Report of the Academic Policy Committee D16-52

480th REPORT OF THE ACADEMIC POLICY COMMITTEE TO SENATE

PART A: On the APC meeting held on March 29th, 2017

I. TO BE APPROVED BY SENATE

(A) NEW TEACHING PROGRAMS REQUIRING SENATE APPROVAL

Graduate and Postdoctoral Studies
Graduate Certificate in Translational Engineering (15 cr.) – *appendix A*
At a meeting on March 29th, 2017, APC reviewed and approved a proposal to create a new Graduate Certificate in Translational Engineering (15 cr.*).* McGill's current graduate program in Biological and Biomedical Engineering provides an excellent preparation for a career in research, but little training in the translational skills required to design, develop, manufacture and commercialize biomedical devices and technologies. This new program will fill this gap and respond to the strong interest students have expressed for this kind of training and the clear demand from the industry for students with expertise.

APC therefore recommends that Senate approve the following resolution:
Be it resolved that Senate approve the proposed Graduate Certificate in Translational Engineering.

Graduate and Postdoctoral Studies/ Faculty of Education
Ph.D. in Kinesiology Sciences (0 cr.) – *appendix B*
At a meeting on March 29th, 2017, APC reviewed and approved a proposal to create a new Ph.D in Kinesiology Sciences. Since the early 2000's, the Department of Kinesiology and Physical Education has graduated more than 20 Ph.D. students enrolled in Kinesiology using the *Ad hoc* option, and currently has 20 students registered in this doctoral program. Given this continuous success, it is now time to formalize this offering as a structured program recognized by the Ministry. This will only be the third doctoral program of this kind in Quebec, and the first one in English, therefore attracting students from across Canada, as well as international students.

APC therefore recommends that Senate approve the following resolution:
Be it resolved that Senate approve the proposed Ph.D. in Kinesiology Sciences.

Desautels Faculty of Management
M.M. in Analytics; Non-Thesis (45 cr.) – *appendix C*
At a meeting on March 29th, 2017, APC reviewed and approved a proposal to create a new M.M. in analytics. This program is designed to train students in the evolving field of management analytics and address the growing needs of organizations (non-profit, for profit, governmental) for management analysts. The program will have an important experiential component and will aim at providing students with hands-on application of the concepts taught in real world settings and the opportunity to interact with practitioners in leading analytics organisations. This program will be self-funded.

APC therefore recommends that Senate approve the following resolution:
Be it resolved that Senate approve the proposed M.M. in Analytics; Non-Thesis.

(B) ACADEMIC PERFORMANCE ISSUES / POLICIES / GOVERNANCE/AWARDS - *none*

(C) CREATION OF NEW UNITS / NAME CHANGES / REPORTING CHANGES

Faculty of Agricultural and Environmental Sciences
Proposal for the renaming of the School of Dietetics and Human Nutrition to the School of Human Nutrition – *appendix D*
At a meeting on March 29th, 2017, APC reviewed and approved a proposal from the Faculty of Agricultural and Environmental Sciences to change the name of its School of Dietetics and Human Nutrition to the School of Human Nutrition. This change will reflect the broader scope of offerings and activities of the School of Dietetics and Human Nutrition, whose mandate has evolved from exclusive undergraduate dietetics education to other undergraduate and graduate research programs in Human Nutrition since its creation. It will also align with the nomenclature commonly found in universities across North America, where either Human Nutrition or Nutritional Sciences are used.

APC therefore recommends that Senate approve the following resolution:
Be it resolved that Senate approve and recommend to the Board of Governors for approval the renaming of the School of Dietetics and Human Nutrition to the School of Human Nutrition.

Research Advisory Council
Ludmer Centre for Neuroinformatics and Mental Health – *appendix E*
At a meeting on March 29th, 2017, APC reviewed and approved a proposal to establish the Ludmer Centre as an official research centre of McGill University. The Ludmer Centre is an innovative collaboration between the Douglas Mental Health University Institute Research Centre, the Jewish General Hospital's Lady Davis Institute for Medical Research and McGill University's Montreal Neurological Institute. This unique virtual collaboration of three institutions creates a more cost-effective approach to research, by maximizing their research expertise and infrastructure. The Ludmer Centre brings together and supports four complementary research pillars (neuroinformatics, neuroimaging, epigenetics and statistical genetics). The goal of the cross-disciplinary research conducted at the Centre is to advance neuroinformatics and mental health research and McGill's neuroscience leadership role.

APC therefore recommends that Senate approve the following resolution:
Be it resolved that Senate approve and recommend to the Board of Governors for approval the creation of the Ludmer Centre for Neuroinformatics and Mental Health, on the understanding that the honorific naming is subject to approval by the Board of Governors, in accordance with the Policy Relating to the Naming of University Assets.

(D) CHANGES IN DEGREE DESIGNATION – *none*

(E) INTER-UNIVERSITY PARTNERSHIPS – *none*

(F) OTHER – *none*

II. TO BE ENDORSED BY SENATE / PRESENTED TO SENATE FOR DISCUSSION – *none*

III. APPROVED BY APC IN THE NAME OF SENATE

(A) DEFINITIONS – *none*

(B) STUDENT EXCHANGE PARTNERSHIPS / CONTRACTS / INTERUNIVERSITY PARTNERSHIPS

At a meeting on March 29th, 2017, APC reviewed and approved the following student exchange partnerships (these exchange programs will be limited to undergraduate students enrolled in the Desautels Faculty of Management):

- Between the Desautels Faculty of Management and the Faculty of Business and Accountancy, University of Malaya, Kuala Lumpur (Malaysia)
- Between the Desautels Faculty of Management and the Faculty of Business Administration, Foreign Trade University, Hanoi (Vietnam)
- Between the Desautels Faculty of Management and the School of Management, Zhejiang University, Hangzhou (P.R. China)
- Between the Desautels Faculty of Management and the Faculty of Economics and Business Administration, The Humboldt-University in Berlin (Germany)

(C) OTHER - *none*

IV. FOR THE INFORMATION OF SENATE

A) ACADEMIC UNIT REVIEWS – *none*

B) APPROVAL OF COURSES AND TEACHING PROGRAMS

1. Programs

a) APC Approvals (new options/concentrations and major revisions to existing programs)

i. New Programs

Graduate and Postdoctoral Studies/Faculty of Education
M.A. in Education and Society; Non-Thesis - Coursework (45 cr.)
At a meeting on March 29th, 2017, APC reviewed and approved a proposal to create a new M.A. in Education and Society; Non-Thesis; Coursework, intended for practicing teachers that work full time and cannot commit to completing a thesis or project in a Master's program. The Faculty of Education hopes that the addition of a coursework option will help attract more students.

M.A. in Education and Society; Non-Thesis- Coursework – Mathematics and Science Education (45 cr.)
At a meeting on March 29th, 2017, APC reviewed and approved a proposal to create a new M.A. in Education and Society; Non-Thesis; Coursework- Mathematics and Science. This program is intended for people who are interested in furthering their education but cannot commit the time to a thesis or project. The Faculty of Education hopes that the addition of a coursework option will help attract more students.

M.A. in Education and Society; Non-Thesis- Project- Mathematics and Science Education (45 cr.)
At a meeting on March 29th, 2017, APC reviewed and approved a proposal to create a new M.A. in Education and Society; Non-Thesis- Project- Mathematics and Science. This program is intended for people who are interested in furthering their education and cannot commit to a thesis, but still wish to complete a research project. The Faculty of Education hopes that the addition of a project option will help attract more students.

Faculty of Science
B.Sc.; Major in Chemistry; Biophysical Chemistry (65-66 cr.)
B.Sc.; Honours in Chemistry; Biophysical Chemistry (74-75 cr.)
At a meeting on March 29th, 2017, APC reviewed and approved a proposal to create a new B.Sc; Major in Chemistry; Biophysical Chemistry and B.Sc; Honours in Chemistry; Biophysical Chemistry. In order to capitalize on investments made in Biophysics, several departments in the Faculty of Science are developing an integrated Biophysics undergraduate teaching and recruitment strategy. These two options have been created by the Department of Chemistry as part of this initiative.

B.Sc.; Major in Physics; Biological Physics (81-82 cr.)
B.Sc.; Honours in Physics; Biological Physics (81-82 cr.)
At a meeting on March 29th, 2017, APC reviewed and approved a proposal to create a new B.Sc.; Major in Physics; Biological Physics and a new B.Sc.; Honours in Physics; Biological Physics. The creation of those two new options follows the hiring of several Biological Physicists in the Department of Physics, and will respond to the growing interest in the rapidly-evolving field of biological physics.

ii. Major Revisions of Existing Programs- *none*

b) APC Subcommittee on Courses and Teaching Programs (SCTP) Approvals
(Summary Reports: http://www.mcgill.ca/sctp/documents/)

i. Moderate and Minor Program Revisions
Approved by SCTP on 16th February 2017, reported to APC on 29th March 2017

School of Continuing Studies
Graduate Certificate in Entrepreneurship (15 cr.)

Faculty of Science
B.Sc.; Major in Biology and Mathematics (76 cr.)
B.Sc.; Major in Computer Science and Biology (63-74 cr.)
B.Sc.; Honours in computer Science and Biology (66-77 cr.)
B.Sc.; Major in Physiology and Mathematics (79 cr.)
B.Sc.; Major in Physiology and Physics (82 cr.)
B.Sc.; Major in Anatomy and Cell Biology (67 cr.)
B.Sc.; Honours in Anatomy and Cell Biology (73 cr.)

Approved by SCTP on 9th March 2017, reported to APC on 29th March 2017

Faculty of Agricultural and Environmental Sciences
B.Sc.(Nutr.Sc.); Major in Nutrition; Food Function and Safety (90 cr.)
B.Sc.(Nutr.Sc.); Major in Nutrition; Global Nutrition (90 cr.)
B.Sc.(Nutr.Sc.); Major in Nutrition; Health and Disease (90 cr.)
B.Sc.(Nutr.Sc.); Major in Nutrition; Nutritional Biochemistry (90 cr.)
B.Sc.(Nutr.Sc.); Major in Nutrition; Sports Nutrition (90 cr.)

Faculty of Engineering
B.Eng; Co-op in Mining Engineering (150-151 cr.)

Graduate and Postdoctoral Studies
M.Sc. in Family Medicine; Medical Education (45 cr.)
M.Sc.(A.) in Occupational Therapy; Non-Thesis (60 cr.)
M.Sc. (A.) in Physical Therapy; Non-Thesis (60 cr.)
Ph.D. in Epidemiology (0 cr.)

Ph.D. in Epidemiology; Global Health (0 cr.)
Ph.D. in Epidemiology; Pharmacoepidemiology (0 cr.)
Ph.D. in Epidemiology; Population Dynamics (0 cr.)

ii. Program Retirements - *none*

2. Courses

a) New Courses
Reported as having been approved by SCTP on 16th February 2017: 2
Faculty of Arts: 2

Reported as having been approved by SCTP on 9th March 2017: 39
Faculty of Agricultural and Environmental Sciences: 1
School of Continuing Studies: 1
Faculty of Dentistry: 4
Faculty of Engineering: 2
Desautels Faculty of Management: 30
Faculty of Medicine: 1

b) Course Revisions
Reported as having been approved by SCTP on 16th February 2017: 35
Faculty of Arts: 29
Faculty of Law: 6

Reported as having been approved by SCTP on 9th March 2017: 20
Faculty of Agricultural and Environmental Sciences: 4
Faculty of Arts: 1
Faculty of Education: 1
Faculty of Engineering: 6
Faculty of Medicine: 8

c) Course Retirements
Reported as having been approved by SCTP on 16th February 2017: 3
Faculty of Arts: 3

Reported as having been approved by SCTP on 9th March 2017: 7
Faculty of Arts: 2
Faculty of Medicine: 5

(B) OTHER - *none*

McGill

APC APPENDIX A 17-APC-03-32

New Program/Major or Minor/Concentration Proposal Form

(2013)

1.0 Degree Title
Please specify the two degrees for concurrent degree programs

Graduate Certificate

1.1 Major (Legacy = Subject) (30-char. max.)

Translational Biomedical Engineering

1.2 Concentration (Legacy = Concentration/Option) If applicable to Majors only (30 char. max)

1.3 Minor (with Concentration, if Applicable) (30char. max)

2.0 Administering Faculty/Unit

Graduate and Postdoctoral Studies (GPS)

Offering Faculty/Department

Medicine/ Biomedical Engineering

3.0 Effective Term of Implementation
(Ex. Sept. 2004 = 200409)
Term

201709

4.0 Rationale and Admission Requirements for New Proposal

McGill's current graduate program in Biological and Biomedical Engineering provides an excellent preparation for a research career but little training in the translational skills required to design, develop, manufacture, and commercialize biomedical devices and technologies. There is strong student interest in such training and a clear demand in industry for students with this expertise. This certificate represents an initiative to meet this need.

Admission Requirements: See attached page.

5.0 Program Information

Please check appropriate box(es)

5.1 Program Type

- ☐ Bachelor's Program
- ☐ Master's
- ☐ M.Sc. (Applied) Program
- ☐ Dual Degree/Concurrent Program
- ☐ Certificate
- ☐ Diploma
- ☒ Graduate Certificate
- ☐ Graduate Diploma
- ☐ Ph.D. Program
- ☐ Doctorate Program (Other than Ph.D.)
- ☐ Private Program
- ☐ Off-Campus Program
- ☐ Distance Education Program (By Correspondence)
- ☐ Other:

Please specify

5.2 Category

- ☐ Faculty Program (FP)
- ☐ Major
- ☐ Joint Major
- ☐ Major Concentration (CON)
- ☐ Minor
- ☐ Minor Concentration (CON)
- ☐ Honours (HON)
- ☐ Joint Honours Component (HC)
- ☐ Internship/Co-op
- ☐ Thesis (T)
- ☐ Non-Thesis (N)
- ☐ Other:

Please specify

5.3 Level

- ☐ Undergraduate
- ☐ Dentistry/Law/Medicine
- ☐ Continuing Studies (Non-Credits)
- ☒ Masters & Grad Dip & Certs
- ☐ Doctorate
- ☐ Post-Graduate Medicine/ Dentistry
- ☐ Graduate Qualifying
- ☐ Postdoctoral Fellows

5.4 FQRSC (Research) Indicator (For GPS)

☐ Yes ☒ No

6.0 Total Credits

15

7.0 Consultation with

Related Units ☒ Yes ☐ No

Financial Consult ☒ Yes ☐ No

Attach list of consultations. N/A

Admission requirements: Students with an undergraduate engineering degree with a major or minor in biomedical engineering, or the equivalent and an undergraduate GPA of 3.3. Graduates from other areas of engineering /natural sciences will be admitted provided that they have a background in general physiology equivalent to that covered in both Physiology 209 and 210. Applicants lacking the life science background may be admitted but will be required to fulfill the physiology prerequisite in the first year of the certificate. This may be achieved by taking Physiology 209 or 210 or other courses approved by the program director. The prerequisite course will not count toward the program's 15 credits.

8.0 Program Description (Maximum 150 words)

The program comprises three mandatory core courses and two complementary. The mandatory courses deal with topics that are unique to the translational process in the biomedical engineering environment. Topics covered will include: managing intellectual property, patents and the patenting process, regulatory affairs, medical standards, quality management systems, and clinical trials. The two complementary courses will provide the student with advanced training. In a specialized area of biomedical engineering selected from the areas where Departmental staff have significant expertise.

In cases where students have taken one or more of the core courses as part of another program, these core courses will be replaced with the equivalent number of credits, at the 500 level or higher, by other appropriate courses selected in consultation with the program director.

9.0 List of proposed program for the New Program/Major or Minor/Concentration

If new concentration (option) of existing Major/Minor (program), please attach a program layout (list of courses) of existing Major/Minor.

Proposed program (list course as follow: Subj Code/Crse Num, Title, Credit weight, under the heading of: Required Courses, Complementary Courses, and Complementary Courses).

Graduate Certificate in Translational Biomedical Engineering (15 credits)

Required Courses (9 credits)
Three courses dealing with issues related specifically to the translation of biomedical engineering advances to clinical and commercial environment:

BMDE 653 Patents in Biomedical Engineering (3 credits)
BMDE 654 Biomedical Regulatory Affairs - Medical Devices (3 credits)
BMDE 655 Biomedical Clinical Trials – Medical Devices (3 credits)

Complementary Courses (6 Credits)
Students must complete 6 credits of biomedical engineering course work selected from one or more of the following domains or other appropriate courses at the 500 level or higher approved by the Program Director:

General Biomedical Engineering
BMDE 501 Selected Topics in Biomedical Engineering (3 credits)

Biomedical Signals and Systems
BMDE 502 BME Modelling and Identification (3 credits)
BMDE 503 Biomedical Instrumentation (3 credits)
BMDE 512 Finite-Element Modelling in Biomedical Engineering (3 credits)
BMDE 519 Biomedical Signals and Systems (3 credits)

Medical Imaging
BIEN 530 Imaging and Bioanalytical Instrumentation (3 credits)
BMDE 610 Functional Neuroimaging Fusion (3 credits)
BMDE 650 Advanced Medical Imaging (3 credits)
MDPH 607 Introduction to Medical Imaging (3 credits)

Biomaterials and Tissue Engineering
BIEN 510 Nanoparticles in the Medical Sciences (3 credits)
BMDE 504 Biomaterials and Bioperformance (3 credits)
BMDE 505 Cell and Tissue Engineering (3 credits)

Biosensors and Devices
BIEN 520 High Throughput Bioanalytical Devices (3 credits)
BIEN 550 Biomolecular Devices (3 credits)
BIEN 560 Biosensors (3 credits)
BMDE 503 Biomedical Instrumentation (3 credits)
BMDE 508 Introduction to Micro and Nano-Bioengineering (3 credits)

10.0 Approvals

Routing Sequence	Name	Signature	Date
Department	Prof. Robert E. Kearney		Dec. 12/16
Curric/Acad Committee	Prof. Robert E. Kearney		Dec. 12/16
Faculty 1	DAVID RADALE		Dec 20, 2016
Faculty 2	Elaine Davis	Elaine C Davis	Dec. 20, 2016
Faculty 3			
CGPS		CGPS Approval	Jan. 16, 2017
SCTP			Feb. 2, 2017
APC			
Senate			

SCTP APPROVED

Submitted by

Name	
Phone	
Email	
Submission Date	

To be completed by ARR:

CIP Code

APC APPENDIX D 17-APC-03-34

McGill

New Program/Major or Minor/Concentration Proposal Form

(07/2004)

1.0 Degree Title
Please specify the two degrees for concurrent degree programs

Doctor of Philosophy (Ph.D.)

1.1 Major (Legacy= Subject)(30-char. max.)

Kinesiology Sciences

1.2 Concentration (Legacy = Concentration/Option)
If applicable to Majors only (30 char. max.)

1.3 Minor (with Concentration, if Applicable) (30 char. max.)

2.0 Administering Faculty/Unit

Graduate and Postdoctoral Studies

Offering Faculty/Department

Education / Kinesiology and Physical Education

3.0 Effective Term of Implementation
(Ex. Sept. 2004 = 200409)
Term

201809

4.0 Rationale for new proposal

Since the early 2000's, McGill has graduated more than 20 Ph.D. students enrolled in Kinesiology (i.e., science of human movement) research in the Department of Kinesiology and Physical Education (KPE) using the Ad hoc option. KPE currently has 20 registered Ph.D. students. Given KPE's sustained success in recruiting and graduating Ph.D. students and in supporting them using their successful research programs, there is a need to formalize this offering into a structured program that complies with the Quebec Ministry's expectations of University Ph.D. programs. This new degree program, Ph.D. in Kinesiology Sciences, will only be the third such Ph.D. program in Quebec, and the only one offered in English, and would further attract students from Canada and the world to McGill University. The academic purpose of this Ph.D. program is to advance the science of human movement aimed to promote health and well-being across the lifespan by actively engaging Ph.D. students in kinesiology-related research. Admission requirements will be a Master's degree in Kinesiology or related disciplines, or equivalent.

5.0 Program Information
Please check appropriate box(es)

5.1 Program Type	5.2 Category	5.3 Level
Bachelor's Program	Faculty Program (FP)	Undergraduate
Master's	Major	Dentistry/Law/Medicine
M.Sc. (Applied) Program	Joint Major	Continuing Ed (Non-Credit)
Dual Degree/Concurrent Program	Major Concentration (CON)	Collegial
Certificate	Minor	Masters & Grad Dips & Certs
Diploma	Minor Concentration (CON)	[X] Doctorate
Graduate Certificate	Honours (HON)	Post-Graduate Medicine/Dentistry
Graduate Diploma	Joint Honours Component (HC)	Graduate Qualifying
[X] Ph.D. Program	Internship/Co-op	Postdoctoral Fellows
Doctorate Program (Other than Ph.D.)	[X] Thesis (T)	
Private Program	Non-Thesis (N)	
Off-Campus Program	Other	
Distance Education Program (By Correspondence)	Please specify	
Other (Please specify)		

6.0 Total Credits

0

7.0 Consultation with Related Units X **Yes** No

Financial Consult X **Yes** No

Attach list of consultations.

8.0 Program Description (Maximum 150 words)

The objective of the Ph.D. in Kinesiology Sciences is to provide opportunities for in-depth research experience in (an) area(s) of Departmental expertise within the breath of kinesiology research. The program will provide graduate research training in kinesiology-related areas such as exercise physiology, biomechanics, motor control, physical and health education pedagogy, and sport, exercise and health psychology provided by a rich environment in the Department of Kinesiology and Physical Education. Students with a Master's degree in kinesiology or related discipline or equivalent background will qualify to apply. Students will complete 12 credits of required courses, including a capstone course intended to survey contemporary issues in kinesiology research, and two complementary courses intended to provide adequate theoretical depth to support their program of research.

NOTE: This program does not lead to Certification as a practicing kinesiologist

9.0 List of proposed program for the New Program/Major or Minor/Concentration.

If new concentration (option) of existing Major/Minor (program), please attach a program layout (list of all courses) of existing Major/Minor.

Proposed program (list courses as follows: Subj Code/Crse Num, Title, Credit weight under the headings of: Required Courses, Complementary Courses, Elective Courses)

Proposed Ph.D. in Kinesiology Sciences (0 credits)

Required Courses (12 credits)
EDKP 605 Research Methods 1 (3 cr.)
EDKP 617 Seminar in Kinesiology and Physical Education 1 (0 cr.)
EDKP 618 Seminar in Kinesiology and Physical Education 2 (0 cr.)
EDKP 619 Seminar in Kinesiology and Physical Education 3 (0 cr.)
EDKP 620 Seminar in Kinesiology and Physical Education 4 (0 cr.)
EDKP 661D1 Current Topics in Kinesiology Research (3 cr.)
EDKP 661D2 Current Topics in Kinesiology Research (3 cr.)
EDKP 701 Ph.D. Comprehensive Examination (0 cr.)
EDPE 676 Intermediate Statistics (3 cr.)

