of Psychiatry and Neurology & Neurosurgery

Financial report & forecast

| Expenses | 2022/23 report | 2023/24 budget |
|---|---------------------|---------------------|
| Total salaries | 152,624 | 258,604 |
| Training | 0 | 0 |
| Stipends | 30,000 | 60,000 |
| Outreach | 9,650 | 30,000 |
| Publications | 0 | 0 |
| Other (detail in #10 below) | | |
| Targeted Project Transfers | 770,000 | 1,168,000 |
| Research Funding Distribution | 111,600 | 300,000 |
| Potential Single-Cell t/f's (Neuro/JGH/Douglas/Ludmer) | 0 | 3,515,000 |
| Total expenses | \$ 1,107,572 | \$ 5,331,604 |

| Revenues | 2022/23 report | 2023/24 budget |
|-------------------------------------|--------------------|---------------------|
| Carryover | 122,386 | 1,882,892 |
| FMHS (Single Cell Init. Matching) | 0 | 447,144 |
| User fees | 0 | 0 |
| Other sources (detail in #10 below) | | |
| Ludmer Heritage Endow. | 329,918 | 325,402 |
| Ludmer Single Cell Accel. Endow | 0 | 65,944 |
| Targeted Project Donations | 780,160 | 1,068,000 |
| Ludmer Single-Cell Direct Spend | 1,758,000 | 1,757,000 |
| Total revenues | \$2,990,464 | \$ 5,546,382 |

- Budget justification and details (e.g., itemize if multiple salaries, detail other sources of funding):

22/23

In fiscal 22/23 The Centre's main operating revenue was comprised mainly from the interest from the Heritage Endowment which is now fully funded. The Centre had a gap year in lower funding as the Heritage Direct Spend Fund had been spent down to zero. The Centre's expenses for 22/23 were minimal due to drop in activities (COVID 19 and departure of the Associate Director in Sept.2022).

The Centre is also the custodian of targeted donations (Sievers, Gross, Chamandy) that have come in for specific project use and therefore those revenues do not impact the Centre's operating power, but do provide leverage to some of the Centre's members for their research projects.

23/24

During 22/23 the Centre became the recipient and custodian of the new Ludmer Centre Single-Cell Genomics Brain Initiative, which also has a component of matching funding from McGill Faculty of Medicine and Health Sciences, that will boost the Centre's Operating budget in tandem with the Heritage Fund and allow it to distribute research funding in a competitive call for support in the summer of 2023. The Centre will want to use the full Single-Cell allocation along with the full McGill matching to make this year's budget work. The Centre has a new full-time Associate Director and has added a full-time Communications Officer

to its staff, along with the existing Finance Officer (1 day/wk) and Web Designer (1 day/wk to be terminated when the Website is transferred to the new McGill platform where it will be hosted at no cost). The Centre plans new outreach programs via the new Communications Officer and the funding from the Single Cell Initiative. The targeted donations (Single-Cell, Sievers, Gross, Chamandy) continue to provide crucial leverage to Centre related interests. The Centre continues to provide each Co-Scientific Director with a \$15,000 research allowance each year. The “potential” transfers to Single-Cell Initiative partners (Douglas, JGH, Neuro, Ludmer) will depend on their need and proof of their matching funding. Any unused portions by partners will be carried forward to the next year. The Centre will have a forecast carryforward budget to 24/25 to ensure continuity of activities and the ability to have a competitive call for support.

Detailed funding schedules are available upon request.

- Explain why continued support from the FMHS is crucial to Unit (½ page max):

In the instance of the Ludmer Centre, the support of FMHS is crucial to the operations of the Ludmer Centre allowing researchers of international reputation in the field of Neuroscience to continue to attract donors of the caliber of certain alumnies such as Mr.Ludmer Family Foundation or Mr.& Ms.Sievers Foundation amongst others.

All this research does and will continue to bring benefits to the society and the research enterprises with such innovative actions such as adhering to open-science and already well-established international collaborations. The COVID 19 pandemic did create a lot of challenges in the mental health sector amongst others, and more than ever, the R&D efforts are solicited to help people recover from those difficult 2-3 years.

The success of the Ludmer Centre shines upon the McGill University, the 3 hospital affiliates and their researchers to develop, attract and maintain among the highest minds in the Neuroinformatic field. The numerous articles published by the principal investigators does attract potential new donors to the cause of brain research in all shapes and forms as a global centre of excellence and acting as an incubator for neuroinformatics, genetics and epigenetics (big data) research and training.

The latest initiative of the Ludmer Centre is the Single-Cell Genomics Brain Initiative keeps McGill University, its hospital partners and top researchers at the forefront of the research in the field of Neuroinformatics and mental health research.

FMHS will also be helping the Ludmer Centre when the Website is transferred to the McGill platform as it will be supported by McGill including the translation of it's content.

- Provide suggestions about how the Faculty could do better to support the Unit and research efforts in general (**no page limit but please be specific and unleash your creativity!**)

The FMHS is already helping us with the transfer of the Ludmer Centre Website from the old WordPress platform to the McGill platform as it will be easier to update and add/remove information. IT of McGill for design and development is already supporting our Communications Officer Naghmeh Shafiei with the transfer and development. Also included is the support of the translation into French of the version of the Website.

Also, the UA of FMHS with Brian's group accepted both the Communication Officer and the Associate Director into their offices at 1010 Sherbrooke Ouest and this is a great privilege to have offices next to the UA Team as it facilitates meetings and interactions. These 2 actions are very important, appreciated and it will improve efficiency of the work that the Ludmer Centre does and will continue to do.

Appendix

Part 1. Response to last year's comments from the CORU

From the Committee: They noted that information concerning the Centre's activities are out of date, both in the annual report and on the Centre's website. - The Committee also noted that the description of these activities was not well detailed, which does not showcase the Centre's actual contributions to research, training, and outreach.

Response from the Ludmer Centre: the actual Associate Director of the Ludmer Centre came into position as of Dec.12th, 2022 and the new position of Communication Officer was filled by Ms.Naghmeh Shafiei only on Jan.9th, 2023. The Ludmer Centre website is being transitioned from its older platform WordPress to the new McGill Platform and it should be completed by 3Q 2023. It will be updated with all of the past and present Annual Reports and with all of the activities (contributions to research, training and outreach) involved past and present to the best of its reconciliation.

From the Committee: Budget information lacked detail.

Response from the Ludmer Centre: budget information provided in this annual report took into consideration last year's comment. Additional information upon request is available.