Complementary Courses (6 credits)
A minimum of 6 credits from the following; other courses, at the 500 level or higher, on these topics from the Faculty of Education or other Faculties may be selected subject to approval of program advisor.

EDKP 603D1 Individual Reading Course 1 (3 cr.)
EDKP 603D2 Individual Reading Course 1 (3 cr.)
EDKP 616 Individual Reading Course 2 (3 cr.)
EDKP 630 Human Walking Mechanics (3 cr.)
EDKP 635 Modeling Human Movement (3 cr.)
EDKP 640 Advanced Ergonomics (3 cr.)
EDKP 650 Research in Physical Education Pedagogy (3 cr.)
EDKP 652 Cardio-Respiratory Exercise Physiology (3 cr.)
EDKP 654 Sport Psychology (3 cr.)
EDKP 655 Inclusive Physical Activity (3 cr.)
EDKP 662 Nerve/Muscle Exercise Response (3 cr.)
EDKP 664 Motor Learning (3 cr.)
EDKP 665 Motor Behaviour and Disability (3 cr.)
EDKP 671 Experimental Problems (3 cr.)
EDKP 672D1 Advanced Experimental Problems (3 cr.)
EDKP 672D2 Advanced Experimental Problems (3 cr.)

Ph.D. KPE

10.0 Approvals

Routing Sequence	Name	Signature	Date
Department	Prof Julie Côté		Jan. 19, 2017
Curric/Acad Committee	Prof Elizabeth Wood		Jan 24, 2017
Faculty 1			
Faculty 2			
Faculty 3			
CGPS		CGPS Approval	Feb. 13, 2017
SCTP			MARCH 9, 2017
APC			
Senate			

SCTP APPROVED

Submitted by

Name	
Phone	
Email	
Submission Date	

To be completed by ARR:

CIP Code

Fédération des Kinésiologues du Québec
Campus de l'Université de Montréal, Département de Kinésiologie
C.P. 6128, Succ. Centre-Ville, Montréal, Qc H3C 3J7
[Téléphone : (514) 343-2471] [Télécopieur : (514) 343-2181]
[Web : www.kinesiologue.com] [Courriel : info@kinesiologue.com]

Montréal, 12 janvier 2017

Julie Côté, Ph.D.
Directrice et Professeure Agrégée
Département de Kinésiologie et d'Éducation Physique
Université McGill
475 avenue des Pins ouest, Montréal, QC, H2W 1S4

Chère Professeure Côté,

Par la présente, la Fédération des Kinésiologues du Québec (FKQ) désire apporter son appui enthousiaste à la demande de nouveau programme de doctorat en sciences de la kinésiologie déposée par l'Université McGill.

La FKQ est un organisme sans but lucratif, regroupant plus de 1200 membres, dont près de 1000 kinésiologues accrédités.

En 2013, la FKQ a déposé une demande de constitution en ordre professionnel à l'Office des professions du Québec, à laquelle les représentants de l'Université McGill ont activement contribué. De par cette demande, nous espérons qu'à l'instar de l'Ontario, le statut professionnel des kinésiologues, leur domaine et leurs activités professionnelles soit reconnus au Québec, ce qui contribuerait à l'essor de notre profession au Québec.

Actuellement, il existe deux programmes francophones de doctorat en sciences de la kinésiologie au Québec, soit à l'Université de Montréal et à l'Université Laval. Bien que l'accréditation à la FKQ ne requière actuellement pas de diplôme d'études supérieures, les avancées de recherches en sciences de la kinésiologie représentent un élément important au développement de notre profession. La formalisation de ce programme de doctorat à l'Université McGill ne pourrait que davantage favoriser les liens entre la FKQ et l'Université McGill, contribuer à la construction de savoirs et de compétences en kinésiologie et ultimement optimiser l'impact de la kinésiologie sur la santé des Québécois.

Par conséquent, la FKQ désire appuyer la demande de nouveau programme de doctorat en sciences de la kinésiologie déposée par l'Université McGill.

En vous souhaitant un bon succès, je vous prie d'agréer mes salutations distinguées,

Valérie Lucia
Directrice générale

McGill Ph.D. in Kinesiology Sciences, New Ph.D. Program Framework Document

Section A: Rationale for the Proposed Program

1. Evolution of the discipline – brief history of the field and where it's headed. How the new Ph.D. program fits within the discipline

As a discipline, kinesiology (i.e. study of human movement) has its roots in physical education and health promotion, both of which have a rich history at McGill University since the luminaries Tait Mackenzie, James Naismith, Ethel Mary Cartwright and Sir Arthur Currie were students and professors at McGill. In the 1960s, the physical education teacher-training model that grounded many physical education departments received increasing research attention. In 1967, the University of Waterloo and Simon Fraser University established their Departments of Kinesiology, the two first in North America to offer education in exercise sciences. The 1996 "Physical Activity and Health" report by the Acting Surgeon General of the United States, in collaboration with over 200 American and Canadian exercise scientists, stressed the important role of physical activity in optimizing health. The report provided impetus for universities to ensure appropriate training for individuals to assess, design and monitor physical activity across the lifespan. The report also recognized the science of kinesiology as a complex and developing field, contributing strong evidence to the interaction between physical activity and health, and stressed the need for continued research in this discipline. Thus, since the late 1990s, most universities in Canada have created their own academic kinesiology program, with various health and/or performance perspectives aligned with each institution's specific expertise (e.g. human performance in the workplace, high performance sport, clinical interventions, recreation and activities of daily living). Some institutions have maintained the historical link between physical education and kinesiology by offering both programs within the same Faculty (University of Toronto) or Department (McGill), while others have separated both fields in separate departments (U. Laval).

Professional bodies exemplify the evolution of the discipline of kinesiology as they now encompass both a body of knowledge and an associated client-centered practice. The primary mission of these organizations is to promote population health through various intervention strategies emphasizing physical activity and to set standards of practice for their members. In the US, the American College of Sports Medicine (ACSM) represents 50,000 practicing exercise specialists (the U.S. equivalent to kinesiologists). In 2013, Ontario was the first Canadian province to request and obtain professional status for practicing kinesiologists. According to Ontario law, specific professional acts such as prescribing exercise programs are now to be performed by certified, licensed kinesiologists. A similar request was submitted to the *Office des Professions du Québec* in 2014 by the La Fédération des Kinésiologues du Québec (FKQ), supported by a provincial committee of university kinesiology representatives, including McGill University. Although the objective of post-graduate kinesiology programs is not to prepare students to qualify for this certification, these graduate programs create a strong knowledge base of effective best practices used by kinesiologists. These best practices must be based on sound knowledge foundations and be able to evolve in breadth and depth from ground-breaking research, in a way that is open to other disciplines and to the world.

To meet these needs, Ph.D. programs in Kinesiology have emerged in Canada in the last decades, but only two such programs currently exist in the province of Quebec (Université de Montréal, Université Laval, both delivered in French). *Although the McGill Ph.D. in Kinesiology Sciences would be a new program, our Department has been graduating Ph.D. students for more than 20 years (first graduate on record dating back to 1988).* To do so, our Department has been using the *Ad hoc* Ph.D. option, which has been used to individually customize students' program according to their dissertation topic. In the late 1990s, this option was exercised only sporadically, but we have had Ph.D. student cohorts registered in our Department on a continuous basis since the mid 2000's (see Table 1), with graduates going on to Faculty positions in institutions as prestigious as Columbia University. This corresponded to a period for our Department of only marginal growth of our full-time faculty complement (which has traditionally oscillated around 15) but of significant expansion of research productivity, in line with the general development of the discipline of kinesiology worldwide (see previously).

Academic year	New admits	Total enrolment	Degrees granted	Full-time Tenure Track (eligible supervisors)
2005/6	2	2	NA	12
2006/7	1	3	NA	12
2007/8	4	8	0	12
2008/9	4	12	0	14
2009/10	3	15	0	14
2010/11	8	21	2	16
2011/12	3	20	4	15
2012/13	4	21	3	14
2013/14	3	20	4	15
2014/15	4	19	5	14
2015/16	3	16	6	14
2016/17	(5)	(20)	(4)	13

Table 1: Ad hoc Ph.D. admissions, enrolment and graduation statistics for students enrolled in McGill's Department of Kinesiology and Physical Education. *note: fragmented information is available for the years prior to 2006; preliminary data available for 2016/17.

In 2007, at a point where KPE began to show evidence for a sustainable Ph.D. cohort size, a decision was made by McGill to explore the creation of an Interdisciplinary Allied Health Ph.D. program, with a goal of uniting cohorts of different McGill academic units including our Department into one Ph.D. program. *However, in 2014, this plan was abandoned as it was not seen as a feasible solution for Ph.D. studies. In parallel, during this period, our Ph.D. enrolment numbers were maintained and we began consistently graduating Ph.D. candidates.*

To this day, McGill's KPE is rated among the top 3 most research-intensive Kinesiology program-delivering Departments (in terms of research funding per professor), according to a cyclical review of our Department produced in 2015. This provides evidence of the ability of our Department to adequately support Ph.D. student cohorts with quality research training environments and sizeable trainee stipend support. *As a department, we now feel well equipped to request a formal Ph.D. program in Kinesiology Sciences. This new program would be the only one in Quebec delivered in English, representing a unique market to attract Canadian and international students interested in the emerging field of Kinesiology Sciences.*

2. Definition of proposed body of knowledge – what skills and understanding will students in the program gain? In what key research areas?

The mission of McGill's Department of Kinesiology and Physical Education (KPE) is to train leaders of tomorrow through excellence in teaching, research and service and to advance and translate knowledge about sport, physical activity and human health across the lifespan, through a transdisciplinary focus from the cell, to the individual and to society. With the proposed new Ph.D. program, we aim to train critical thinkers, using state-of-the-art kinesiology research methods and statistical approaches, who will make significant original contributions to the advancement of kinesiology sciences. In regards to the scope of training, the contribution of our research programs falls within three domains, that are aligned with the Canadian Tri-Council granting agencies: *Health Sciences, Natural Sciences and Engineering, and Social Sciences and Humanities.* In fact, all three research pillars contribute almost equally to the scope of kinesiology research in KPE, as evidenced by a nearly balanced track record of research funding in KPE from each Tri-Council granting agency. It follows that the proposed Ph.D. program will target the development of kinesiology research skills relevant to all three pillars for each student. More specifically, our Department specializes in research training in the following key areas of kinesiology research, with recent Ph.D. graduates in each of these six main specialization areas:

- Adapted Physical Activity
- Biomechanics
- Exercise Physiology
- Motor Control and Learning
- Physical and Health Education Pedagogy
- Sport and Health Psychology

Because kinesiology is an interdisciplinary field, it enables collaborative partnership with other health research disciplines. Thus, the ability to conduct interdisciplinary research is also an important objective pursued in the proposed Ph.D. program. In sum, we make a commitment to train McGill Ph.D. in Kinesiology Sciences students to develop their research breadth and depth, so they can become international leaders of kinesiology research.

3. Related Programs at McGill - brief discussion of related programs offered at McGill, and how the new program is different.

Below are the doctoral programs currently delivered by McGill University that are the most similar to the proposed Ph.D. in Kinesiology Sciences (with their affiliate unit):

- Human Nutrition (School of Dietetics and Human Nutrition)
- Rehabilitation Science (School of Physical and Occupational Therapy)
- Biological and Biomedical Engineering (Biomedical Engineering Department)
- Epidemiology, Biostatistics (Epidemiology, Biostatistics & Occupational Health)
- Physiology (Department of Physiology), Experimental Medicine (Medicine)
- Neuroscience (Integrated Program in Neuroscience)
- Psychology – Experimental Psychology Track (Department of Psychology)
- Educational Studies (Integrated Studies in Education)
- Educational Psychology (Educational and Counselling Psychology)

The first three listed programs are designed for students with professional training in their respective fields (e.g. nutritionists, physiotherapists, engineers). The next three are more similar to ours in that the admission path requires an academic background in Sciences (traditionally an M.Sc.), and they are also characterized by a broader, interdisciplinary knowledge base, although not specifically health-focused. Finally, the next three are more grounded in the Social Sciences and Humanities, the latter two being the only Ph.D. programs offered in the Faculty of Education, KPE's home Faculty. However, none of those three programs are as grounded in interdisciplinarity across the natural, health and social sciences to the same extent as the proposed program. *The Ph.D. in Kinesiology Sciences will be unique in that its core discipline deals with human movement, with research approaches that could as well be grounded in the health sciences, the natural science and engineering, and the social sciences and humanities.*

4. Similar Programs Offered Elsewhere – list of Ph.D. programs offered at our peer institutions (within Quebec, Canada and internationally).

Kinesiology/Exercise Sciences departments can be found in various University Faculties, schools or units, or even outside the academic setting (e.g. sport institute, clinical setting). In Quebec, the Kinesiology Department at the Université de Montréal is an independent unit reporting directly to the University Provost, whereas in Université Laval it is part of the Faculty of Medicine. In McGill, the Department of KPE is housed in the Faculty of Education, due to the history and tradition related to our physical education program. The variety in these affiliate structures has impacts on the content and areas of specialization within the respective Ph.D. programs. For instance, the proposed Ph.D. program incorporates Physical and Health Education Pedagogy as one of its areas of specialization whereas the Kinesiology Ph.D. program at Université Laval program includes obesity and diabetes as areas of expertise, with the associated research conducted in the clinical setting, and has a separate Ph.D. program in Psychopedagogy / Sport an Physical Education stream. Therefore, our Ph.D. program will be the only one in Quebec with a dedicated research focus on physical and health education and adapted physical activity integrated into its Ph.D. in Kinesiology Sciences program, providing a unique, interdisciplinary profile and skillset to its graduates.

The Shanghai Ranking (www.shangairanking.com) recently unveiled a ranking of Sport Science Schools and Departments for the year 2016 (all of which would offer a doctoral program in a discipline linked to Kinesiology). This ranking is led by a diverse group of institutions located in Australia (Deakin), England (Loughborough), the USA (South Carolina) but also several North European and Scandinavian Countries (Denmark, Norway, Germany, Netherlands). Among the u21 Universities, the one with the highest ranking Sport Science unit is the University of Queensland (5th on the Shangai ranking), followed by the University of Birmingham (12th), and Canada's University of British Columbia (16th). On this list, McGill's Department of Kinesiology and Physical Education sits in 60th position, as the 11th Canadian institution (*and the first one without a current Ph.D. program*). Only two other Kinesiology-related Departments in Quebec have their own Ph.D. programs: Université Laval, which stands ahead of McGill in the Shanghai Departmental ranking in 41st position, and Université de Montréal, which is ranked below McGill's KPE Department in the Shanghai rankings. *Thus, despite not having a formal Ph.D. program, McGill's KPE Department is able to rank higher than other comparable Departments with Ph.D. programs in the world, but nevertheless, sits comparatively low in 60th position worldwide compared to how the majority of McGill Departments rank compared to their own peer institutions worldwide.*

Section B: Academic Dossier

1. Overview of the Proposed Program

The Ph.D. in Kinesiology Sciences is designed for flexibility and focus on research. Below is a description of its academic content (Table 2), comprising 8 required courses totaling 12 credits and including the 0-credit comprehensive examination course, and a list of Complementary courses, from which students must choose a minimum of 6 credits. It should be noted that students admitted with a Master's degree in Kinesiology or related discipline may have parts of these academic program requirements waived. Finally, other courses may be taken as identified by the student's supervisory committee.

Required courses (12 cr)	Complementary courses (6 cr)
EDKP 605 Research Methods (3 cr)	EDKP 603 Individual Reading Course 1 (6 cr)
EDPE 676 Intermediate Statistics or equivalent (3 cr)	EDKP 616 Individual Reading Course 2 (3 cr)
EDKP 617 Seminar in Kinesiology and Physical Education 1 (0 cr)	EDKP 630 Human Walking Mechanics (3 cr)
EDKP 618 Seminar in Kinesiology and Physical Education 2 (0 cr)	EDKP 635 Modeling Human Movement (3 cr)
EDKP 619 Seminar in Kinesiology and Physical Education 3 (0 cr)	EDKP 640 Advanced Ergonomics (3 cr)
EDKP 620 Seminar in Kinesiology and Physical Education 4 (0 cr)	EDKP 650 Research in Physical Education Pedagogy (3 cr)
*EDKP 661 Current Topics in Kinesiology Research (6 cr) *new course**	EDKP 652 Cardio-Respiratory Exercise Physiology (3 cr)
EDKP 701 Ph.D. Comprehensive Examination (0 cr)	EDKP 654 Sport Psychology (3 cr)
	EDKP 655 Inclusive Physical Activity (3 cr)
	EDKP 662 Nerve/Muscle Exercise Response (3 cr)
	EDKP 664 Motor Learning (3 cr)
	EDKP 665 Motor Behaviour and Disability (3 cr)
	EDKP 671 Experimental Problems (3 cr)
	EDKP 672 Experimental Problems (6 cr)

Table 2: Ph.D. Kinesiology Sciences course content. * note only two courses appearing above are not part of the Department of KPE's current offering: EDPE 676 (permission to list this course has been granted by the corresponding Department Chair, please see consultation record), and EDKP 661 (new course proposal to be submitted along with this new Program proposal, see below).

2. Required Academic Activities - including comprehensive exam, thesis seminar, responsible conduct of research course, etc.

The standard Ph.D. program requirements (e.g. completion of comprehensive exam by end of year 2), as well as associated policies and procedures stipulated by Graduate and Postdoctoral Studies (e.g. progress tracking) will be incorporated into this new program, as they already are part of the Ad Hoc Ph.D. offering followed in the Department of Kinesiology and Physical Education.

3. Required Courses (including any newly proposed courses) – capstone course, research methods, mandatory seminar series, statistics, etc.

Table 2 lists all required courses for the Ph.D. in Kinesiology Sciences program. The academic core of the program will be the new course, tentatively called EDKP 661 Current Topics in Kinesiology Research (please see new course proposal form and preliminary course outline, appendix A). EDKP 661 is a two-term, 6-credit course that will serve as the Capstone course for each student cohort. The course description is the following:

> *Lecture and seminar-based discussions of current research across sub-disciplines and areas relevant to kinesiology. Students will situate their specific areas of doctoral research within the broader multidisciplinary field of kinesiology and other health-related research disciplines. Taught by experts in sub-disciplines of kinesiology research (e.g. exercise physiology, biomechanics, motor control, physical and health education pedagogy, sport and exercise psychology) and in interdisciplinary health research. Through individual and group work, students will be expected to develop a breadth and foundation of knowledge in kinesiology, its evolution and future directions of the field.*

From the program perspective, this course will serve to provide Kinesiology research breadth to each student enrolled in the program, whereas individual research thesis work will be designed to provide program depth to students in their own area of specialization.

4. Complementary Courses – selection of courses from the department and other units that students in the program will find relevant or informative to take during their Ph.D. studies.

Table 2 (above) provides a list of complementary courses at the 600-level or above currently being offered in the KPE Department. Additional courses may be substituted at the request of the student's supervisory committee for their pertinence and relevance to the student's individual specialization within the Ph.D. in Kinesiology Sciences program.

Section C: Resources

A detailed budget is currently being prepared, with the majority of resources allocated towards growing our program (e.g. advertisement, program coordination, program delivery related costs). Below is a table showing a preliminary rough estimate for our enrolment count, based on information available as of Jan. 17th 2017 on time to graduation, attrition, and projected number of KPE tenure track professors.

Academic year	New admits	Total enrolment	Full-time KPE Supervisors
2016/17	(5)	(20)	13
2017/18	5	18	14
2018/19	6	22	16
2019/20	7	26	17
2020/21	8	29	17
2021/22	8	31	18
2022/23	9	34	18
2023/24	9	37	18
2024/25	10	39	18
2025/26	10	41	18

Table 2: Enrollment projections for the Ph.D. in Kinesiology Sciences.

Conclusion

As a Department, McGill's KPE

- Has an academic mission in line with the developments of the field of Kinesiology (movement science), an academic discipline that is well integrated into University offerings worldwide since the 1990s.
- Does not have a formal Ph.D. Kinesiology program (in contrast to comparable Departments of the G13 and of most comparable Universities worldwide);
    - if it did, it would only be the 3rd one in Quebec, and the only one offered in English, representing a sizeable recruitment asset
- Has been accepting, supervising and graduating Ph.D. students sporadically since the late 1980's, and consistently since the mid-2000's, to the current sustained enrolment of about 20 students.
- Has a solid infrastructure to support current and future students, in terms of space, equipment, and grant support from comparatively successful KPE members.
- Is thus requesting formalization of a Ph.D. program in Kinesiology Sciences.

EDKP 661 Current Topics in Kinesiology Research (6 credits)

Fall 2018 – Winter 2019

Department of Kinesiology and Physical Education (KPE), McGill University

Class Schedule
Location: Currie Gym 305/6
Times: Mondays 9:35 am–12:35 pm

Format
Lectures & Seminars

Course Coordinator
Dr. Shane Sweet; Email: shane.sweet@mcgill.ca

Course Description
Lecture and seminar-based discussions of current research across sub-disciplines and areas relevant to kinesiology. Students will situate their specific areas of doctoral research within the broader multidisciplinary field of kinesiology and other health-related research disciplines. Taught by experts in sub-disciplines of kinesiology research (e.g. exercise physiology, biomechanics, motor control, physical and health education pedagogy, sport and exercise psychology) and in interdisciplinary health research. Through individual and group work, students will be expected to develop a breadth and foundation of knowledge in kinesiology, its evolution and future directions of the field.

Learning Outcomes:

Throughout the course, students will:
1. Develop an understanding of the scope of Kinesiology from the current scientific literature
2. Identify current and future trends in Kinesiology
3. Develop research paradigms targeting specific topics relevant to physical activity and health from a variety of Kinesiology sub-disciplines
4. Develop research paradigms that address specific topics relevant to physical activity and health using interdisciplinary research approaches with other scientific specialties
5. Design knowledge mobilization plans to effectively communicate Kinesiology research to a variety of end-users (e.g., community members, coaches, teachers, patients, employers)

Prerequisites
EDKP 605 Research Methods or equivalent; EDPE 676 Intermediate Statistics or equivalent

Readings
Lecture notes, weekly reference articles and links will be available on MyCourses.

Methods of Evaluation

Students will be assessed using a variety of means (oral, written, individual, team) and will be expected to demonstrate doctoral-level learning and critical assessment capabilities.

- ***Report on current & future trends***: a written assignment following Lecture 1 and associated readings, with an objective of critically analyzing a future trend in Kinesiology research, amongst the ones discussed in class. Students will explain the origins of this trend, describe its current state, highlight potential impact and risks that it will pose to the future of science, and reflect on how their research will follow or oppose this trend.

- ***For/against debates***: pairs of students with complementary specialization area will engage in two critical debates with another pair of student about a current 'hot topic' in kinesiology research related to the previous block of five lectures during the Fall semester (e.g. Is the higher occurrence of work-related musculoskeletal disorders in women due to sex (biological) or gender (socio-cultural) differences?).

- ***Written research proposals***:
  - *Proposal 1 (intra-disciplinary)*, to be submitted individually at the end of the Fall semester, students will briefly present a literature review, a rationale, a set of objectives and hypotheses, research methods and expected outcomes corresponding to a research project that would be conducted using the perspective of kinesiology research (i.e. using one or several research approaches presented during the Fall semester). The goal of Proposal 1 is to encourage student to develop a research idea that can serve as the premise for their PhD thesis. Proposal 1 is to be no more than 10 double spaced pages, excluding title page and references.

  - *Proposal 2 (interdisciplinary)*, a group of three students from different sub-disciplines of Kinesiology will submit, at the end of the Winter semester, a collective interdisciplinary research proposal drawing from kinesiology or relevant health research field. Groups will have to integrate at least two disciplines to develop research questions, present relevant methods and outline interdisciplinary expected outcomes. The groups will also need to demonstrate the added-value of each discipline's contribution to the research protocol. In addition, the perspective of the knowledge user will be incorporated into an integrated knowledge mobilization plan incorporated into the proposal.

  - *Critique of written proposals* will be conducted by students, individually for proposal 1 and as a group for proposal 2. Students will provide feedback to their peers in similar fields of research for proposal 1 and within larger breadth of their research for proposal 2. The goal of these critiques is to provide an opportunity to students to critique their peers work and provide constructive feedback to improve an end-product. Original and feedback improved proposals will be assessed along with comments provided to improve the original proposals.

- ***Oral research proposals:***
  - *Proposal 1* will parallel the objectives of the written research proposal 1 and will be presented individually at the beginning of the Winter semester.

  - *Proposal 2* will parallel the objectives of the written research proposal 2 and will be presented by groups at the end of the Winter semester.

- *Critiques of the oral presentations* will be performed on a one-to-one basis for proposal 1 and as a group for proposal 2 (with the attending audience). Students will be required to provide constructive feedback to presenting students/group that is aimed at improving the delivery and content of the presentation.

Grading Scheme

Report: current & future trends	10%
For/against debates (2)	10%
Written research proposals (2)	36%
Research Proposal Critique (2)	10%
Oral research proposal (2)	24%
Oral research proposal Critique (2)	10%
	100%

Course Schedule

FALL SEMESTER: INTRA-DISCIPLINARY ASPECTS IN KINESIOLOGY RESEARCH	
Weeks	**Topics**
1	The disciplinary field of Kinesiology: what is it? Past, present, future (S. Sweet, C. Paquette)
2	Kinesiology & Applied Exercise Physiology: research advances in the determination of physical activity targets for a healthy population (R. Andersen)
3	Kinesiology & Basic Physiology: methodological advances for the study of exercise & cardio-respiratory physiology in health and disease (D. Jensen)
4	Kinesiology, Motor Control & Learning: Technological advances for imaging and manipulating control of the human body to augment its mobility (C. Paquette, T. Milner)
5	Kinesiology & Biomechanics: Technological advances to measure and model human forces and motions (D. Pearsall)
6	Kinesiology & Muscle Anatomy & Physiology: advanced methods to study muscle structure and function, from the molecule to the whole-body (D. Rassier, T. Milner, D. Jensen, J. Côté)
7	*For/against debates round 1*
8	Kinesiology & Ergonomics: lab-based and workplace-based research advances to detect and prevent work-related injuries (J. Côté)
9	Kinesiology & Adapted Physical Activity: advanced research approaches for effective physical activity programming for individuals with disabilities (W. Harvey, S. Sweet)
10	Kinesiology & Health Education Pedagogy: advanced research methods to appropriately account for age, sex, gender and cultural diversity in kinesiology research (L. Schaefer)
11	Kinesiology & Health Psychology: technological advances for effectively communicating physical activity targets for a healthy population (L. Duncan)
12	A case of collaborative research in Kinesiology: merging sport psychology and biomechanics research to better prevent concussion chronicity (G. Bloom, D. Pearsall)
13	*For/against debates round 2*

WINTER SEMESTER: INTER-DISCIPLINARY ASPECTS OF KINESIOLOGY RESEARCH	
Weeks	**Topics**
14-15	*Oral research proposals 1 - Critiques*
16	Working with other disciplines: What is interdisciplinary research and how can you achieve it? [S.Sweet, KPE + Guest lecture from a McGill affiliated Interdisciplinary Research Centre (e.g., Center for Interdisciplinary Research in Rehabilitation of Greater Montreal; Centre for Interdisciplinary Research on Montreal; or Interdisciplinary Research Network on Discrimination and Inclusion)]
17	Working with other disciplines to advance research: the case of a contribution of kinesiology to prehabilitation research for better medical outcomes (C. Scheede-Bergdahl, KPE)
18	Working with Kinesiology researchers: Panel of experts composing of collaborators of KPE members in fields related to medicine & physiology. *Confirmed Interested Panelists: Sylvie Lambert (Nursing); Benjamin Smith (Medicine); Michael Sidel (Neuroscience)*
19	Working with Kinesiology researchers: Panel of experts composing of collaborators of KPE members in allied health fields (e.g., physiotherapy, nutrition). *Confirmed Interested Panelists: Stefanie Blain-Moraes (Biomedical engineer); Shawn Robbins (Physiotherapy);Hugues Ploudre (Nutrition);*
20	Working with Kinesiology researchers: Panel of experts composing of collaborators of KPE members in the social sciences (e.g., education, business, psychology). *Confirmed Interested Panelists: Lisa Starr (Education);*
22	End-user/Patient engagement: How can end-users inform Kinesiology research? (S. Sweet, KPE)
23	Recapping interdisciplinary research: A discussion on how the past 6 lectures advance Kinesiology research? (Sweet, KPE)
24	Beyond research: developing an effective integrated knowledge mobilization plan (S. Sweet)
25-26	*Oral research proposals 2 - Critiques*

Academic Integrity statement:
McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/students/srr/honest/ for more information).

L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples renseignements, veuillez consulter le site www.mcgill.ca/students/srr/honest/).

I encourage you to visit the above mentioned websites as soon as possible to insure that you are aware of the definitions of cheating, plagiarism and other academic offences that are used by McGill. Simply taking this initiative may help you avoid accidental and unfortunate situations. Also, I encourage you to visit the following website for precious help on how to refer to internet resources in your assignments, and especially, how to critically evaluate the scientific value of what you read on the internet:
http://www.mcgill.ca/library/library-findinfo/internet/

Right to Bilingual Submission:

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

"Conformément à la Charte des droits de l'étudiant de l'Université McGill, chaque étudiant a le droit de soumettre en français ou en anglais tout travail écrit devant être noté (sauf dans le cas des cours dont l'un des objets est la maîtrise d'une langue).

Please contact the instructor at the beginning of the semester should you wish to explore this option further.

Additional policy statements:

Instructor generated course materials (e.g., handouts, notes, summaries, exam questions, etc.) are protected by law and may not be copied or distributed in any form or in any medium without explicit permission of the instructor. Note that infringements of copyright can be subject to follow up by the University under the Code of Student Conduct and Disciplinary Procedures.

As the instructor of this course I endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me and the Office for Students with Disabilities, 514-398-6009.

McGill has policies on sustainability, paper use and other initiatives to promote a culture of sustainability at McGill." (See the Office of Sustainability.)

In keeping with McGill's preparedness planning strategies with respect to potential pandemic or other concerns, *In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.*

Additional policies governing academic issues which affect students can be found in the McGill Charter of Students' Rights" (The Handbook on Student Rights and Responsibilities is available here).

APC APPENDIX E 17-APC-03-34

McGill

New Program/Major or Minor/Concentration Proposal Form

(2013)

1.0 Degree Title
Please specify the two degrees for concurrent degree programs

Master of Management

1.1 Major (Legacy= Subject)(30-char. max.)

Analytics

1.2 Concentration (Legacy = Concentration/Option)
If applicable to Majors only (30 char. max.)

Non-Thesis

1.3 Minor (with Concentration, if Applicable) (30 char. max.)

2.0 Administering Faculty/Unit

Graduate and Postdoctoral Studies

Offering Faculty/Department

Management

3.0 Effective Term of Implementation
(Ex. Sept. 2004 = 200409)
Term

201805

4.0 Rationale and Admission Requirements for New Proposal

The program is designed to train students in the evolving field of management analytics and address the growing needs of organizations (for-profit, non-profit, governmental) for management analysts. The emphasis of the program will be on managerial problem-solving using state-of-the art data analytics tools to optimize organizational decisions in a variety of managerial settings. The pedagogical approach will be mainly experiential with the objective of graduating students with a balanced combination of management and data-analytic skills. Admission requirements can be found on p. 3.

5.0 Program Information
Please check appropriate box(es)

5.1 Program Type

- ☐ Bachelor's Program
- ☒ Master's
- ☐ M.Sc. (Applied) Program
- ☐ Dual Degree/Concurrent Program
- ☐ Certificate
- ☐ Diploma
- ☐ Graduate Certificate
- ☐ Graduate Diploma
- ☐ Ph.D. Program
- ☐ Doctorate Program (Other than Ph.D.)
- ☐ Private Program
- ☐ Off-Campus Program
- ☐ Distance Education Program (By Correspondence)
- ☐ Other (Please specify)

5.2 Category

- ☐ Faculty Program (FP)
- ☐ Major
- ☐ Joint Major
- ☐ Major Concentration (CON)
- ☐ Minor
- ☐ Minor Concentration (CON)
- ☐ Honours (HON)
- ☐ Joint Honours Component (HC)
- ☐ Internship/Co-op
- ☐ Thesis (T)
- ☒ Non-Thesis (N)
- ☐ Other

Please specify

5.3 Level

- ☐ Undergraduate
- ☐ Dentistry/Law/Medicine
- ☐ Continuing Ed (Non-Credit)
- ☐ Collegial
- ☒ Masters & Grad Dips & Certs
- ☐ Doctorate
- ☐ Post-Graduate Medicine/Dentistry
- ☐ Graduate Qualifying
- ☐ Postdoctoral Fellows

5.4 FQRSC (Research) Indicator

(for GPS) Yes No

6.0 Total Credits

45

7.0 Consultation with

Related Units Yes ☒ No ☐

Financial Consult Yes ☒ No ☐

Attach list of consultations.

8.0 Program Description (Maximum 150 words)

The core module is designed to teach the fundamentals of data and decision analytics, team management, and leadership. The complementary course module is designed to expose students to a variety of management analytics application topics including marketing, retailing, supply chain, healthcare, security, pricing, talent and network analytics. Finally, the experiential module, which consists of a capstone management analytics project and a study trip, is designed to provide students with the experience of hands-on application of the concepts taught in real-world settings and the opportunity to interact with practitioners in leading analytics organizations.

9.0 List of proposed program for the New Program/Major or Minor/Concentration.

If new concentration (option) of existing Major/Minor (program), please attach a program layout (list of all courses) of existing Major/Minor.

Proposed program (list courses as follows: Subj Code/Crse Num, Title, Credit weight under the headings of: Required Courses, Complementary Courses, Elective Courses)

Required courses (30 credits)

BUSA 684 Analytics Study Trip (3 credits)
BUSA 693 Management Analytics Capstone (6 credits)
INSY 660 Coding Foundations for Analytics (3 credits)
INSY 661 Database and Distributed Systems for Analytics (3 credits)
INSY 662 Data Mining and Visualization (3 credits)
MGSC 660 Mathematical and Statistical Foundations for Analytics (3 credits)
MGSC 661 Multivariate Statistical Analysis (3 credits)
MGSC 662 Decision Analytics (3 credits)
ORGB 660 Managing Data Analytics Teams (1.5 credits)
ORGB 661 Ethical Leadership and Leading Change (1.5 credits)

Complementary courses (15 credits)
15 credits from the following:
ACCT 696 Advanced Topics in Accounting Analytics (1.5 credits)
FINE 695 Advanced Topics in Finance Analytics 1 (1.5 credits)
FINE 696 Advanced Topics in Finance Analytics 2 (1.5 credits)
INSY 670 Analytics for Digital Business Models (1.5 credits)
INSY 671 Analytics and Open Innovation (1.5 credits)
INSY 672 Healthcare Analytics (1.5 credits)
INSY 673 Security Analytics (1.5 credits)
INSY 695 Advanced Topics in Information Systems (1.5 credits)
MGPO 695 Advanced Topics in Strategy Analytics (1.5 credits)
MGSC 670 Revenue Management (1.5 credits)
MGSC 672 Operations and Supply Chain Analytics (1.5 credits)
MGSC 695 Advanced Topics in Management Science (1.5 credits)
MRKT 671 Advanced Marketing Analytics (1.5 credits)
MRKT 672 Internet Marketing Analytics (1.5 credits)
MRKT 673 Pricing Analytics (1.5 credits)
MRKT 674 Retail Analytics (1.5 credits)
MRKT 696 Advanced Topics in Marketing Analytics (1.5 credits)
ORGB 671 Talent Analytics (1.5 credits)
ORGB 672 Organizational Network Analysis (1.5 credits)
ORGB 695 Advanced Topics in Organizational Behaviour (1.5 credits)

Attach extra page(s) as needed

10.0 Approvals

Routing Sequence	Name	Signature	Date
Department	Demetrios Vakratsas		Dec 20, 2016
Curric/Acad Committee	Isabelle Bajeux-Besnainou		Dec 20, 2016
Faculty 1	Isabelle Bajeux-Besnainou		Dec 20, 2016
Faculty 2			
Faculty 3			
CGPS		CGPS Approval	Feb. 13, 2017
SCTP			MARCH 9, 2017
APC			
Senate			

SCTP APPROVED

Submitted by

Name	Jui Ramaprasad	To be completed by ARR:
Phone	7426	CIP Code
Email	jui.ramaprasad@mcgill.ca	
Submission Date	Dec. 21, 2016	

ADMISSION REQUIREMENTS

- Applicants must hold an undergraduate degree
- Applicants whose mother tongue is not English or who do not hold an undergraduate or graduate degree from a recognized institution where language of instruction is English, should demonstrate proficiency in English using TOEFL or IELTS with the following minimum scores:

TOEFL:

IBT (Internet-Based Test): 86 overall, no less than 20 in each of the four component scores
PBT (Paper-Based Test): 567

IELTS (International English Language Testing System): a band score of 6.5 or greater (Academic module)

- GMAT or GRE is required for applicant without a degree from a Canadian or US University

McGill

MEMORANDUM

OFFICE OF THE PROVOST AND VICE-PRINCIPAL (ACADEMIC)
James Administration Building, Room 504
Tel: (514) 398-4177 Fax: (514) 398-4768

TO: **Senate**

FROM: **Christopher Manfredi, Provost and Vice-Principal (Academic) – Chair of APC**

RE: **Renaming of the School of Dietetics and Human Nutrition (for decision)**

DATE: April 20th, 2017

Purpose: The School of Dietetics and Human Nutrition proposes to change its name to the School of Human Nutrition.

Background: Since it was established in the 1980's, the School has evolved from a mandate of exclusive undergraduate dietetics education, to offer other undergraduate and graduate research programs in Human Nutrition. The School now has ten and a half tenured professors, four hundred and fifty undergraduate students, a hundred graduate students and six faculty lecturers. Research spans from foundational systems biology, to the clinical setting, and includes an international focus. While dietetics education unquestionably remains a centerpiece of the school's mission, the new name aims to avoid potential misrepresentation of a reserved term, and to be inclusive of the broader research and educational mission in Human Nutrition.

Prior consultations/ approvals: The School has conducted a survey of names of units at universities across North America and found only one instance where Dietetics is incorporated in the name. The standard now is either Nutritional Sciences or Human Nutrition. The Faculty considered and unanimously approved the departmental request at its meeting of 11 November 2016. An extract of the minutes of this meeting is attached. The proposal was reviewed and approved by APC at its meeting of March 29th, 2017.

Next steps: The proposal will be submitted to the Board of Governors for final approval.

MINUTES

MEETING OF THE FACULTY OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

The November 11, 2016 meeting of Staff of the Faculty of Agricultural and Environmental Sciences, held in R3-048, was called to order at 2:30 p.m. with Professor Cue in the Chair and Professor Ngadi as Acting Secretary.

3.06 Motion – School of Dietetics and Human Nutrition – Professor Wykes

Professor Wykes moved, seconded by Professor Koski to change the name of the School of Dietetics and Human Nutrition to "The School of Human Nutrition". Professor Wykes gave the rationale behind this request. Since it was established in the 1980's, the School has evolved from a mandate of exclusive undergraduate dietetics education, to offer other undergraduate and graduate research programs in Human Nutrition. The School now has ten and a half tenured professors, four hundred and fifty undergraduate students, a hundred graduate students and six faculty lecturers. Research spans from foundational systems biology, to the clinical setting, and includes an international focus. While dietetics education unquestionably remains a centerpiece of the school's mission, the new name aims to avoid potential misrepresentation of a reserved term, and to be inclusive of the broader research and educational mission in Human Nutrition.

Professor Wykes mentioned that they had conducted a survey of names of units at universities across North America and found only one instance where Dietetics is incorporated in the name. The standard now is either Nutritional Sciences or Human Nutrition.

Mr. Mandana asked if the name change would potentially have implications for enrolment entitlement? Professor Wykes responded that the standard in Quebec is to call the undergraduate dietetics program, "Nutrition". The website for the School has a very high traffic rate. The CodeR cut off for admission is 30 which is very good.

Professor Scott enquired if the rationale for dropping "Dietetics" was mainly because other universities were doing so? Professor Wykes replied that part of the reason was to be like their peer universities but it was also to be inclusive. The School had conducted a survey of graduate students and they were incorporating the word dietetics into their credentials. The students have a degree in Nutritional Sciences at the undergraduate level, Human Nutrition at the graduate level and the students that are dieteticinas have that in their credentials.

Professor Cue called the question to consider the motion.

CARRIED

The motion was unanimously approved.

Professor Cue asked where this goes from here and Professor Wykes responded that it would go to the Academic Policy Committee.

McGill

MEMORANDUM

OFFICE OF THE PROVOST AND VICE-PRINCIPAL (ACADEMIC)
James Administration Building, Room 504
Tel: (514) 398-4177 Fax: (514) 398-4768

TO: **Senate**

FROM: **Christopher Manfredi, Provost and Vice-Principal (Academic) – Chair of APC**

RE: **Creation of the Ludmer Centre for Neuroinformatics and Mental Health**

DATE: April 20th, 2017

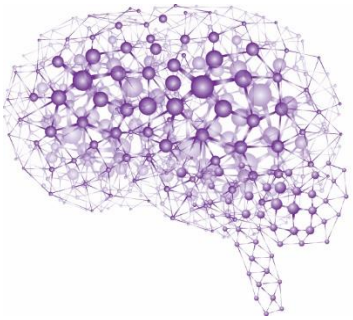
Purpose: The recognition of the Ludmer Centre for Neuroinformatics and Mental Health as an official research centre of McGill University.

Background: The Ludmer Centre is an innovative collaboration between the Douglas Mental Health University Institute Research Centre, the Jewish General Hospital's Lady Davis Institute for Medical Research and McGill University's Montreal Neurological Institute. This unique virtual collaboration of three institutions creates a more cost-effective approach to research, by maximizing their research expertise and infrastructure. The Ludmer Centre brings together and supports four complementary research pillars (neuroinformatics, neuroimaging, epigenetics and statistical genetics). The goal of the cross-disciplinary research conducted at the Centre is to advance neuroinformatics and mental health research and McGill's neuroscience leadership role.

Prior consultations/approvals

As per the Policy on Research Centres, the proposal was reviewed and approved by the Research Advisory Council on February 21st, 2017. The proposal was subsequently reviewed and approved by APC at its meeting of March 29th, 2017.

Next steps: The proposal will be submitted to the Board of Governors for final approval.



CENTRE CENTER
LUDMER
NEUROINFORMATIQUE & SANTÉ MENTALE | NEUROINFORMATICS & MENTAL HEALTH

Ludmer Centre

for Neuroinformatics & Mental Health

McGill Centre Accreditation Proposal

RAC Submission: November 2016

Updated: March 2017

Contact:

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TABLE OF CONTENTS

The Ludmer Centre was built on the belief that

science is on the cusp of a revolution in our ability to understand and treat brain disorders

provided we can bring together the right infrastructure and expertise.

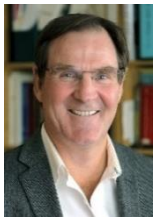
1 IDENTIFICATION

Initiated in 2013, the **Ludmer Centre for Neuroinformatics & Mental Health** is an innovative collaboration between three cutting-edge research Institutions: the Douglas Mental Health University Institute (Douglas) Research Centre, the Jewish General Hospital's Lady Davis Institute for Medical Research (JGH/LDI), and McGill University's Montreal Neurological Institute (McGill/MNI).

McGill University holds a key leadership role within the Ludmer Centre because of its unique role among McGill-affiliated teaching hospitals and research institutions, including the Douglas Research Centre and the JGH/LDI, and the fact that most of their researchers are also McGill professors, hence, the request for accreditation as a McGill Centre. At the request of Dr David Eidelman, Dean of Medicine & Vice-Principal of Health Affairs, provisional acceptance as a McGill-accredited research centre was granted on November 2015 (Appendix I). This dossier is the Ludmer Centre's official application for official accreditation as a McGill Centre.

The Ludmer Centre is organized around four complementary research axes: (1) Epigenetic, (2) Neuroimaging, (3) Neuroinformatics, and (4) Statistical Genetics —each of which is led by one of the centre's three Scientific Directors, who are McGill professors and world-renowned leaders in their fields. Refer to Appendix II for their individual bios.

Dr Michael Meaney leads the Epigenetics and mental health component of the Ludmer Centre. A world authority on epigenetics and mental health, he ranks among the world's most cited scientists and has conducted pioneering investigations that uncovered the biological mechanisms through which epigenetic factors– environmental changes in the prenatal and early-childhood periods– can affect brain develop and alter gene expression. The Michael Meany Lab and team are located in the Douglas Research Centre,[1] 3rd floor.



Dr Alan Evans leads both the Neuroimaging and Neuroinformatics components: the McGill Centre for Integrative Neuroscience (MCIN). Dr Evans has developed important biomarkers for the early diagnosis of neurological and psychiatric diseases and pioneered neuroimaging techniques and neuroinformatics technologies that are now universally used. A world authority on brain mapping and imaging technologies, he ranks among the top 1% of cited researchers. His office is located in the McConnell Brain Imaging Centre (level B2) and MCIN is on floor L1 at the MNI.[2]

Dr Celia Greenwood leads the Statistical Genetics analysis component of the Ludmer Centre and is on the board of directors for the International Genetic Epidemiology Society. A senior statistician, she has made significant contributions in genetics, genomics, and genetic epidemiology. Her work provides access to genetic datasets as well as the analytical capacity to develop the algorithms underpinning the Centre's big-data approach. The team is located on the 4th floor of the Centre for Clinical Epidemiology at the Lady Davis Institute for Medical Research.[3]

The intent is to maximise the existing research expertise and infrastructure of three Institutions through a unique 'virtual' collaboration; as such, the Ludmer Centre, represents a new, more cost-effective approach to research. The Centre itself does not exist as a stand-alone, physical structure, thereby minimising unnecessary costs entailed in establishing a separate brick-and-mortar facility, building parallel infrastructures (labs, tools, etc.), and relocating research teams. Although the Ludmer Centre

[1] Centre de recherche de l'Hôpital Douglas, 6875, boul. LaSalle | Montréal (Québec) H4H 1R3
[2] Montreal Neurological Institute, 3801 University Street, Room WB2, Montréal, QC, H3A 2B4
[3] Jewish General Hospital, Room H-461, 3755 Côte Ste-Catherine, Montreal, QC H3T 1E2, Canada

does not have a single physical location, the Institutions agreed to provide the necessary research space; Section 7 of the Collaboration Agreement (copy appended) states:

> "Physical space will be allocated and infrastructure investments undertaken to accommodate Ludmer Centre staff, informatics/research infrastructure and research cadres in each of the Institutions, as provided for in this Collaboration Agreement and Executive Committee decisions. As such, each of the Institutions will house a Ludmer Centre Component reflecting its specific expertise, resources and support relative to the Ludmer Collaboration."

Leveraging this innovative partnership-mode and the international reputations of the three Scientific Directors as well as that of their affiliated Institutions, the Ludmer Centre, hence Montreal and Canada, is poised to become a world leader in big-data analysis for brain and mental-health research.

2 RATIONALE

2.1 SOCIETAL CONTEXT & BACKGROUND

Some 1 in 4 people are impacted by brain disorders,[4] the world's largest undertreated epidemic! **There are currently over 400 mental illnesses[5] and 600 neurological disorders[6]** ranging from depression, anxiety, schizophrenia, bi-polar, autism spectrum, and attention deficit/hyperactive disorders to Alzheimer's, Parkinson's and dementia. Due to previous research limitations that impeded our ability to study the living brain, the majority are still diagnosed through symptom-based checklists. Medications and therapies are effective in managing certain symptoms in some patients, but not all—not even in those with the same diagnosis. While some symptoms are manageable, **few neurological disorders and no mental illnesses are curable.**

In addition to the unquantifiable impact on individuals and their families, research on mental illness and neurological disorders demonstrates significant financial impacts on society and businesses:

- The World Health Organization forecasts that brain disorders will surpass cancer as the second leading cause of death by 2040.[7]
- In Canada, the economic burden of psychiatric and neurological diseases, disorders and injuries is conservatively estimated at $22.7 billion annually, 14% of the total burden of disease.[8]
- Some 44% of employees claim to experience a mental health issue.[9] These mental health issues account for $6 billion annually in lost productivity from absenteeism, presenteeism[10] and turnover.[11] They also account for some 30% of short- and long-term disability claims; one of the top three drivers of such claims by more than 80% of employers.[12]

[4] World Health Organization, 2011
[5] Psychcentral.com, accessed Sept 2016, http://psychcentral.com/dsm-5/
[6] http://www.psychguides.com/guides/neurological-problem-symptoms-causes-and-effects/
[7] WHO. Atlas on country resources for neurological disorders, 2004
[8] Canada Brain Fact Sheet, Brain Canada, Accessed May 31, 2016.
[9] Conference Board of Canada, 2011 report, Building Mentally Healthy Workplaces: Perspectives of Canadian Workers and Front-Line Managers
[10] Presenteeism: showing up for work without being productive.
[11] Smetanin, P; Stiff, D; Briante, C; Adair, C.E.; Ahmad, S.; and Khan, M. The Life and Economic Impact of Major Mental Illnesses in Canada: 2011 to 2041. (2011) Risk Analytica, for Mental Health Commission of Canada.
[12] Ibid

- The economic cost is at least $50 billion annually in healthcare, social services and income-support costs—2.8% of the 2011 gross domestic product or $2.5 trillion over 30 years.[13,14]

New research approaches in genetics, epigenetics and neuroimaging, combined with technological advances in neuroinformatics, have created **a tipping point in our ability to move beyond the limitations of symptom-based diagnosis and treatment to the prevention of brain disorders**.

Given the cost to societies and individuals, this would also have a profound impact on national, as well the global, economy.

2.2 RESEARCH CONTEXT & BACKGROUND

Over the past decade, silo-based research approaches into specific brain disorders, including genetic and neuroimaging studies, have failed to identify unique causal origins; moreover, findings often contradicted underlying assumptions about the biology of mental dysfunctions. Converging neuroscience evidence is challenging the idea that our genetic code determines our gene expression by demonstrating how early exposure to adversity can become biologically embedded. Studies have shown how childhood experiences can 'turn genes on and off' creating vulnerabilities to mental disorders across a person's lifespan.[15,16] The findings of such studies have initiated a paradigm shift, one that challenges the simplicity of symptom-based diagnostic categories. Consequently, epigenetics, a relatively new field of research backed by a growing body of evidence, is now seen as crucial to unravelling the underlying pathophysiology of brain disorders.

A growing number of researchers now recognise the need to cross-analyse multivariate datasets, specifically neuroimaging, genetic, epigenetic and clinical datasets, to trace and understand the emerging patterns in brain development and how these manifest in symptoms.

Longitudinal birth-cohort studies of children and their families that document the interplay between environmental conditions (epigenetics) and genetic influences (from conception to old age) are a key component of quality multivariate data collection. However, the ensuing datasets require long-term financial investment and stewardship across their life cycle: from acquisition to storage, distribution and analysis. As an emerging field of research, epigenetics also requires innovative leadership.

New research and technologies, many pioneered by Ludmer Centre researchers, have resulted in significant advancements in the fields of genetic mapping, neuroimaging and epigenetics, among others. These and more have created a deluge of complex data, the analysis of which is reliant on costly, highly specialized neuroinformatics infrastructure**,** dedicated cadres of highly-specialized neuroinformatics and statistical experts, and ever-increasing computational capacity for analysis. The high-cost, ethical leadership and need to continually innovate the computational infrastructure underpinning today's research, particularly in neuroscience, means individual scientists, research centres and even bioscience

[13] Ibid
[14] Boivin, Michel, & Hertzman, Clyde. (Eds.). (2012). Early Childhood Development: adverse experiences and developmental health. Royal Society of Canada – Canadian Academy of Health Sciences Expert Panel. Ottawa, ON: Royal Society of Canada
[15] Boivin, Michel, & Hertzman, Clyde. (Eds.). (2012). Early Childhood Development: adverse experiences and developmental health. Royal Society of Canada - Canadian Academy of Health Sciences Expert Panel
[16] Meaney, M. J. (2010). Epigenetics and the biological definition of gene x environment interactions. Child Development, 81(20331654), 41-79.

Two recent (2016) **market studies by Grand View Research, Inc. underscore the potential of the Ludmer Centre's approach** —epigenetic & neuroinformatics— to improve diagnostic and treatment approaches. The reports estimate that:

- The global epigenetics market size will reach USD 16.31 billion by 2022, up 19.3% from $3.98 billion in 2014 (Jan 2016 report).
- The global bioinformatics services market will reach USD 4.1 billion by 2024 (June 2016 report).

companies can no longer replicate and maintain the longitudinal studies or neuroinformatics infrastructure cost-effectively.[17]

Recognising the research potential inherent in epigenetics and neuroinformatics (insert-box, left), corporate and academic researchers alike are seeking better ways to collaborate and drive brain research innovations while reducing costs and improving operational management.[18] Many have or will be looking to partner with a research centre that has a demonstrated capacity to provision the neuroinformatics infrastructure (platforms, tools, high-capacity computation capacity, etc.) as well as research leadership and access to vital databanks of epigenetic, imaging and genetic datasets.

The Ludmer Centre is such a research centre.

2.3 PURPOSE OF THE RESEARCH CENTRE

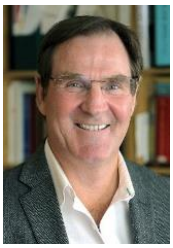
The Ludmer Centre's founders recognised that the ability to collect and mine the massive quantities of novel datasets offers unprecedented opportunities to advance brain research; however, this requires substantive investments in the collection of quality multivariate datasets and the right research tools.

The Ludmer Centre's **unique cross-disciplinary research leadership** brings together four complementary research pillars—neuroinformatics, neuroimaging, epigenetics and statistical genetics—led by three world-renowned leaders in their field. In addition to its three Scientific Directors, the centre aims to develop and support a cadre of primary investigators across multiple McGill faculties and affiliated teaching centres as well as within the Centre's collaborating institutions. Together, they lead innovative research that is generating novel datasets and insights, while concurrently innovating and expanding the tools and computational infrastructure required for their analysis.

Through support to four pillars, the Ludmer Centre aims to undertake and advance neuroinformatics and mental-health research and McGill's neuroscience leadership role.

[17] Z. D. Stephens, et al. Big Data: Astronomical or Genomical? Plos Biology. July 7, 2015
[18] Ibid

2.3.1 NEUROINFORMATICS & NEUROIMAGING PILLARS



Ludmer Scientific Director Dr Alan Evans is a James McGill Professor of Neurology & Neurosurgery, Psychiatry, and Biomedical Engineering and Director of the McGill Centre for Integrative Neuroscience (MCIN) at McGill. **MCIN is the Ludmer Centre's Neuroimaging & Neuroinformatics pillars.**

Dr Evans, a world authority on brain mapping and imaging technologies, ranks among the top 1% of cited researchers. He has developed important biomarkers for the early diagnosis of neurological and psychiatric diseases and pioneered neuroimaging techniques and neuroinformatics technologies that are now universally utilized. Currently, he is collaborating on the development of the BigBrain browser/atlas, a virtual reference brain with an isotropic 3D spatial resolution of 20 µm—50 times greater than the 1mm resolution of previous 3D human brain models. Although exploitation has only commenced, it is already being utilized by researchers, surgeons performing Parkinson's surgeries, and educational institutions.

Dr Evans and his team are recognised leaders in neuroimaging and neuroinformatics research. MCIN is now the main neuroinformatics service hub for several large-scale studies in brain development. For example (see box, right), through its CBRAIN platform, MCIN is the hub for a network of 10 cohort studies in Europe, Asia, and North America that are a rich source of genetic, epigenetic, phenotyping, imaging, and social data on parents and children from the prenatal period to adolescence; crucial dataset to advancing mental health research. Analysis of these datasets is helping to provide an unprecedented picture of normal and abnormal brain development.

Initially developed to support Dr Evans' neuroimaging research, the neuroinformatics ecosystem (Appendix III), through decades of research collaborations, now enables computationally-intensive brain research by applying innovative mathematical and statistical approaches that allow researchers to integrate clinical, psychological or neuroimaging phenotypes with genotypic and epigenetic information. MCIN's neuroinformatics ecosystem streamlines the hosting, analysis and visualization of these and other complex datasets through such tools as (i) web-based imaging and behavioural databases, (ii) an automated MRI segmentation pipeline, (iii) brain-behaviour correlation analysis for volume- or surface-based data, among others. Continually innovated, MCIN tools, notably on the CBRAIN/LORIS platform, are specifically designed to facilitate large-scale multivariate data analysis for researchers with limited informatics and statistical expertise.

For example…

MCIN-developed technologies are used in a series of network collaborations studying abnormal pediatric development: Canada's MAVAN, the USA's IBIS, Singapore's GUSTO, the Netherlands' Generation R Study and three NeuroDevNet projects -Autism Spectrum Disorders, Fetal Alcohol Spectrum Disorders and Cerebral Palsy.

They are also used in two multi-centre European initiatives to investigate Alzheimer's Disease: AddNeuroMed and NeuGrid.

MCIN leads and supports the analysis of these and the Ludmer Centre's datasets together with other freely-available datasets; such as, the Autism Brain Imaging Data Exchange and datasets obtained through long-standing collaborations (e.g. IMAGEN, Quebec Newborn Twin Study).

With over 20-years invested in research and development and a dedicated team of over 60 neuroinformatics and neuroimaging experts, no other Canadian or international initiative can match

MCIN's neuroinformatics infrastructure and expertise nor its leadership and proven track record for high-powered computing and big-data analytics.

The Ludmer Centre aims to provide researchers around the world with access to MCIN's innovative neuroinformatics ecosystem and databases by maintaining, expanding and developing databases populated with heterogeneous datasets while concurrently innovating and expanding the computational infrastructure and tools (CBRAIN/LORIS) required for their analysis.

2.3.2 GENOMIC/EPIGENETICS PILLAR

Ludmer Scientific Director Dr Michael Meaney is a James McGill Professor of Psychiatry and Neurology & Neurosurgery, a Senior Researcher at the Douglas Mental Health University Institute, and the Director of the Ludmer Centre's **Genomic**/ **Epigenetics** Pillar: the **Sackler Program for Epigenetics & Psychobiology**.

A world authority on epigenetics and mental health, he ranks among the world's most cited and awarded scientists. He has conducted pioneering investigations that have uncovered the biological mechanisms through which epigenetic factors–adverse experiences in early childhood–can affect brain develop and alter gene expression through DNA methylation.

Dr Meaney and his 15-member lab are pursuing next-generation sequencing analysis that will define epigenetic states across the genome in relation to environmental conditions in early life. He leads and provides direct access to the two longitudinal cohort studies that pioneered the study of gene environment interactions in human brain development and function —MAVAN in Montreal and GUSTO in Singapore— as well as collaborations with other cohort studies across Canada and the USA. The founder of the Canadian Neuroepigenetic Network, he is also concerned with translating epigenomic studies into clinical practice and prevention/intervention programs. These studies and collaborations are essential to systematic and quality data collection and provided a biological framework for understanding 'nature vs nurture' interactions and will have profound implications for public health policy.[19]

Novel epigenetics research is deepening our understanding of how genes, biology and environment interact to produce brain disorders across the human lifespan. Although the developmental processes through which these factors operate are poorly understood, 70 percent of mental disorders as well as some neurodegenerative disorders, including Alzheimer's, dementia, and Parkinson's, are believed to have their genesis in the prenatal or early-childhood period.

The Ludmer Centre believes that it is crucial to unravelling the underlying pathophysiology of brain disorders that will lead to new preventive and therapeutic avenues. Working with human and animal models, Dr Meaney's team aims to define the genetic and environmental determinants of individual trajectories of vulnerability and resilience. They are expanding key datasets and apply neuroinformatics analytics to help define precision interventions based on causal factors, not merely symptoms. The aim is to develop a model for a neuroinformatics approach capable of predicting treatment outcomes, by mapping the functional, neural circuitry, genetic and epigenetic determinants of individual responsiveness. The ultimate goal is to develop a detailed, multidimensional picture of what vulnerability

[19] September 27, 2016. UBC honours three of Canada's leading health researchers. http://www.med.ubc.ca/three-faculty-receive-margolese-and-chew-wei-prizes

to mental illnesses looks like in any individual, what confers resilience or risk, and what interventions can help stop these devastating conditions before they take root in adolescence and early adulthood.

The Centre will expand epigenetic research through collaborations with other longitudinal studies and researchers globally and provide the computational resources to better understand the biological basis for vulnerability to mental disorders and an empirical basis for diagnosis and expected treatment outcomes.

2.3.3 STATISTICAL GENETICS PILLAR

Scientific Director Dr Celia Greenwood leads the Ludmer Centre's **Genomics, Bioinformatics & Statistical Genetics (GBSG) Pillar**. She is an Associate Professor in the departments of Oncology, Human Genetics, and Epidemiology; Biostatistics & Occupational Health; and Division of Cancer Epidemiology at McGill University; a Senior Scientist at the Lady Davis Institute's Centre for Clinical Epidemiology, and a member of the board of directors of the International Genetic Epidemiology Society. She has made significant contributions in genetics, genomics, and genetic epidemiology. Her research collaborations provide access to vital genetic datasets and linkages with other research domains manipulating similar datasets (e.g., cancer).

Dr Greenwood and her seven-member team of experts and students develop statistical methods and complex algorithms capable of integrating and linking phenotype, epigenetic, genetic, imaging and clinical datasets that enable researchers to identify patterns held in common. As part of this research, they develop algorithm software and pipeline packages in **R, the leading computer language** of choice for predictive analytics, data mining and data science software.[20] R functions developed by the GBSG team are designed specifically for researchers who need to analyse genetic and genomic data as well as methodologists developing methods of analysis for such data. R packages are the end result of a multi-year process that culminates in the publication of software packages on three open-source platforms[21] — beginning with GitHub and, once stringently tested and vetted, CRAN and/or Bioconductor— where researchers can access them either as a compiled tool or as source code. These are also accompanied by a publication(s) explaining their function and methodology.

Within the Ludmer Centre, this team is the lynchpin to extracting meaningful results and new insights from the neuroinformatics platforms and the growing mass of high-quality multivariate datasets. Dr Greenwood is also a key driver in developing transdisciplinary capacities across the Ludmer Centre's multi-disciplinary research teams.

2.4 PREVIOUS COLLABORATIONS

Dr Meaney and Dr Evans have over 20 years of collaborative research; Dr Greenwood joined the collaboration in 2013 as part of Phase I for the Ludmer Centre. They or members of their teams through

[20] According to the 2016 results of the 17th annual KDnuggets software poll: http://www.kdnuggets.com/2016/06/r-python-top-analytics-data-mining-data-science-software.html

[21] Although GitHub does not have a vetting or peer-review process, the feedback from users is crucial to improving the software for submission to the more stringent CRAN or Bioconductor, open development software projects that specialize in creating tools for the analysis of high-throughput genomic data.

collaborative work on MAVAN, GUSTO and Ludmer Centre projects have contributed to numerous papers and co-authored or tri-authored several grants, with more in the pipeline.

In 2016, and over and above the CFREF Health Brains for Health Lives initiative for which Dr Evans is the Scientific Director, Dr Meaney is a thematic lead and Dr Greenwood's lab was leveraged as a strength, the Ludmer Scientific Directors brought in over $7M as lead PIs, most of which include collaborations across the three Ludmer Pillars.

2.5 LUDMER CENTRE TRAINEE & MENTORSHIP COMMITMENT

A key goal of the Ludmer Centre is to invest in the future through the development of transdisciplinary research cadres capable of maximizing the potential of the Centre's neuroinformatics infrastructure in the application of a big-data approach to brain research. To accomplish this, the Centre is expanding and creating unique and individualized mentoring and training opportunities for new researcher trainees — under-graduate (summer research projects), Masters and PhD students, post-doctoral fellows, and visiting scholars — as well as developing seminars series and workshops.

As the Centre grows, we hope to identify dedicated funding streams that will enable us to provide more research support to these trainees. Currently, and in the immediate future, the Ludmer Centre will provide the following support:

Ludmer Centre PIs will continue to take on new trainees and create new learning opportunities in order to expose them to the potentials of transdisciplinary research utilizing neuroinformatics.

- The Centre's Scientific Directors will continue to mentor and take on new trainees. Where appropriate, the Centre also encourages joint trainee supervision within and outside of the Ludmer Centre's PI cadre in order to expand the multidisciplinary interactions. In 2016, the three Directors mentored 26 post-doctoral fellows and 28 students (PhD, MSc and undergraduate)
- The addition of four new faculty as Ludmer Primary Investigates (PIs) in 2016 has and will enabled the Centre to expand the number of trainees as well as increase ttheir exposures to a vibrant transdisciplinary research environment. Three new Tenure Track positions will further expand these opportunities; the first has already been advertised.
- The Centre is committed to expanding transdisciplinary PhD opportunities:
    - **Quantitative Life Sciences (QLS) PhD program**: As part of the core committee, Dr Greenwood helped spearhead the development of the new interdisciplinary and inter-faculty QLS PhD program, securing an ideal academic home for Ludmer trainees. The provisional McGill QLS program will accept students beginning September 2017. Full approval from the Quebec government is anticipated for mid-2018. In recognition of her research and leadership in mentoring students, Dr Greenwood is the first QLS Graduate Program Coordinator.
    - **McGill's Integrated Program in Neuroscience:** Ludmer Centre PIs will continue to work across faculties to ensure appropriate interdisciplinary training through such programs as McGill's Integrated Program in Neuroscience, a popular program for PhD students that allows for breadth of thesis topics across neuroscience.
    - **New Initiative:** The Centre will capitalize on opportunities to establish new PhD opportunities through international initiatives and under the guidance of the appropriate McGill authorities; for example, Ludmer Scientific Directors and China-based universities

are exploring the possibility of creating a joint PhD program as part of the McGill/Ludmer Centre China-Cuba-Canada (CCC) Initiative.

The Centre provides a number of lectures and trainings aimed at trainees as well as faculty.

- **Ludmer Research & Peer Exchange meetings:** Initiated in 2015 and led by Dr Greenwood, the Centre organizes nine Ludmer Research & Peer Exchange meetings annually; these rotate between the Ludmer Centre's partner institutions and include participation from other institutions (e.g., University of Montreal). These provide opportunities for Ludmer trainees to present their work and engage in discussions with their peers and faculty members across multiple disciplines.
- **Ludmer Speaker Series:** The Centre will develop a new lecture series, to be led by Dr R Bagot, aimed at supporting a speaker series featuring young promising researchers.
- **Neuroinformatics training:** The MCIN team provides hands-on one-on-one training in the use of the neuroinformatics infrastructure and multi-modal data analysis relevant to the trainees research needs.
- **Training on Existing Statistical Tools:** Dr Greenwood's team provides a number of specialized training workshops to trainees and Faculty in the other Ludmer Labs each year. These aim to expand understanding and appropriate usage of various statistical algorithms and software packages, as well as best practices in reproducible research.
- **Algorithm Development Support:** Dr Greenwood's team welcomes Post-doctoral Fellows and Students to spend a few day to a few weeks in her lab to received one-on-one support to advance the statistical aspects of their research.
- **Academic Lectures:** Capitalizing on its growing international drawing power, the Ludmer Centre organizes academic presentations from leading scientists visiting the Centre. Aimed at trainees and faculty, there were three such presentations in 2016: Dr David Kennedy, Dr David Glahn and Dr Pedro A. Valdes-Sosa.
- **Scientific Advisory Committee:** All Ludmer trainees and faculty are invited to participate in the Centre's Scientific Advisory Committee meeting, which occurs every 2 years. Several are asked to present their work, either as a poster display or as part to the main presentations to the SAC members. All Ludmer trainees and faculty are invited to participate in an open discussion on the science and direction of the Centre. The meeting includes a number of informal activities that allow trainees to interact with the SAC members.
- **International Conferences:** In conjunction with other McGill centres/institutions, the Ludmer Centre aims to host local, national and international conferences. The first will be the INCF 2018 congress. A committee is being formed and students will be invited to join and participate in organizing pre and post congress events.
- **Ludmer Centre's Annual Meeting[22]:** All Ludmer Trainee and Faculty will be invited to participate in the Ludmer Centre's annual meeting, which will also have a training component; the second is scheduled for late 2017.

Trainees and faculty are encouraged to interact with each other to expand their breath of knowledge and experiential opportunities as well as engage in collaborations they would not otherwise have by participating in working groups and key presentations.

[22] This meeting coincides with the SAC every second year.

- **Informal Training:** The Centre supports a number of informal training opportunities through initiatives that encourage visits and exchanges with collaborating institutions nationally and internationally. For example, trainees and faculty from across Canada and around the world join the MCIN lab for 1-week to 3-month visits for direct hands-on training/experience with the neuroinformatics ecosystem. Ludmer trainees and faculty are given multiple opportunities to interact and, where relevant, work with these visitors. Several such visits have led to the identification of highly qualified PhD and post-doctoral candidates as well as research collaborations.
- **Working Groups:** Trainees and faculty are given opportunities to join existing and new transdisciplinary teams focused on improving and expanding the algorithmic and neuroinformatics tools. These working groups meet regularly to discuss and review tool development needs and to prioritize development goals and establish subgroups to advance specific goals. They provide opportunities as well as peer- and expert-feedback for PhD/Post-doctoral Fellows to develop, test and implement their theories prior to publication and to integrate and operationalize their algorithms/pipelines into the CBRAIN/LORIS platform. Active groups include:
    - The LORIS Working Group
    - BigBrain Atlas Working Group
    - The Ludmer Epigenomics Working Group
- **Fundraising Skills:** As fundraising is a vital aspect of any research career, where appropriate, trainees and faculty are also included in donor presentation specific to their Ludmer Centre pillar(s) and the Ludmer Centre as a whole. Some will also be given opportunities to present their work to lay populations.

Trainees and faculty receive direct support for their research projects through access to the Ludmer Centre's key datasets, neuroinformatics tools and technical experts.

- Trainees have access to and are expected to utilize the Centre's:
    - unique multimodal datasets and the disciplinary-specific experts to help them navigate and make sense of the data.
    - neuroinformatics ecosystem and experts (MCIN/Dr Greenwood's teams) to tweak or expand the tools required to meet the needs of their research.
- The datasets and expertise can be and are often leveraged in grant requests as an in-kind contribution from the Ludmer Centre and its Institutional partners.
- Modest funding in the form of research support and seed funding to select trainees and faculty is and will continue to be provided to encourage transdisciplinary projects that encompass at least two of the four Ludmer Centre's pillars.

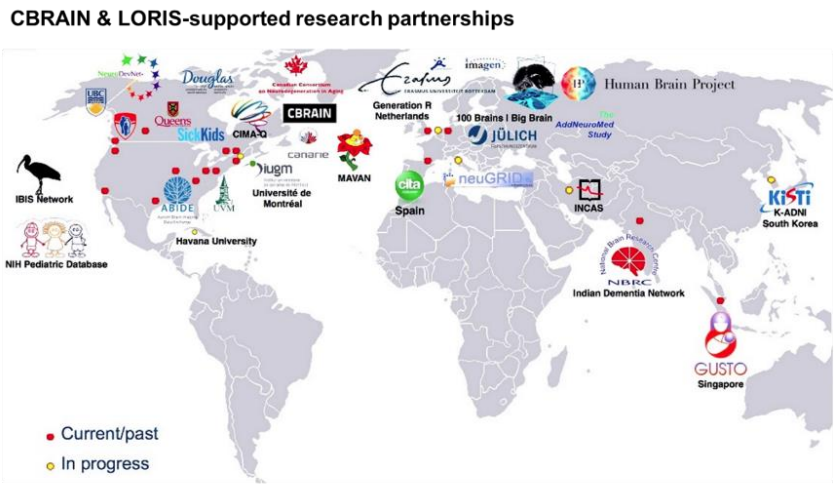
2.5.1 PHASE I ACCOMPLISHMENTS

Since the inception of the Ludmer Centre in 2013, the three Scientific Directors and their teams have been engaged in the collaborative development of the neuroinformatics platforms, establishing the centre's databases, research and publications. Collaborations in the initial and successful Phase I focused on advancing epigenetic research and the neuroinformatics infrastructure, as well as establishing the centre itself. A Collaboration Agreement was established, including reporting, governance structures and their terms of reference, and guidelines for withdrawing from the Ludmer Centre collaboration. The

governance structures were operationalised and the social media platforms —website, Facebook, LinkedIn, Twitter and YouTube— and public lecture series (Montreal and Toronto) launched.

In less than three years of operation, the Ludmer Centre has established its place as a world leader in neuroinformatics-driven brain research and is now a core component of McGill's neuroscience strategy, Health Brains for Health Lives (HBHL), funded by the Canada First Research Excellence Fund (CFREF). Highlights of the centre's 2015 accomplishments include (note, a 20-page report is available):

- Building on Dr Meaney's research, Dr Evans' neuroinformatics and Dr Greenwoods statistical expertise, the Ludmer Centre established and continues to expand two unique databases from the MAVAN and GUSTO longitudinal cohort studies. These include the first datasets to include infant/child neuroimaging, genotyping/epigenotyping, environment conditions and longitudinal assessment of developmental outcomes; **there are no global equivalents to these databases**. These are accessible to researchers globally thought Ludmer Centre collaborations.
- **Neuroinformatics infrastructure innovated and expanded:** Multiple innovative methodological enhancements were added to MCIN's cutting-edge neuroinformatics infrastructure, improving and expanding functionality and the ability to manipulate, view and process new datasets (refer to Appendix III). New software launches were issued for the CBRAIN and LORIS platforms. These tools are accessible free-of-charge to researchers globally.
    - **CBRAIN** is a powerful web-based portal that allows brain researchers to perform computationally intensive analyses on data by connecting them to high-performance-computing facilities across Canada and around the world. CBRAIN now supports nearly **400 users in 22 countries.**
    - **LORIS** is a web-based data and project management software for neuroimaging research studies. It is an open-source framework for storing and processing behavioural, clinical, neuroimaging and genetics data. LORIS supports more than **370 users around the world.**
- **Leading research:** Leveraging the Ludmer Centre's infrastructure and databases, **key drivers of new research funding and collaborations**, our researchers:
    - **Published over 60 articles** in peer-reviewed journals, 44 in 2015 alone.
    - Collaborated with over **40 affiliated scientists at McGill and over 300 scientists worldwide** – in North America, Europe, East Asia, South Asia, and Latin America – who use the centre's resources to conduct wide-ranging brain research projects.
    - **Engaged in over 20 multi-year research grants/partnerships ($18M+)** and several partnerships based on the scientific exchange of data.



Brain Imaging Research Network, the U.S. Infant Brain Imaging Study, and the Dutch Generation R Study, among others.

- **Training tomorrow's researchers:** In 2015, Ludmer Centre researchers mentored 38 new researchers (Masters, PhDs & Post-doctoral Fellows), hosted several visiting scholars and provided trainings to researchers in other disciplines (200 locally and over 150 CBRAIN/LORIS users).

2.5.2 LUDMER CENTRE ANNUAL REPORT2016

The Ludmer centre's 2016 Report was presented to the Ludmer Centre Executive Committee March 14th, 2017. A copy of the report has been included as an addendum to this application.

The report demonstrate the strength and innovative approach of the Ludmer Centre collaboration through a detail description of progress to date and an impressive list of research achievements. The review of each pillar's activities, outputs and research collaborations demonstrates how synergies between the four Ludmer pillars has brought key elements together to accelerate brain research and expedite the development of neuroinformatics capacities. Publications (77), grants (over $7M as lead PIs) and collaborations (MCIN now powers over 20 data-sharing initiatives and we have collaborations with 11 longitudinal, high-risk and intervention cohort studies) increased dramatically in 2016. Grants secured in 2016 — CFREF/HBHL, Open Science Institute initiative, which is underpinned by MCIN, and a CFI-Cyber Infrastructure grant ($2.9M) — will also expand collaborations in 2017.

The Centre also expanded its Primary Investigator (PI) membership beyond the founding Scientific Directors to include four new PIs in the Genomic/Epigenetics Pillar: Dr Rosemary Bagot, Dr Kieran O'Donnell, Dr Patricia Silveria and Dr Tie-Yuan Zhang. Innovative leaders in their fields, they rank among the most promising young neuroscientists in Canada and increase the Centre's research and mentorship capacities. The Ludmer Centre also advertised its first Tenure Track position, a vital hire in building the Centre's transdisciplinary expertise. These new hires, and planned faculty additions in 2017, not only increase the Centre's expertise and enlarge the bandwidth but also permit the development of a more ambitious agenda for Phase II and ensured the continued success of the Ludmer Centre and the legacy of the founding donation.

2.6 SUPPORT & RECOMMENDATIONS

Funders and Institutional partners alike have committed to establishing the Ludmer Centre as a world-class centre in brain research:

- **Donors:** The Irving Ludmer Family Foundation invested $7.4M in start-up funding and, as discussed in the Budget section, is committed to further investment. The Centre has also initiated its Donor Advisory Committee, which is expected to bring in more support.
- **Collaborating Institutions:** The Douglas Research Centre, the JGH/LDI, and McGill/MNI have demonstrated their support through the Collaboration Agreement, high-level representation on the Executive Committee (ExCom), and over $5M in funding contributions.
- **The Douglas and JGH/LDI support:** Both have committed to supporting and instating fundraising activities on behalf of the Ludmer Centre researchers. A committee to coordinate these fundraising activities has been established.
- **McGill support:**

- The Ludmer Centre is an integral component in the successful 2016 CFREF/HBHL initiative ($84M) and the Open Science Institute initiative ($20M), for which numerous letters of recommendations were secured.
- The Provost and Vice-Principal (Academic) of McGill University, Christopher P. Manfredi, has committed to securing the centre's future by establishing three tenure track(TT) Ludmer Centre positions, the first was advertised in February 2017, with the remaining two TT hires set for late 2017 and 2018 in the faculty of Medicine or Science. Three new primary investigators, Dr Kieran O'Donnell, Dr Patricia Silveira, and Dr Rose Bagot, have been hired to increase the centre's capacity to engage in new research, take on new student mentorships, and expand the number of research collaborations. A third hire in neuroinformatics, supported by the MNI, is current underway.
- University Advancement (UA) Vice-Principal Marc Weinstein and Research & Innovation Vice-Principal Dr Rosie Goldstein both sit on the Ludmer Centre's Executive Committee and have personally spearheaded fundraising initiatives for the Ludmer Centre: some $2M towards a Research Chair and $1M from EMC[2] in support of increased computational capacity has already been secured. Several more proposals are under discussion with key donors.
- Within the Faculty of Medicine, both Dean Eidelman and Dr Guy Rouleau sit on the Executive Committee. Dean Eidelman requested the Ludmer Centre be given provisional acceptance as a McGill-accredited research centre (Appendix I). Dr Guy Rouleau provides direct support, leadership and guidance to the Scientific Directors to advance the centre's agenda.

- **Government:** As a direct result of the Quebec government's interest in the emerging Cuba-China-Canada initiative, the Ludmer Centre was recently included in the August 2016 Montreal-based meetings with the delegation from the National Natural Science Foundation of China (NSFC) and in Quebec's September 2016 trade mission to Cuba. The Quebec government also provided support fo a CCC workshop in Cuba in February 2017.

- **Granting agencies:** Supported by the Institutional partners, combined, the Ludmer Centre researchers had secured over $18M in multi-year research grants and partnerships by the end of 2015 and a further 7^{+}M as lead PIs in 2016. Notably and indicative of MCIN's growing importance to Canada's neuroscience research community, Dr Evans again doubled his projected annual research funding goal securing **$4.5M in research funding in 2016**, in addition to a $1M in-kind donation of 0.5 petabytes of high-performance computing (HPC) capacity from EMC2. IBM has also expressed interest in supporting Dr Evans's work.

  The Canadian government also acknowledged MCIN's neuroinformatics leadership in awarding $84M in CFREF funding to McGill's HBHL and $2.9M from the Canadian Fund for Innovation (CFI) Cyberinfrastructure Initiative. CFI Cyber "*aims to enhance the capacity of Canadian institutions and researchers to conduct leading-edge research in areas of demonstrated strength by supporting the infrastructure needs of computationally- and data-intensive research.*"[23] Dr Evans received 100% of his requested funding (30% of the allocated $10M).

[23] https://www.innovation.ca/sites/default/files/Funds/cyber/CyberinfrastructureInitiativeCallforProposalsRev.pdf

In 2016, Dr Evans secured $1.5M from Brain Canada to build a pan-Canadian network of autism researchers, a clear acknowledgement of his success in building similar large-scale national initiatives for Alzheimer's disease (Canadian Consortium on Neurodegeneration in Aging), among others. Finally, in November 2016, over 40 of Canada's leading neuroscientists affirmed MCIN's vital national role when they agreed to submit a single unified proposal under the leadership of Dr Evans for a 2017 ($11M) Brain Canada large-scale Platform Support Grant aimed at strengthen Canada's national neuroscience research community. MCIN is clearly Canada's national infrastructure provider and gateway of choice to international collaborations, hence, well situated to secure future funding.

2.7 RESEARCH PROGRAM

The **Ludmer Centre for Neuroinformatics & Mental Health is a multicentre, transdisciplinary collaboration** that unites, among other domains, research in genetics, epigenetics, neuroimaging, neuroscience, statistics and computer sciences. Leveraging over 30 years of research and expertise in epigenetics, neuroimaging, statistics and neuroinformatics, as well as extensive international collaborations, the Ludmer Centre's long-term goal is to advance understanding of normal brain development and mental disorders—specifically those factors that give rise to individual variations and dynamic changes in mental health over time and within individuals.

> **Vision:** *The Ludmer Centre was founded on the promising potentials of big-data research and envisages a near future where mental illnesses and neurological disorders are significantly reduced through preventive strategies and their diagnoses (based on biological metrics) lead to more effective, individually-tailored treatment approaches.*
>
> **Mission:** *To establish the Ludmer Centre as a global, collaborative incubator for neuroinformatics research and the sharing of multivariate datasets as well as a centre of excellence in research training, thereby, increasing multidisciplinary and transdisciplinary big-data research to advance the prevention, diagnosis and treatment of brain disorders.*

The centre's research area encompasses the human lifespan, within which the prenatal period and early childhood is a priority area as susceptibilities to mental disorders often find their genesis during these crucial developmental years. As detailed in the Centre's Logic Model (refer to Appendix IV), the Ludmer Centre aims to undertake and advance neuroinformatics and mental-health research by :

- ✓ **Ensuring researchers have global access to innovative neuroinformatics infrastructure and databases** by maintaining, expanding and developing databases populated with heterogeneous datasets (genetic, epigenetic, neuroimaging, etc.) while concurrently innovating and expanding the computational infrastructure (MCIN) required for their analysis.
- ✓ **Leading and supporting 'big-data' research and stimulating global innovation** by sharing access to databases and neuroinformatics infrastructure and by engaging in global, multidisciplinary collaborations.
- ✓ **Catalysing future research by mentoring and engaging young, high-calibre researchers,** thereby, developing transdisciplinary research cadres capable of maximizing the potential of the centre's neuroinformatics infrastructure and datasets—the next generation of neuroscience innovators and leaders.

2.7.1 PHASE II, MOVING FORWARD

In Phase II, under the leadership of the three Scientific Directors, the Ludmer Centre will continue to support basic research in epigenetics, imaging, and statistical genetics as well as the continued technological development of its neuroinformatics infrastructure and databases. It will also focus on growing the centre's global reputation and solidifying its capacity to maximize the impact of its infrastructure and expertise by increasing its cadre of researchers and collaborations as well as outreach to and the training of new researchers.

Activities and outputs will focus around three strategic goals; specifically, the Ludmer Centre will:

I. **Ensure global access to innovative neuroinformatics infrastructure & databases:** Harnessing and expanding on MCIN's proven, open-science neuroinformatics infrastructure — essential tools if researchers are to fully exploit today's large datasets and the reason why big-data analytics in brain research (as envisaged in this proposal) is now possible — the Ludmer Centre will maintain, expand and develop databases populated with heterogeneous datasets (e.g., genetic, epigenetic, neuroimaging) and the computational infrastructure required to analyse these and advance neuroinformatics research generally. Specifically, the centre aims to:
    a. Maintain MCIN's existing neuroinformatics platforms, tools and requisite expertise (located in the MNI, refer to Appendix III) to support researchers globally.
    b. Develop, maintain and expand databases that consolidate and integrate heterogeneous datasets (human & animal) to support researchers globally.
    c. Develop algorithms for complex, multivariate analysis.
    d. Innovate and expand the centre's user-friendly, cutting-edge neuroinformatics technologies, software packages, processes and procedures.

II. **Lead & support 'big-data' research:** The Ludmer Centre's lead researchers and teams will ensure access to neuroinformatics infrastructure and datasets by developing and leading research and by engaging in multidisciplinary collaborations, globally. Specifically, the centre aims to:
    a. Expand the number of national and international researchers (collaborations) undertaking neuroinformatics and mental health research utilizing the centre's expertise, infrastructure, and/or datasets.
    b. Expand the number of direct research projects undertaken by the centre's Primary Investigators and teams.
    c. Generate and collect new high-quality datasets derived from longitudinal human cohort studies (e.g., genetic, epigenetic, neuroimaging & phenotype datasets) and relevant animal models to populate the databases.

III. **Catalyse future research by mentoring and engaging young, high-calibre researchers:** The Ludmer Centre will continue to foster a 'big data approach' to future research endeavours by developing neuroinformatics research capacities through the training of researchers as well as the recruitment and mentoring of new researchers across varied disciplines. Specifically, to:
    a. Hire as well as provide mentorship and an incubator/training environment for graduate students, post-doctoral researchers and fellows.
    b. Organise and/or deliver training workshops and conferences that transcend mental-health research disciplines to reach prospective and current researchers.

c. Publish manuscripts on research outcomes and on improving understanding of neuroinformatics research/tools including data-acquisition standardisation protocols.

Timelines for the centre's activities and milestones can be viewed in Appendix VII: Milestones, Gantt Chart. In keeping with its commitment to open science, all neuroinformatics tools are provided free-of-charge to researchers world-wide and database access, due to data-management ethical considerations, is provided through research collaborations.

3 STRATEGIC POSITIONING

Neuroscience research proposed by the Ludmer Centre directly aligns with and strengthens three of McGill's seven thematic areas, the Areas of Research Excellence, outlined in its Strategic Research Plan:

- Support health research and improved delivery of care
- Unlock the potential of the human brain and the entire nervous system
- Advance knowledge of the foundations and applications of technology in the Digital Age

Through the Ludmer Centre and CFREF/HBHL initiatives, McGill has shown a strong commitment to being a leader in neuroscience research and investing in and advancing the neuroinformatics infrastructure underpinning it.

The Ludmer Centre also aligns with three of McGill's Core Commitments, specifically:

- Innovation: The Centre's neuroinformatics infrastructure (MCIN) epitomised the cutting-edge innovative approach McGill wants to instil in its researchers and students. The Centre's focus on supporting researchers globally to undertake a cutting-edge neuroinformatics approach and to advance novel epigenetics research will contribute to further innovations by expanding the breadth and depth of planned research.
- Sustainability: The Centre's is not creating new labs but ensuring the sustainability of existing cutting-edge research labs in McGill/MNI, the Douglas and the JGH/LDI. The Centre's goal is to ensure the sustainability of the neuroinformatics infrastructure and longitudinal studies by raising awareness of their potential to redefine mental health research, by increasing their user-base and collaborations, and by supporting the identification of government, donor and corporate investors.
- Social engagement: A key component of the above is achieved through the Ludmer Centre's social engagement and focus on building bridges with colleagues from other research institutions, governments, private industry, and the public. The Centre aims to drive the use of common standards and protocols, to contribute to the develop of big-data ethical guidelines, to share access to cutting-edge neuroinformatics infrastructure, to work with researchers to innovate this infrastructure to meet their needs, and to translate findings to clinical applications (through CFREF/HBHL), among others. Through its communication strategy, it also aims to inform and engage the public and decision makers in the Centre's and McGill neuroscience goals.

Finally, the Centre's third goal –to train students and researchers to employ a neuroinformatics approach and to create a cadre of transdisciplinary neuroscience researchers– directly supports McGill's commitment, through CFREF/HBHL and other initiatives, to train tomorrow neuroscience researchers. Its international collaborations also support the goal to attract high-quality students from around the world.

As outlined below, each of the Centre's components advances McGill's existing reputation and research leadership across three domains.

3.1 ADVANCING MCGILL'S NEUROSCIENCE & NEUROINFORMATICS LEADERSHIP

The dataset tsunami, the rate of rapid technological advancements that continually expand big-data analytics, and the cost of these innovations are creating a new paradigm: windows of opportunity for academic institutions to assume specialized leadership roles through concentrated investment in the innovative informatics infrastructure that already underpin their existing areas of research expertise. Similar to high-tech start-ups, academic institutions that fail to specialized and embrace the need for continued investment in their computational-infrastructure, and the informatics expertise to maintain and innovate it, will become increasingly marginalized as neuroscience research leaders. The race is on to see which institutions will lead the neuroinformatics research revolution. However, no other academic institution has McGill's leadership advantage: the MCIN neuroinformatics ecosystem.

To spur innovative specialisation, the Canadian government established the Canada First Research Excellence Fund (CFREF) to help "*Canadian postsecondary institutions turn their key strengths into world-leading capabilities."* Recognising the innovative uniqueness of MCIN's neuroinformatics infrastructure, McGill used MCIN as the foundational pillar for its CFREF submission (quote, right; Neurohub box, next page), Healthy Brains for Healthy Lives (HBHL), and selected Dr Evans as its Scientific Director.

> ***CFREF/HBHL, McGill****: "HBHL begins with neuroinformatics [i.e., MCIN]: the infrastructure (hardware and software), tools, and expertise needed to organize and manage the current deluge of data about the brain, behavior, and environment of the healthy population as well as of affected individuals. It is an area in which McGill has developed a world-leading research and training environment."*

MCIN's neuroinformatics infrastructure also underpins the Tanenbaum Open Science Institute (OSI) initiative. Led by Dr Guy Rouleau, the OSI will establish an unprecedented open-science platform at McGill aimed at encouraging and facilitating the global sharing of neuroscience data. These initiatives rank among the largest investments ever received by McGill and, as evidenced by the response to the OSI initiative worldwide, a major game-changing commitment. Through both initiatives, McGill has shown a strong commitment to neuroscience leadership as well as investing in and advancing the neuroinformatics infrastructure underpinning it: MCIN.

MCIN's neuroinformatics ecosystem was built on over 30 years of sustained investment and a reputation for service delivery and technical innovation; consequently, MCIN's international user base and collaborations are set to expand dramatically. As previously noted, MCIN is already the go-to facility for the storage and analysis of neuroimaging datasets by multiple large-scale international projects. MCIN leads multiple network projects in grid-processing of large brain databases, nationally (CBRAIN) and internationally (GBRAIN). The LORIS/CBRAIN ecosystem has been adopted by over 700 researchers in 22 countries and is a key component of several large-scale initiatives including McGill's CFREF/HBHL and other global initiatives under discussion (e.g. the Cuban-Chain-Canada initiative).

Internationally, the global neuroscientific community is converging towards larger, real-time collaborations, as exemplified by projects such as the International Neuroinformatics Coordinating Facility, Neugrid4U (EU), LONI (USA), the Human Brain Project (EU), and ADNI (Asia). As an active partner in these initiatives and in global standardization discussions as well as through 2016 funding to expand the CBRAIN/LORIS platform (CFREF/HBHL, CFI, OSI), MCIN is now uniquely positioned to bridge Canadian researchers with as well as lead global neuroscience initiatives.

NeuroHub & the Ludmer Centre

McGill and Institutional partners are committed to being the world leader in the development and innovation of neuroscience infrastructure and big-data analytics. The diagram depicts how neuroscience researchers, teams and centres from McGill and affiliated institutions are integrating to build a holistic and synergistic neuroscience hub —the NeuroHub— to maximize the potential of each component part. The Ludmer Centre, indicated in purple, is a key foundational component of this new working dynamic.

Research Programs	Child Development	Mental Health	Neurodegenerative Disorders	Normal Brain Function	Open Science Initiative	National & International Collaborations	Training
1. Neuroscience Resources	McConnell Brain Imaging Centre; Centre for Neurological Disease Model; Cellular Imaging Facility; Centre for Experimental Therapeutics; BRAMS; Bell-Douglas Brain Bank						
2. Field-specific research expertise	Imaging/Modeling (Evans), Epigenetics (Meaney), Statistical genetics (Greenwood), iPSCs (Rouleau)						
3. Neuroinformatics, Computational capacity & tools	MCIN: CBRAIN, LORIS, BrainBrowser, MINC2, CIVET, BrainWeb, BigBrain						

Three Foundational Layers *(1) Neuroscience resources, (2) Field-specific research expertise, and (3) Neuroinformatics, computational capacity & tools: Depicted as horizontal layers, these represent the computational infrastructure and databases that research programs and scientists can draw on to conduct and expand their research. The Ludmer Centre provides the neuroinformatics component and 75% of the research expertise.*

Research Programs: *Research programs and initiatives, encompassing different areas, are and will continue to be built on the three foundational layers. Within these, the Ludmer Centre also engages in direct research in (1) Child Development, (2) Mental Health and (3) Neurodegenerative Disorders.*

Open Science Initiative *(cross-cutting): Open science underpins McGill's guiding approach to research. MCIN's neuroinformatics platforms and tools are already provided and accessed free-of-charge by researchers around the world. The MAVAN and GUSTO databases, developed with Ludmer Centre support, are also made available to other scientists through collaborations. Recognizing that a lack of transparency can lead to the duplication of research, to lost opportunities to maximize research potential of individual studies, and to early-stage discoveries being patented before their broader potential has a chance to be fully explored, the Open Science Initiative aims to accelerate the application of a broader open-science approach within and outside of McGill. The Ludmer Centre supports and benefits from this.*

Training New Researchers *(cross-cutting): All McGill NeuroHub researchers are committed to training future researchers. The Ludmer Centre's endeavors will focus on providing workshops, mentorships and post-graduate/post-doctoral internships designed to enable researchers to utilize and advance the neuroinformatics platforms, tools and databases. The Ludmer Centre goal is to create a new cadre of transdisciplinary researchers – those capable of maximizing the potentials of the Ludmer Centre's neuroinformatics infrastructure and databases.*

National/international users & collaborators *(cross-cutting): Given today's technology, researchers no longer have to be located in the same place nor is it cost-effective or even economically feasible for universities to invest in building parallel infrastructures. Collaborations are cost-effective, have a multiplier effect on research productivity, and maximize the potential of expensive infrastructure. The Ludmer Centre's goal is to advance neuroscience research by building and supporting multi-disciplinary collaborations through access to cutting-edge neuroscience infrastructure that is continually innovated.*

NeuroHub: McGill & Partner Institutions' ambitious 2016 Canada First Research Excellence Fund (CFREF) application.

Underscoring its innovative edge, other academic institutions that are investing to secure their own neuroscience niche have not only consulted but also included MCIN as a key component in their strategy. For example, MCIN contributes to the US BRAIN Initiative (technology focused), the European Human Brain Project (brain simulation), US Human Connectome Project (large imaging database), and the BigBrain Initiative (ultra-high-resolution 3D model of a human brain), among others. Through the CFREF/HBHL, MCIN in partnership with Western University's BrainsCAN and the Canadian Institute for Advanced Research (CIFAR) will drive the creation of a Canadian-based neuroscience consortium. This consortium will complement major brain projects globally and to which McGill researchers are already connected. The goal is to have these initiatives adopt MCIN technology rather than recreate it, thereby solidifying MCIN as an international neuroinformatics leader.

Clearly, McGill, through MCIN, already has the cutting-edge neuroscience infrastructure and leadership edge many institutions want to build.

Maintaining and advancing McGill's neuroinformatics leadership is a key focus of the Ludmer Centre.

3.2 ADVANCING MCGILL'S STATISTICAL LEADERSHIP

Big-data analytics is important not just because of the size and complexity of the datasets but, more precisely, for the patterns that can be derived by making connections between the disparate datasets. Neuroinformatics and increasing complex datasets require sophisticated algorithms and the highly specialised expertise to develop these. Complex algorithms development, as led by Dr Greenwood's team, is a key component to the success of big-data analytics. The resulting tools and software are posted to open-source websites

The Ludmer Centre recognises that the statistical expertise underpinning neuroscience research is set to grow in complexity; concurrently, the demand for innovative highly-skilled statistical experts will also increase. Today, statisticians are in high demand across the private sector, with Masters and PhD graduates competitively and aggressively head-hunted. Competition among academic institutions for those that remain within the less lucrative research track is high and set to grow as big-data approaches to research evolve and become more complex. The establishment of a Scientific Director position and support for this unit demonstrates the Ludmer Centre's, hence McGill's and the JGH/LDI's, commitment to investing in this research and raises our ability to attract today's and tomorrow's leaders in statistical research. Through her positions on the board of directors for the International Genetic Epidemiology Society, Dr Greenwood is considered a leader in her field, further increasing our competitive advantage in attracting research statisticians.

For example, in 2016, The GBSG team managed 21 active Ludmer-related software development projects in the reporting period; among these, 15 have applications in cross-disciplinary research — a multiplier impact beyond the Ludmer Centre's brain health focus. Among the completed projects, the GBSG team published seven new or updated R software packages to support analysis of (i) Rare Variant analyses, (ii) Methylation data and (iii) Associations in high dimensional data on the GitHub, CRAN or Bioconductor open-source platforms. These were also integrated in MCIN neuroinformatics platform (LORIS/CBRAIN) as toolkits.

3.3 ADVANCING MCGILL'S EPIGENETICS LEADERSHIP

Epigenetics remains a relatively new field of research; however, the growing body of evidence and potential inherent in epigenetics makes it a requirement in any brain-health research. Theorized by Conrad Waddington in the 1940s, it would be 50 years (2009) before McGill researchers Michael Meaney and Moshe Szyf provided the first documented example of an epigenetic mechanism.[24] Today, brain health and disorders, including many neurological disorders, are understood to be the complex interplay of genetic, biological, and epigenetic factors.[25] Although the developmental processes through which these factors operate is ill-understood, 70 percent of mental illnesses as well as some neurodegenerative disorders (e.g., Alzheimer, dementia, Parkinson's) are believed to have their genesis in the prenatal or early childhood period and, in some cases, their onset in these crucial development years.[26] Longitudinal birth cohort studies of children and their families that document the interplay between environmental conditions and genetic influences are a key component of epigenetic research and entail a long-term financial commitment and investment in maintaining databases and research staff familiar with the data. Further, to maximize the potential inherent in epigenetic datasets, they must be combined with other datasets (genetic, imaging, etc.) in a format accessible to all researchers.

Epigenetics is set to provide revolutionary discoverys that will profoundly impact mental health research. McGill, in partnership with the Douglas Research Institute, is well positioned to become a world leader in epigenetics. Ludmer Centre Scientific Director Dr Meaney leads and provides direct access to the two longitudinal birth cohort studies that pioneered the study of gene environment interactions in human brain development and function. Based in Canada (MAVAN) and Singapore (GUSTO), these studies include the first datasets around the world to include infant/child neuroimaging, genotyping/epigenotyping, environment conditions and longitudinal assessment of developmental outcomes. Dr Meaney's research collaborations also provides access to other cohort studies across Canada and the USA.

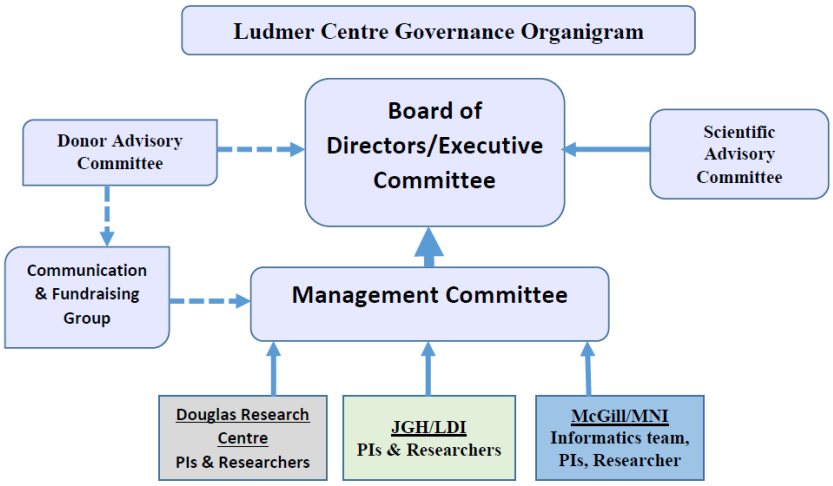
As of the end of 2016, Dr Meaney's team provides innovate research leadership and, through direct partnerships or research grants, is now **partnered with at least five longitudinal cohort studies, three high-risk cohort studies, and three intervention studies**, among others. Access to these cohorts not only fuels new research and grant funding, but provides invaluable datasets and research opportunities for Dr Greenwood's team to develop new algorithms and software tools. Collaborations with Dr Evans' team ensures the integration of these tools and the development of additional tools (storage, visualisation, etc.), and in some cases, the capture of new datasets into a larger neuroinformatics infrastructure.

Dr Meaney's leadership has vastly expanded McGill's international collaborations and his reputation in epigenetics has attracted some of tomorrow's brightest researchers to McGill (most recently Dr K O'Donnell and Dr Rose Bagot). Dr Meaney's work offers a clear advantage in positioning McGill as an epigenetic and neuroscience leader – one recognised through the inclusion of Dr Meaney's work in McGill's CFREF/HBHL initiative. Maintaining and advancing McGill's epigenetics leadership is a key focus of the Ludmer Centre.

[24] Wikipedia, Behavioral Epigenetics: https://en.wikipedia.org/wiki/Behavioral_epigenetics
[25] Government of Canada (2006). The human face of mental health and mental illness in Canada.
[26] Government of Canada (2006). The human face of mental health and mental illness in Canada.

4 GOVERNANCE & STAFFING

The Ludmer Centre Collaboration Agreement, which was signed by the three collaborating Institutions in November 2016, established the Ludmer Centre and defined partner commitments (including member withdrawal, new admissions and dissolution of the centre). It also established the governance structures, as shown in the organigram (right). These bodies are described in detail in Schedule C of the Collaboration Agreement, including committee membership, voting authority, and mandate for each. These include:



- **Executive Committee/Board of Directors:** The Executive Committee, whose membership temporarily expands twice annually to form the Board of Directors (in line with McGill policy[27] requiring a board of directors), meets quarterly and is responsible for the oversight, development and sustainability of the Ludmer Centre and Institutional/donor accountability, including final approval of all operational and financial reports and budgets.

  The Executive Committee has provided effective governance since September 2013 including direction, leadership and conflict resolution; the other structures were introduced in 2015. Because the Centre is a unique collaboration between three founding institutions (the Douglas, JGH and McGill/MNI), consensus is the modus operandi, but where a vote is required, the ultimate authority resides with the three voting members of the Executive Committee (the institutional leads or their designates). This ensures the Centre remains aligned with the broader goals and objectives of the parent institutions. Consequently, all other members, including the Scientific Directors, hold an advisory and/or implementation role. The three voting members are:

  - McGill: Vice-Principal Health Affairs; Dean, Faculty of Medicine,
  - Douglas: President and CEO of the Centre intégré universitaire de santé et de services sociaux (CIUSSS) de l'Ouest-de-l'Île-de-Montréal
  - JGH: President-Director General of the Centre intégré universitaire de santé et de services sociaux (CIUSSS) du Centre-Ouest-de-l'Île-de-Montréal

  For ease of reference, the Executive Committee section in Schedule C of the Collaboration Agreement has also been included as Appendix VI in this document.

  Further, to eliminate conflict, the collaborating Institutions also agreed, via the Collaboration Agreement, to establish a central Ludmer Centre Fund managed by University Advancement (UA) at McGill University to be disbursed in accordance with quarterly decisions made by the Ludmer

[27] Policy for Research Centres. The web site is now up and running: http://www.mcgill.ca/secretariat/files/secretariat/research_centres_policy_on_1.pdf.

Centre's Executive Committee. Both the Ludmer Centre Fund (Schedule D. Collaboration Agreement) and the Prospect Clearance Protocols (Schedule E, Collaboration Agreement) where agreed in advance to minimise conflict on both fundraising and fund disbursement by establishing clear protocols to guide these interactions.

- **Management Committee:** Led by the Scientific Directors and the Associate Director, the Management Committee is responsible for the daily operational oversight and management of the Ludmer Centre and is accountable to the Executive Committee. These meeting commenced in 2015.
- **Communication & Fundraising Group (CFG):** Recognising that fundraising will require both Institution-specific and collaborative efforts, the CFG delineates and implements the Ludmer Centre's collaborative communication and fundraising strategy. Members include representatives of each of the partner Institutions' fundraising bodies. The first meeting was held in January 2016.
- **Donor Advisory Committee** (**DAC**)**:** The DAC provides counsel to the Ludmer Centre's Executive and Management Committees, Associate Director and CFG on interpreting and promoting the Ludmer Centre to external constituencies and offers advice according to their area of expertise and support on fundraising and promotional issues. There are currently three members: Mr I Ludmer, Mr R Coull and J Clark. The first meeting was held in Sept 2016.

McGill Faculty Leadership: Within McGill/MNI, in compliance with the McGill Policy on Research Centres,[28] the Ludmer Centre is formally connected to the Faculty of Medicine and reports to the Dean of Medicine, in addition to the other collaborating Institutions (the Douglas and JGH/LDI). Within McGill, the Faculty of Medicine is the "Lead Faculty". Should other McGill faculties join the Ludmer Centre as full members, the designated Lead Faculty can be changed or alternated, providing the affected deans and collaborating Institutions are in agreement (i.e., per the Collaboration Agreement).

Scientific Advisory Committee (**SAC**)**:** The SAC provides advice and guidance to the Ludmer Centre to help ensure the Centre achieves its stated objectives and remains at the leading edge of research in neuroinformatics and mental health. Held every two years, it is comprised of internationally recognised leaders in one of the Ludmer Centre's fields of research. The first meeting was held December 13-14, 2016; the 4-member distinguished SAC committee included:

- **David Glahn,** PhD Psychiatry, Yale U; SAC **Chair**
- **Ed Bullmore,** FRCP, FRC Psych, FMedSci, Professor of Psychiatry, U of Cambridge
- **David N. Kennedy**, PhD, Professor of Psychiatry University of Massachusetts
- **Dr. Jordan Smoller,** Psychiatric & Neurodevelopmental Genetics Unit, Mass. General Hospital

A copy of the SAC report, which was very positive, has been provided as an addendum to this application.

Staffing: As noted by other universities embarking on undertakings of similar scale (e.g., University of Toronto), administrative support is crucial to success. The Ludmer Centre is administered/managed by an Associate Director, is in the final stages of recruiting a full-time Development Associate to support fundraising, and has hired a part-time (20%) Finance Officer cost-shared with MCIN (80%) to support financial reporting. Funding has been secured for these positions.

[28] Policy for Research Centres. The web site is now up and running: http://www.mcgill.ca/secretariat/files/secretariat/research_centres_policy_on_1.pdf.

Founding Collaborating Institutions & New Collaborations: The Ludmer Centre Collaboration was founded by the Douglas, JGH/LDI and McGill/MNI; however, it was also envisaged as a bilingual Montreal-wide research hub, hence the eventual inclusion of one or more francophone institutions is a desired goal. The founding Institutions agree that, upon agreement of the Executive Committee, the Scientific Directors and Associate Director may actively recruit an institution that enhances or expands the Ludmer Centre's capacity to achieve its mandate as a Collaborating Institution. As such, the Collaboration Agreement establishes provisions for the admission of new members: the unanimous vote of the collaborating Institutions' voting representatives and the execution of an amendment to the 2016 Collaboration Agreement.

Collaboration Agreement: A copy of the Collaboration Agreement has been provided with this document; the Schedules mentioned above can be found on the following pages:

5 MEMBERSHIP

In line with its strong transdisciplinary-focused approach, the Ludmer Centre membership embraces neuroscience research, an extremely large discipline encompassing the work of a wide variety of scientists with broad research interests with specializations in brain function; areas such as:

- **Behavioural Neuroscience:** biological processes underlying behaviour in humans and in animals, including the physiology of neuronal and synaptic transmission, neurochemistry, and neuropharmacology.
- **Cognitive Neuroscience:** biological processes underlying cognition in humans and in animals, including the physiology of neuronal and synaptic transmission, neurochemistry, and functional neuroanatomy.
- **Clinical Neuroscience:** the study of the organization and function of the nervous system as it relates to topics of interest to psychologists, including pain, anxiety, stress, sleep, depression, schizophrenia, akinetic and dyskinetic movement disorders, and senile dementia.
- **Specialised research disciplines:** Genetics, epigenetics, neuroimaging, etc.
- **Bioinformatics & neuroinformatics:** the technical capacity to analysis the above.

In line with this broad definition, the centre aims to develop a cadre of primary investigators across multiple McGill faculties and affiliated teaching centres as well as from within the Centre's three collaborating Institutions and other non-affiliated institutions. To facilitate this, the Centre's membership guidelines do not limit researchers to one particular faculty or the collaborating Institutions.

Individual researcher membership in the Ludmer Centre is broken down into two broad categories, full and associate members.

Full Members

Full members are drawn from the Collaborating Institutions' researchers and will be invited to an annual Ludmer Centre retreat (first is planned for 2017). Exceptions, in order to include researchers from non-

collaborating Institutions and other McGill-affiliated institutions as Full Members, can be made if a researcher's work directly builds and expands the Ludmer Centre's research capacities (e.g., neuroinformatics platform, access to vital datasets, etc.).

Researchers wanting to join the Ludmer Centre as a Full Member may submit an official request to the Executive Committee via the Scientific Directors or Associate Director. The application will comprise a CV and a 1-page summary of his/her research focus, relevance to the Ludmer Centre, and title sought (see below). The application will be reviewed by the Scientific Directors, who will then make a recommendation to the Executive Committee to approve or reject the application. All those accepted as full members will agree to a set of reporting metrics relevant to their Ludmer-Centre-related research and reflective of their level of membership. Full members may withdraw from the Ludmer Centre at any time, but must complete their reporting obligations, if any, to the Ludmer Centre. The Centre recognizes the following full-member categories and titles:

- **Ludmer Scientific Directors:** The highest full-membership level, they are appointed by the Executive Committee, based on nominations by their respective Institutions, to provide scientific leadership for the Centre. The Ludmer Centre provides a directorship stipend; direct funding for their research, infrastructure and staffing needs; and promotes their work to the public and donors.
- **Ludmer Primary Investigators**: The second highest membership level, these are researchers whose work aligns with the Centre's goals, who utilize and contribute to the Centre's expertise, neuroinformatics ecosystem (MCIN services), and bioinformatics/biostatistics, and are supported by the Centre; i.e., the centre promotes their work to the public and donors as part of the Ludmer Centre's program of activities. They may also request Ludmer Centre funding. They participate in and contribute to regular discussions relevant to the Centre's direction and activities. Note: The Ludmer Centre, in coordination with the collaborating Institutions and subsequent to the identification of appropriate academic positions and funding thereof, will actively support the recruitment of leading researchers/academics (Ludmer Distinguished Investigators) to meet and expand the Ludmer Centre's research mandate.
- **Ludmer co-Investigators**: All established researchers utilizing the Ludmer Centre's infrastructure/services or directly collaborating on a research project are considered part of the Ludmer Centre's primary investigator team for the duration of said research or collaboration. Their Ludmer-Centre-related work will be promoted by the Centre.
- **Ludmer Centre Research & Development (R&D) Staff**: All staff employed by the Scientific Directors (lab managers, informatics experts, research associates, etc.) or Ludmer Distinguished Investigators may indicate that they work for the Ludmer Centre.

Associate Members

These are researchers for whom the Ludmer Centre's neuroinformatics ecosystem (i.e., MCIN) is integral to their research (MCIN-hosted databanks, LORIS/CBRAIN-reliant) or researchers who are actively engaged in collaborations with Ludmer Centre researchers. These may be researchers from both within and outside of the Ludmer Centre's founding Institutions. Those wanting to join the Ludmer Centre as an Associate Member may submit an official request to the Executive Committee via the Scientific Directors or Associate Director. The application will comprise a 1-page summary of his/her research focus and relevance to the Ludmer Centre and title sought (see below). The application will be reviewed by the

Scientific Directors, who will make a recommendation to the Executive Committee to approve or reject the application. The Centre recognizes the following associate-member categories:

- **Ludmer Graduate / Master / PhD Scholars & Postdoctoral Fellows:** All trainees —undergrad, Masters and PhD students and Post-Doctoral Fellows— undertaking a research project aligned to the Ludmer Centre's goals and fully or co-supervised or mentored by a researcher in at least one of the three researcher categories defined above (Ludmer SDs, Dis and PIs) may request to use the title "Ludmer Scholar" or "Ludmer Postdoctoral Fellow" for the duration of this supervision or post-doctoral work.
- **Ludmer Collaborators:** Researchers who are collaborating on a Ludmer Centre project may refer to themselves as a "Ludmer Collaborator" for the duration of the research project.
- **Ludmer Visiting Scholars:** All visiting scholars with one of the Scientific Directors' or Distinguished Investigators' labs may use the title "Ludmer Visiting Scholar" for the duration of their visit.

Invited Members: final list pending

#	***Full Members***	**Actual & proposed members**
1	***Ludmer Scientific Directors***	Dr Michael Meaney, Dr Alan Evans & Dr Celia Greenwood
2	***Ludmer Primary Investigator***[29]	**Kieran O'Donnell**, epigenetics, Associate Professor, Psychiatry **Rose Bagot**, epigenetic/neurobiology, Associated Professor, Psychology **Tie Yuan Zhang**, epigenetic/neurobiology, Psychiatry **Dr Patricia Silveira,** epigenetics/paediatrics Assistant Professor, Psychiatry **2017 proposed members: Sherif, Karama**, psychiatrist with research training in brain imaging and genetics, Assistant Professor, Psychiatry**; Marc Fournier**, neuroimaging/BIC; **Seun Jeon**, computer science/biomedical engineering/BIC; **JB Poline**, computational neuroscience/MCIN (when hired); **Claudia Kleinman**, Bioinformatics for functional genomics/Assistant Professor, Department Human Genetics; **Aurélie Labbe**, Associate Professor, Psychiatry;
3	***Ludmer co-Investigator***	**2017 proposed members (list is being updated): Tristan Glatard**, Assistant Professor, Computer Sciences, Concordia University; **Barry Bedell**, Assistant Professor, Department of Neurology & Neurosurgery; **Pierre Bellec**, assistant professor/researcher, computer science & operations research department (DIRO), Université de Montréal Louis Collins, **Yong He**, neuroimaging/brain anatomical/functional network analysis, BIC; **Jason Lerch**, neuroimaging, BIC; **David McDonald**, computer scientist/BIC; John Sled, BASc (UBC), MEng (McGill), PhD (McGill)/Associate Professor, Department of Medical Biophysics, UoToronto; **Lu Zhao**, Computational neuroimaging analysis, Laboratory of Neuro Imaging, Keck School of Medicine, University of Southern California; **Yuanchao Zhang**, University of Electronic Science and Technology of China; **Alex Zijdenbos,** Computing in Mathematics, Natural Science, Engineering and Medicine, Biospective Inc.; **Heungsun Hwang**, quantitative methods and advanced modeling methodologies/Associate Professor, Dept Psychology, McGill; **Antonio Ciampi,** Associate Professor, Department of Epidemiology, Biostatistics & Occupational Health, McGill; **Marie-Hélène Pennestri,** Regular Researcher, Hôpital Rivière-des-

		Prairies (CIUSSS du Nord-de-l'Île-de-Montréal), Adjunct Professor, Department of Psychology, Université de Montréal
4	***Ludmer Research & Development (R&D) Staff***	All staff employed by the Scientific Directors (lab managers, informatics experts, research associates, etc.) or Ludmer Distinguished Investigators

6 LAB FACILITIES & OTHER RESOURCES

The Ludmer Centre unites three pre-existing laboratories in each of the partner institutions. As agreed in the Collaboration Agreement, each of the institutions has committed to maintaining one of the laboratories (Scientific Director's office and relevant space for their infrastructure, research team and students) and affixing appropriate, visible Ludmer Centre signage to these areas. Completed in August 2016, and as part of Phase I, McGill/MNI renovated a floor (L1) in the MNI to accommodate the MCIN's neuroinformatics team. Under the Collaboration Agreement all new staff hires and laboratory expansions must be submitted and approved by the Executive Committee in consultation with the laboratory's host Institution. Approval will include a fundraising plan.

Infrastructure access: To assume a global neuroinformatics leadership position and encourage researchers globally to adopt a big-data approach to mental health research, no user fees are currently envisaged to access the existing open-science neuroinformatics platforms and tools (CBRAIN, LORIS, BrainAtlas, etc.). Researchers requiring access to the Ludmer Centre datasets, due to ethical restrictions linked to data usage, will be required to collaborate with one of the Centre's researchers. Research projects requiring significant technical support or modifications (e.g., algorithm development, new/adapted tools, etc.) to the infrastructure/tools/databases will be required to include the relevant Ludmer Centre researcher in the proposed grant application or provide financial support to offset such costs.

The challenge: The Ludmer Centre recognises that a key challenge will be maintaining the cadres of expert lab staff (approximately 75 across all the three labs) required to support and innovate the neuroinformatics infrastructure, databases and longitudinal studies inadequately funded under current research grants. It is also one of the reason the Ludmer Centre was created, to raise awareness of this need and to fundraise to support these costs specifically.

7 BUDGET & FUNDRAISING

As summarised in the table (left), to advance Centre's objectives, the **Ludmer Centre requires $54M CAD over the next four years**, October 2016 to September 2020.

The following provides and overview of the Ludmer Centre's projected budget to 2020, broken down into 4 parts: the Administrative/Operational Budget and a section for each of the three Pillar budgets. The four sections describe the financial situation as well as organizational structures, staff and strategies for securing financial stability for both the Administrative and Research components of the Ludmer Centre.

Budget Summary, Oct. 2016- Sept. 2020

Budget line	Budget
Ludmer Management	$1,669,117
Research management	$10,919,450
Research / Neuroinformatics Personnel	$16,365,613
Students & Fellows	$4,788,379
Primary Investigators	$2,813,600
Equipment	$11,899,856
Research	$4,315,000
Knowledge Translation	$1,100,000
	$53,871,015

It is important to note that the Ludmer Centre regroups three existing, operational labs under one umbrella - it does not establish any new labs:

1. Dr Evans' lab, MCIN, at the MNI

2. Dr Meaney's lab, the Sackler Program for Epigenetics & Psychobiology, at The Douglas
3. Dr Greenwood's lab, Statistical Genetics, at the JGH/LDI

The Ludmer Centre was created to solidify, support and advance the big-data approach to mental health research that the three labs have been working towards for some time. The Ludmer Centre does this by increasing awareness of the potentials of big-data research and the work of Ludmer PIs/trainees among the public and potential donors, including its founding donor Mr Irving Ludmer.

Research Budgets: In mid-2016, each Scientific Director prepared a budget based on their ongoing funded research and planned/projected research funding. Projected needs include planned activities guided by submitted grants and philanthropic gifts for which decisions were still pending when the initial budget was prepared. These will not move forward without secured funding. As of the end of 2016 and noted in each section, many of these grants have now been confirmed as secured funding.

All research staff (lab managers, research assistants, informatics developers) as well as direct research costs will be covered under funds secured for research. The Scientific Directors, supported by the Ludmer Centre, will continue to secure new grants/funding to cover future needs. Should they fail, their research objectives will be adjusted to reflect the available income.

Faculty/PI support: Given the newness of big-data transdisciplinary neuroscience research, which requires a hands-on working knowledge of the Centre's infrastructure, the expectation is that renewed scientific leadership (succession) will come from within the Ludmer Centre's membership; consequently, the Ludmer Centre is committed to expanding its PI membership base. Thus, budget lines to support Ludmer PIs undertaking research relevant to the Ludmer Centre's mandate have been included in the budgets. For example, the Centre received its first Tenure Track license from the Provost's Office in January 2017 and has secured funds to pay the salary of the position now advertised. The Centre also secured funds to support the hire of both Dr R Bagot and Dr K O'Donnell. These hires are vital to the Lumber Centre's future and long-term sustainably (leadership renewal) and are key to expanding the breath of research within each of the Centre's main pillars.

7.1.1 ADMINISTRATIVE/OPERATIONAL COSTS

Recognizing the need for administrative leadership and support, the founding donor Mr Irving Ludmer provided funding for an Executive Director/Fundraiser, Scientific Director stipends, and a communications budget in the initial gift agreements (GA 1), and is committed to further support. UA is currently negotiating Mr Ludmer's next commitment post-September 2017 (end of GA1). Although various aspects are under discussion (e.g., where the Ludmer Administration will be located).

Core Administrative/Operational costs ($1.67M): As of the RAC meeting, Core Admin costs as shown in the table below were 38% ($633K) funded through Gift Agreement 1 (GA1, 282K), projected fundraising via the Ludmer website/lecture activities ($25K), and McGill University Advancement's commitment to hire a Development Officer ($324K), leaving a $1M shortfall. See table below and Appendix V for detailed budget.

Mr Ludmer has confirmed to the Administrative Director his intention to provide adequate funds to ensure that one hundred percent (100%) of the core administrative costs are covered – in addition to providing research funding. Further, Mr Ludmer has indicated his intent to establish an endowment to cover ongoing administrative costs in perpetuity.

Consequently, we consider Administrative costs to be 100% funded.

Summary 4-year Admin/Management and Additional Support Costs

Admin/Operational Costs	2016-17	2017-18	2018-19	2019-20	Total
Admin Director (AD)	$ 103,000	$ 106,090	$ 109,273	$ 112,551	$ 430,914
Scientist Director S/D Funds ($50Kx3)	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 600,000
Finance Officer (shared 20/80 with MCIN)	$ 12,000	$ 12,360	$ 12,731	$ 13,113	$ 50,204
Development Officer (DO)	$ 81,000	$ 81,000	$ 81,000	$ 81,000	$ 324,000
Scientific Advisory Committee (SAC)	$ 25,000	$ -	$ 25,000	$ -	$ 50,000
Governance Committees (e.g. DAC, ExCom)	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 16,000
Communications/Public Relations activities	$ 45,000	$ 45,000	$ 45,000	$ 45,000	$ 180,000
Office supplies, equip, services	$ 500	$ 500	$ 500	$ 500	$ 2,000
Travel (e.g., AD, DA, LC member)	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 16,000
Admin. SubTotal	**$ 424,500**	**$ 402,950**	**$ 431,504**	**$ 410,164**	**$ 1,669,118**
Funding Sources	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**Total**
Ludmer Gift 1 (received)	$ 282,000				$ 282,000
UA 20% of Dev Officer (secured)	$ 81,000	$ 81,000	$ 81,000	$ 81,000	$ 324,000
Direct funding through website (Received)	$ 25,000				$ 25,000
Direct funding through website (projection)		$ 13,000	$ 13,000	$ 13,000	$ 39,000
Ludmer Foundation promised	$ 36,500	$ 308,950	$ 337,504	$ 316,164	$ 999,118
Total	**$ 424,500**	**$ 402,950**	**$ 431,504**	**$ 410,164**	$ 1,669,118

Additional Ludmer Centre Activity Costs ($2.6M): The activities listed in the table below are deemed vital to advancing the Centre's mandate, but are currently unfunded; hence, will only be implemented if and when funding is secured. However, activities aimed at securing this funding include:

- **UA and the Ludmer Development Officer (DO) fundraising:** UA projects that the Ludmer Development Officer will secure some $1M annually, some of which will be allocated to these needs. Ongoing negotiations for a philanthropic gift from an Asia-based donor already includes a significant portion of the Knowledge Translation (KT) activities ($1.1M).
- **Ludmer Admin Officer:** The Ludmer will seek out corporate and philanthropic sponsorships for some of the activities.

Additional Activity Costs	2016-17	2017-18	2018-19	2019-20	Total
Knowledge Translatoin	$ 275,000	$ 275,000	$ 275,000	$ 275,000	$ 1,100,000
Student Support/research	$ 125,000	$ 125,000	$ 125,000	$ 125,000	$ 500,000
Faculty/PI Support	$ 250,000	$ 250,000	$ 250,000	$ 250,000	$ 1,000,000
Additional Activity Total	**$ 650,000**	**$ 650,000**	**$ 650,000**	**$ 650,000**	**$ 2,600,000**

- **Knowledge Translation** (KT) **activities ($1.1M):** KT activities are vital to the center's success and capacity to expand both the use of its neuroinformatics platforms and collaborations.
- **Student Support ($500K):** Incubator/support funding to develop transdisciplinary research capacities among students -graduate, PhD & Post-doctoral Fellows- across the three pillars.
- **Faculty/PI Support ($1M):** Seed/support funding to facilitate new PI hires and punctual support to Ludmer PI members (beyond the Scientific Directors) and their related research.

7.1.2 NEUROIMAGING & NEUROINFORMATICS PILLAR

Based on the comprehensive budget provided by Dr Evans, the Neuroimaging & Neuroinformatics pillar requires $34M over the next 4 years. As of September 2016, some 31% had already be secured through the Ludmer Foundation Gift Agreement 2 (9%), research grants (20%) and McGill (3%, salary costs). See table below and Appendix V for detailed budget.

Summary 4-year Neuroimaging & Neuroinformatics Pillar Costs

Budget Lines	Projected budget	GA2 Funds	McGill Funds	Grants Funds	Total Secured	Shortfall	%
Research management	$ 8,593,300	$ 932,449	$ 732,000	$ 854,705	$ 2,519,153	$ 6,074,147	18%
Research / Neuroinformatics Personnel	$ 10,917,733	$ 1,260,923	$ -	$ 4,406,630	$ 5,667,553	$ 5,250,180	15%
Students & Fellows	$ 2,227,120	$ 52,250	$ -	$ 1,279,669	$ 1,331,919	$ 895,201	3%
Faculty/PI Support	$ 600,000	$ 215,000	$ 180,000	$ -	$ 395,000	$ 205,000	1%
Equipment	$ 11,756,856	$ 450,000	$ -	$ 351,714	$ 801,714	$ 10,955,142	32%
Research	$ -	$ -	$ -	$ -	$ -	$ -	0%
4-YearTotal	**$ 34,095,010**	**$ 2,910,622**	**$ 912,000**	**$ 6,892,718**	**$ 10,715,340**	**$ 23,379,670**	**69%**
	100%	**9%**	**3%**	**20%**	**31%**	**69%**	

The projected shortfall as of September 2016 was $23M of which $10M is for increased computation capacity that will be raised through in-kind contributions from corporate partners (negotiations are ongoing with EMC2, IBM, and CGI) and government grants. The remaining $13M has been or will be raised through:

- **CFREF/HBHL ($84M), <u>funding confirmed</u>**: MCIN's neuroinformatics infrastructure is a vital component the HBHL initiative – the amount to be directed towards MCIN is under discussion.
- **Open Science Initiative (OSI - $20M), <u>funding confirmed</u>**: The OSI will be built on MCIN's neuroinformatics infrastructure – the amount to be directed towards MCIN is under discussion.
- **CFI Cyber grant ($2.9M), <u>confirmed funding</u>**: 100% will be applied to MCIN needs.
- **Brain Canada ($11M), Dr Evans' has been invited to submit a full grant application for April 2017:** Indicative of Dr Evans' recognized leadership role and MCIN's neuroinformatics capacity, Canadian researchers (40) asked Dr Evans to submit a single unified proposal under his leadership. Mr Ludmer provided a letter of support. As CBRAIN/LORIS will provide the backbone of the infrastructure, a significant portion will come to MCIN.
- **Irving Ludmer Foundation:** The primary donor, Mr Irving Ludmer, has committed to providing research funding (around $1-1.5M) to address shortfalls once HBHL/OSI funding has been attributed.
- **UA and the Ludmer Development Officer (DO) Fundraising:** Supported by the Ludmer Admin Director and UA/Neuro Development Office, the Ludmer DO will secure additional funding. For example, in addition to having already securing $2M towards an endowed Chair and Azrieli Autism grant, ongoing and highly promising negotiations include philanthropic funding from an Asia-based donor.
- **Canada-Cuba-China initiative:** led by Dr Evans, the CCC negotiations has already generated investment from the China and Quebec governments for a workshop in Cuba. If successful, the resulting CCC funding will include support for MCIN tools.

Faculty/PI support (per table): This projected budgetary line (refer to table, above) is for faculty support costs (Member PIs, their Research Assistant's salaries or research). Full salary support over three years has been secured to support the tenure track position currently being advertised.

7.1.3 EPIGENETICS & MENTAL HEALTH PILLAR

Based on the detailed budget submitted by Dr Michael Meaney mid-September 2016, the Epigenetics Pillar required $13.1M over the next 4 years, of which <u>73% had already been secured</u> through the Ludmer Foundation Gift Agreement 1 (11%), the Douglas Institute/McGill (8%) and secured research grants (51%) and in-kind donations (2%) – refer to table below. A further $3.6M (27%) is required to meet projected needs to 2020. See table below and Appendix V for detailed budget.

Summary 4-year Epigenetics & Mental Health Costs

Budget Lines	Projected Budget	GA1	Douglas/McGill Funds	Grant funds	In-Kind Funds	Total Secured	Shortfall	%
1. Research Management	$ 1,470,150	$ 113,370	$ 816,000	$ 233,000	$ -	$ 1,162,370	**$ 307,780**	2%
2. Research Personnel	$ 4,691,000	$ 574,000	$ -	$ 3,161,000	$ -	$ 3,735,000	**$ 956,000**	7%
3. Students & Fellows	$ 1,555,000	$ 70,000	$ -	$ 1,275,000	$ -	$ 1,345,000	**$ 210,000**	2%
4. Faculty/PI Support	$ 1,182,000	$ 100,000	$ 270,000	$ 632,000	$ -	$ 1,002,000	**$ 180,000**	1%
5. Equipment & inputs	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**	0%
6. Research	$ 4,220,000	$ 565,000	$ -	$ 1,435,000	$ 270,000	$ 2,270,000	**$ 1,950,000**	15%
4-YearTotal	**$ 13,118,150**	**$ 1,422,370**	**$ 1,086,000**	**$ 6,736,000**	**$ 270,000**	**$ 9,514,370**	**$ 3,603,780**	27%
	100%	**11%**	**8%**	**51%**	**2%**	**73%**	**27%**	

The remaining $3.6M has been or will be secured through the following activities:

- **Grants:** Dr Meaney submitted a Bioinformatics CFI platform grant in 2016.
- **CFREF/HBHL, funding secured:** As a thematic lead, Dr Meaney is eligible to apply for CFREF/HBHL funds.
- **Irving Ludmer Foundation:** The primary donor, Mr Irving Ludmer, has committed to providing research funding (around $1-1.5M) to address shortfalls once HBHL funding has been clarified.
- **UA / Ludmer Development Officer (DO) fundraising:** Supported by the Ludmer Admin Director, UA and the Ludmer DO will raise funds to support research. Dr Meaney is also part of the Canada-Cuba-China initiative leadership that holds the promise of a complimentary philanthropic gift from an Asia-based donor.
- **The Douglas:** Supported by the Ludmer Admin Director, the Douglas has agreed to undertake and support fundraising efforts.

Faculty/PI support: This projected budgetary line (in table, above) is for faculty support costs (Ludmer Member PIs or their Research Assistant's salaries or research) for which funding has been secured. This includes the following member PIs: Dr Tie Yuan Zhag (salary), Dr Kieran O'Donnell (salary and 1 research assistant), Dr P Silveira (salary support) and Dr Rose Bagot (2 research assistants). These funds will be transferred to the relevant PIs. Noteworthy, Dr K O'Donnell with Ludmer Centre support has secured two successfully grants with a third pending a decision.

7.1.4 GENOMICS, BIOINFORMATICS & STATISTICAL GENETICS PILLAR

The Statistic Genetics pillar led by Dr Celia Greenwood requires $2.4M over 4 years, of which $1M (44%) has already been secured, primary through The Ludmer Foundation Gift Agreement 1 (GA1) and some grant funding. An additional $1.4M is required. See table below and Appendix V for detailed budget.

Summary 4-year Genomics, Bioinformatics & Statistical Genetics Costs

Budget Lines	Projected Budget	GA1 Funds	Grants Funds	LDI Funds	Total Secured	Shortfall	%
Research management	$ 856,000	$ 41,000	$ -	$ 460,000	$ 501,000	$ 355,000	15%
Research / Neuroinformatics Personnel	$ 756,880	$ 277,790	$ 57,000	$ -	$ 334,790	$ 422,090	18%
Students & Fellows	$ 506,259	$ 168,759	$ -	$ -	$ 168,759	$ 337,500	14%
Faculty/PI Support	$ 31,600	$ 1,600	$ -	$ -	$ 1,600	$ 30,000	1%
Equipment	$ 143,000	$ 25,000	$ -	$ -	$ 25,000	$ 118,000	5%
Research	$ 95,000	$ 20,000	$ -	$ -	$ 20,000	$ 75,000	3%
Knowledge Translation Activtites	$ -	$ -	$ -	$ -	$ -	$ -	0%
4-Year Total	**$ 2,388,739**	**$ 534,149**	**$ 57,000**	**$ 460,000**	**$ 1,051,149**	**$ 1,337,590**	56%
	100%	**22%**	**2%**	**19%**	**44%**	**56%**	

In addition to applying for further grant funding, the remaining $1.4M has been or will be secured through the following activities

- **Dr Greenwood's newly secured grants, as of end of 2016:** As of the end of 2016, Dr Greenwood had helped secure $4.5M in research funding as a co-PI on multiple grants, $1.48M as the lead PI. In addition to this, Dr Greenwood secured in-kind compute/storage resources from the 2016 Compute Canada Resource Allocation competition
- **Irving Ludmer Foundation:** The primary donor, Mr Irving Ludmer, has committed to providing research funding to address shortfalls.
- **UA and the Ludmer Development Officer (DO) Fundraising:** Supported by the Ludmer Admin Director and UA the Ludmer DO will secure additional funding.
- **JGH/LDI Foundation:** Supported by the Ludmer Admin Director, the JGH Foundations will undertake and support fundraising efforts.

7.1.5 FUNDRAISING LEADERSHIP & SUPPORT

In addition to the Scientific Directors' pursuit of research funding, two core Ludmer Centre staff support and provide leadership in securing additional resources, as describe below.

Development Officer, funding for position secured: Capitalizing on the potentials of stable administrative support, the Centre has secured a four-year commitment from University Advancement VP Marc Weinstein to provide a dedicated Ludmer Centre Development Officer based in the MNI fundraising office to lead philanthropic cultivation and to support the Donor Advisory Committee (DAC) in collaboration with the Ludmer Administrative Director. The focus will be to secure both punctual funding and endowed funding to support key Ludmer Centre positions, ongoing activities (neuroinformatics infrastructure, research) and new PI members.

Based on University Advancement (UA) projections, the Ludmer Development Officer is expected to secure some $1M annually. Additionally, UA VP Marc Weinstein has already secured $2M towards an endowed Chair for one of the Scientific Directors. Endowed Chairs will be a key focus in the Centre's efforts to secure sustainable funding for the Centre's leadership. As indicated in the previous section, funds raised by UA and the Ludmer DO will be applied to research, knowledge transfer and faculty support (Member PIs) needs as well as to provide stopgap/bridge funding for staff salaries (Research Associates, informatics developers, etc.).

Administrative Director (AD), funding for position secured: The Ludmer Centre's fulltime AD, in addition to ensuring synergies across all Ludmer Centre activities in order to maximize impact and opportunities, leads and provides various levels of fundraising support that are expected to contribute to the long-term financial health of the Ludmer Centre. The list below is demonstrative, not exhaustive:

- The AD is developing a public relations strategy to increase awareness of the Ludmer Centre and its PI Members within and outside of the university and to non-academic populations: Ludmer Centre briefs, PI bio-sketches, generation of news articles and increased social media presence, lecture events, web-based donation platform (linked to McGill's secure server/donation platform), etc. This is being done in consultation with and supports existing donor and media communications services among the three Institutional partners.

- The AD established a fundraising coordination group, with representation from each of the partner's fundraising bodies, to assist with fundraising endeavors.
    - The AD supports fundraising by University Advancement (UA) and Ludmer Fundraising Bodies by supporting or organizing key events and donor receptions to highlight the Ludmer PIs and their research:
        - Currently, the Ludmer organizes two annual lectures/receptions in Montreal, a third in Toronto and a fourth is being organized in New York for March 2017.
        - Ad-hoc support for UA activities in 2015 included Ludmer Centre PIs' participation in UA regional donor presentations in London (UK), Toronto, and Montreal (4 event).
        - The AD recently coordinated and prepared two project proposal for a key philanthropic donor in collaboration with the development lead in the Faculty of Medicine (J Leebosh); other such initiatives are being explored.
    - The AD is supporting the Douglas and the JGH/LDI to develop fundraising strategies in support of their respective Ludmer Centre pillar.
- The AD established and leads the Donor Advisory Committee (DAC). A member of the Donor Advisory Committee (DAC), who is a venture capitalist in the bioscience/pharmaceutical sector, is assisting the Administrative Director to develop a pharmaceutical outreach strategy.
- The AD is working to develop corporate partnerships and sponsorships in collaboration with the Research & Innovation Office within the CFREF remit (two ongoing current initiatives include CGI and Neuroforce).
- The AD is supporting the development of a funding base to support an Irish-Canadian research collaboration initiated by Dr O'Donnell (e.g., strategy development includes identification of a local Alumni support base, connections with the Canadian and Irish ambassadors as well as local connections with Montreal-based Irish groups, etc.)

Based on the successes highlighted in the Ludmer Centre's 2016 Annual Report and the activities describe above, we are confident in our ability to secure funding for the Centre's activities.

APPENDICES

In addition to the appendices below, the following documents have been provided with this application:

- the Ludmer Centre Collaboration Agreement,
- the 2016 Scientific Advisory Report
- the Ludmer Centre Annual Report, 2016

I. PROVISIONAL ACCREDITATION LETTER

McGill

David Eidelman, M.D.

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November 23, 2015

Dr. Allan Evans
Dr. Celia Greenwood
Dr. Michael Meaney
Ludmer Centre

Dear Colleagues,

In accordance with university regulations and with the support of the Provost, I am happy to inform you that effective immediately, the Ludmer Centre will have the status of a McGill Research Centre on a provisional basis. This is the first step towards giving the Ludmer Centre a permanent designation as an official McGill Research Centre.

As per the McGill University policy attached (Policy on Research Centres), this provisional status is valid for up to 24 months and is non-renewable. The status will be lost if we do not initiate the process of becoming a McGill University-recognized Research Centre within 24 months of this provisional designation. We will need to obtain approval from the Research Advisory Council (RAC) and then the Academic Policy Committee (APC) before presenting the final proposal to Senate and, ultimately, to the Board of Governors.

The template of a proposal to become a University-recognized Research Centre (Appendix II) as well as the requirements to be so designated (page 4, section 5) are clearly presented in the policy.

I look forward to working with you on this important initiative.

Sincerely,

D. Eidelman

David Eidelman, MD, CM FRCPC FACP

cc: Provost Manfredi
Dr. Rose Goldstein
Marc Weinstein

II. SCIENTIFIC DIRECTORS, BIOS

DR MICHAEL MEANEY**Michael Meaney, CM, PhD, CQ, FRSC**

Co-Director, Ludmer Centre

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Dr Meaney is a leading researcher and laboratory director at the Douglas Mental Health University Institute, an Adjunct Senior Investigator at the Singapore Institute for Clinical Sciences, a James McGill Professor in the departments of Psychiatry and Neurology & Neurosurgery at McGill University, and the Director of the Program for the Study of Behaviour, Genes & Environment at McGill University.

Area of Research: Dr Meaney's laboratory focuses on epigenetics, the biological basis by which environmental factors produce an enduring effect on genomic structures and function, and the resulting phenotype variations, including mental illnesses and learning disabilities. These studies focus on epigenetic modifications to the genome that regulate gene activity, altering or switching them 'on and off'. This work involves both basic science and translational research models, ranging from studies of molecular mechanisms to brain development and function in humans. Dr Meaney is also the director of the Maternal Adversity, Vulnerability & Neurodevelopment (MAVAN) project, a Montreal-based longitudinal study of paediatric epigenetics, and a primary investigator in Singapore's largest birth cohort study, Growing Up in Singapore Towards Healthy Outcomes (GUSTO).

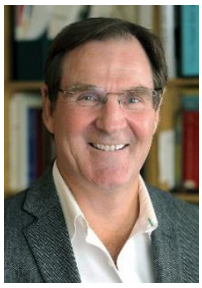
Publications & Impact Profile: In 2014, he was awarded the prestigious Klaus J. Jacobs Research Prize for scientific work of high social relevance in child development, elected to the Royal Society of Canada, and named a Knight of the National Order of Quebec. A recipient of numerous national and international honours, Dr Meaney ranks among the world's most cited scientists and has been invited to present his findings at research institutes, government health agencies, and scientific meetings globally.

- Thomson Reuters Web of Science h-index: 102
- Google Scholar Profile
  - Total citations 56,323; 27,786 since 2010
  - Total h-index 120; 88 since 2010
  - Total i10-index of 292; 242 since 2010

To learn more about Dr Meaney's team and his latest research or to find a list of publications visit the

- **Michael Meaney Laboratory:** http://michael-meaney.lab.mcgill.ca/en/index_en.html
- Google Scholar Profile: https://scholar.google.ca/citations?user=LkRMhD4AAAAJ&hl=en

DR ALAN EVANS



Alan Evans, PhD

Co-Director, Ludmer Centre

McConnell Brain Imaging Centre

Montreal Neurological Institute

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Dr Evans is the director of the McGill Centre for Integrative Neuroscience (MCIN) at the Montreal Neurological Institute (MNI) and a James McGill Professor in the departments of Medical Physics, Biomedical Engineering, and Neurology & Neurosurgery at McGill University. He is also the director of the Montreal Consortium for Brain Imaging Research.

Area of Research

Dr Evans is a world-renowned authority on brain mapping through the use of imaging technologies. He heads the Canadian network for large-scale grid-processing of brain imaging data (CBRAIN); developed a widely used web-access database software for neuroimaging research, LORIS; and founded Biospective Inc. He employs high-performance computing to integrate imaging, behavioural, genetic and epigenetic data in brain research, including neurological and psychiatric disorders. One of Dr Evans' signature achievements was creating the Montreal Neurological Institute-reference brain, the most frequently used spatial reference system for cataloguing structural and functional data for both normal and diseased brains. He also co-led the Big Brain Project, in which scientists sliced a human brain into 7,400 wafer-thin sheets and then digitally reconstructed it, allowing for deeper understanding of the brain's anatomy and its pathophysiology.

Publications & Impact Profile: Dr Evans was named a Fellow of the Royal Society of Canada in November 2015 and awarded the Margolese National Brain Disorders Prize by the University of British Columbia in 2014. He is among the top 1% of researchers in Neuroscience and Behaviour and the 2015 Chair-Elect of the Organization for Human Brain Mapping.

- Thomson Reuters Web of Science h-index: 116
- Google Scholar Profiles
  - Total citations 92,847; 43,170 since 2010
  - Total h-index 157; 109 since 2010
  - Total i10-index 461; 358 since 2010

To learn more about Dr Evans' team and their latest research or find a list of publications visit:

- The McGill Centre for Integrative Neuroscience: http://mcin.ca
- Google Scholar Profile: https://scholar.google.ca/citations?user=FxPzh9kAAAAJ&hl=en

DR CELIA M.T. GREENWOOD

Celia M.T. Greenwood, PhD

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Dr Greenwood is the Director of the Statistical Genetics Team and a Senior Scientist at the Jewish General Hospital's Lady Davis Institute and an Associate Professor in the departments of Oncology; Epidemiology, Biostatistics & Occupational Health; and Human Genetics at the McGill University.

Area of Research

Dr Greenwood, a senior researcher and statistician, has made significant contributions to the fields of genetics, genomics, and genetic epidemiology. Her work involves the development and application of a wide range of statistical approaches aimed at improving our understanding of how genome and environmental factors influence disease risks and progression. This has culminated in the creation of a number of algorithms and analytical software programs. Dr Greenwood also co-led the UK10K statistical team, which studied the genetic code of 10,000 people to investigate how rare, low-frequency genetic variants contribute to human disease. The study established an enduring data resource for future research in human genetics. Recently, her group has been focusing on ways of characterizing tumour abnormalities, analysis methods for rare genetic variants such as those identified by sequencing studies, and analysis of DNA methylation data.

Publications & Impact Profile: Dr Greenwood's work has led to her nomination to the Board of Directors for the International Genetic Epidemiology Society.

- Thomson Reuters Web of Science h-index: 21
- Google Scholar Profile
  - Total citations 7,262; 3073 since 2010
  - Total h-index 37; 28 since 2010
  - Total i10-index of 87; 66 since 2010

To learn more about Dr Greenwood's team and their latest research and publications visit:

- The Statistical Genetics website: http://www.mcgill.ca/statisticalgenetics/home-page
- Google Scholar Profile: https://scholar.google.ca/citations?user=xMvb3yIAAAAJ&hl=en

- new primary investigators, Dr Kieran O'Donnell and Dr Rose Bagot, to increase the centre's capacity to engage in new research, take on new student mentorships, and expand the number of research collaborations. A third hire in neuroinformatics is current underway.

III. MCIN NEUROINFORMATICS ECOSYSTEM

MCIN's neuroinformatics ecosystem is describe in the following articles and at www.MCIN.ca.

- **Neuroinformatics Ecosystem:** MCIN's data-sharing ecosystem - data acquisition to dissemination, LORIS / CBRAIN platforms, and tools/pipelines (e.g., CIVET, MINC, FSL).
  - *Samir D. et al. (2016)* ***The MNI data-sharing and processing ecosystem****, J. NeuroImage. DOI:10.1016/j.neuroimage.2015.08.076*
- **CBRAIN:** A powerful web-based portal that allows brain researchers to perform computationally intensive analyses on data by connecting them to high-performance-computing facilities across Canada and around the world. It has nearly 400 users in 22 countries.
  - *Sherif. T et al. (2014)* ***CBRAIN: a web-based, distributed computing platform for collaborative neuroimaging research****. Front. Neuroinform. 8:54. DOI:10.3389/fninf.2014.00054*
  - *Glatard, T et al.* ***"Controlling the Deployment of Virtual Machines on Clusters and Clouds for Scientific Computing in CBRAIN,"*** *Cluster, Cloud and Grid Computing, 2014 14th IEEE/ACM International Symposium, 26-29 May 2014. DOI:10.1109/CCGrid.2014.42*
- **LORIS:** A web-based data and project management software for neuroimaging research studies, LORIS is an open-source framework for storing and processing behavioural, clinical, neuroimaging and genetics data. It has over 370 users around the world.
  - *C. Rogersa et al. (2015)* ***LORIS: Enhanced tools for data management in neurodevelopmental studies.*** *International J Dev Neuroscience. DOI:10.1016/j.ijdevneu.2015.04.334*
  - *Das S, et al. (2012)* ***LORIS: a web-based data management system for multi-center studies.*** *Front. Neuroinform. 5:37. DOI: 10.3389/fninf.2011.00037*
- **MAVAN & GUSTO multivariate databases:** These comprise genotyping, epigenotyping, neuroimaging and functional phenotyping datasets (publication pending).

IV. LOGIC MODEL

Logic Model Ludmer Centre for Neuroinformatics & Mental Health			
Ultimate Outcome	**Mental illnesses, cognitive disorders, and learning disabilities are significantly reduced through preventive strategies and their diagnoses, based on biological metrics, lead to more effective, individually-tailored treatment approaches.**		
Intermediate Outcome	1. The Ludmer Centre is established as a global centre of excellence and incubator for neuroinformatics (big data) research and training, thereby, increasing multi-, inter- and trans-disciplinary mental-health research to advance the prevention, diagnosis and treatment of mental disorders.		
Immediate Outcome	1.1 Neuroinformatics and mental health research, utilising the Ludmer Centre databases, datasets, software and expertise, is advanced in terms of our understanding of mental disorders and their prevention, diagnosis and treatment.		1.2 Number of scientists engaged in transdisciplinary research in neuroinformatics (big-data) and mental health utilising the Ludmer Centre infrastructure is increased.
Outputs	1.1.1 Dynamic databases comprising heterogeneous datasets (e.g., genetic, epigenetic, neuroimaging, phenotype) from human cohort studies and/or relevant animal models, and the neuroinformatics tools to analysis these, are established, expanded, maintained and made available to researchers globally.	1.1.2 The number and diversity of neuroinformatics and mental health research projects, undertaken by the Ludmer Centre's PI teams and collaborators, increased globally.	1.2.1 Awareness of and research capacities to utilise and undertake multi- and inter-disciplinary neuroinformatics and mental health research are increased among scientific cadres.
Activities	1.1.1.1 Maintain MCIN neuroinformatics infrastructure (CBRAIN/LORIS & tools), computational capacity, and the required technical expertise to assist researchers globally to maximise its research capacity.	1.1.2.1 Expand the number of national and international researchers (collaborations) undertaking neuroinformatics and mental health research utilising the centre's expertise and/or datasets.	1.2.1.1 Hire and provide mentorship and an incubator/training environment for graduate students, post-graduate researchers and fellows.
	1.1.1.1 Using the CBRAIN/LORIS platform, create and maintain neuroinformatics databases that consolidate and integrate heterogeneous datasets from multiple sources.	1.1.2.2 Expand the number of direct research projects undertaken by the Ludmer Centre's Primary Investigator (PI) team.	1.2.1.2 Organise and/or deliver training workshops or conference that transcend mental-health research disciplines to reach prospective and current researchers.
	1.1.1.2 Develop complex algorithms and software packages to enable the resulting datasets to be analysed for trends and predictive outcomes.	1.1.2.3 Collect new high-quality datasets derived from longitudinal human cohort studies (e.g., genetic, epigenetic, neuroimaging & phenotype datasets) and relevant animal models to populate the databases.	1.2.1.3 Publish manuscripts on research outcomes and improving understanding of neuroinformatics research/tools including data-acquisition standardisation protocols.
	1.1.1.3 Innovate and expand user-friendly, cutting-edge neuroinformatics technologies, software packages, processes and procedures.		

V. DETAILED ANNUAL BUDGETS

Detailed Budget Projections, Oct. 2016-Sept. 2020[30]

Refer to sub-sections for detailed projections for the admin and the three research pillars.

Table A: Ludmer Centre 4-year Budget Projection, Oct. 2016-Sept 2020

	Budget line	Epigenetics Component	Neuro-informatics Component	Statistical Genetics Component	Admin/Mgt	Total	%
2016-17	Ludmer Management	$ -	$ -	$ -	$ 424,500	**$ 424,500**	**3%**
	Research Management	$ 372,870	$ 1,979,637	$ 211,000	$ -	**$ 2,563,507**	**16%**
	Research / Neuroinformatics Personnel	$ 1,210,500	$ 2,574,703	$ 277,790	$ -	**$ 4,062,993**	**26%**
	Students & Fellows	$ 370,000	$ 535,627	$ 168,759	$ 125,000	**$ 1,199,386**	**8%**
	Primary Investigators	$ 200,000	$ 150,000	$ 1,600	$ 250,000	**$ 601,600**	**4%**
	Equipment	$ -	$ 5,439,214	$ 25,000	$ -	**$ 5,464,214**	**35%**
	Research	$ 1,020,000	$ -	$ 20,000	$ -	**$ 1,040,000**	**7%**
	Knowledge Translation Activities	$ -	$ -	$ -	$ 275,000	**$ 275,000**	**2%**
	2016-17 Total	**$ 3,173,370**	**$ 10,679,181**	**$ 704,149**	**$ 1,074,500**	**$ 15,631,200**	**100%**
2017-18	Ludmer Management	$ -	$ -	$ -	$ 402,950	**$ 402,950**	**3%**
	Research Management	$ 374,356	$ 2,139,618	$ 215,000	$ -	**$ 2,728,974**	**17%**
	Research / Neuroinformatics Personnel	$ 1,078,000	$ 2,661,683	$ 155,000	$ -	**$ 3,894,683**	**25%**
	Students & Fellows	$ 395,000	$ 548,827	$ 125,000	$ 125,000	**$ 1,193,827**	**8%**
	Primary Investigators	$ 322,000	$ 150,000	$ 10,000	$ 250,000	**$ 732,000**	**5%**
	Equipment	$ -	$ 5,439,214	$ 34,000	$ -	**$ 5,473,214**	**34%**
	Research	$ 1,150,000	$ -	$ 25,000	$ -	**$ 1,175,000**	**7%**
	Knowledge Translation Activities	$ -	$ -	$ -	$ 275,000	**$ 275,000**	**2%**
	2017-18 Total	**$ 3,319,356**	**$ 10,939,342**	**$ 564,000**	**$ 1,052,950**	**$ 15,875,648**	**100%**
2018-19	Ludmer Management	$ -	$ -	$ -	$ 431,504	**$ 431,504**	**4%**
	Research Management	$ 378,462	$ 2,207,847	$ 215,000	$ -	**$ 2,801,309**	**25%**
	Research / Neuroinformatics Personnel	$ 1,192,000	$ 2,777,161	$ 159,650	$ -	**$ 4,128,811**	**37%**
	Students & Fellows	$ 395,000	$ 563,347	$ 112,500	$ 125,000	**$ 1,195,847**	**11%**
	Primary Investigators	$ 330,000	$ 150,000	$ 10,000	$ 250,000	**$ 740,000**	**7%**
	Equipment	$ -	$ 439,214	$ 42,000	$ -	**$ 481,214**	**4%**
	Research	$ 1,150,000	$ -	$ 25,000	$ -	**$ 1,175,000**	**10%**
	Knowledge Translation Activities	$ -	$ -	$ -	$ 275,000	**$ 275,000**	**2%**
	2018-19 Total	**$ 3,445,462**	**$ 6,137,569**	**$ 564,150**	**$ 1,081,504**	**$ 11,228,684**	**100%**
2019-20	Ludmer Management	$ -	$ -	$ -	$ 410,164	**$ 410,164**	**4%**
	Research Management	$ 344,462	$ 2,266,199	$ 215,000	$ -	**$ 2,825,661**	**25%**
	Research / Neuroinformatics Personnel	$ 1,210,500	$ 2,904,186	$ 164,440	$ -	**$ 4,279,126**	**38%**
	Students & Fellows	$ 395,000	$ 579,319	$ 100,000	$ 125,000	**$ 1,199,319**	**11%**
	Primary Investigators	$ 330,000	$ 150,000	$ 10,000	$ 250,000	**$ 740,000**	**7%**
	Equipment	$ -	$ 439,214	$ 42,000	$ -	**$ 481,214**	**4%**
	Research	$ 900,000	$ -	$ 25,000	$ -	**$ 925,000**	**8%**
	Knowledge Translation Activities	$ -	$ -	$ -	$ 275,000	**$ 275,000**	**2%**
	2019-20 Total	**$ 3,179,962**	**$ 6,338,918**	**$ 556,440**	**$ 1,060,164**	**$ 11,135,483**	**100%**
4 year	Ludmer Management	$ -	$ -	$ -	$ 1,669,117	**$ 1,669,117**	**3%**
	Research Management	$ 1,470,150	$ 8,593,300	$ 856,000	$ -	**$ 10,919,450**	**20%**
	Research / Neuroinformatics Personnel	$ 4,691,000	$ 10,917,733	$ 756,880	$ -	**$ 16,365,613**	**30%**
	Students & Fellows	$ 1,555,000	$ 2,227,120	$ 506,259	$ 500,000	**$ 4,788,379**	**9%**
	Primary Investigators	$ 1,182,000	$ 600,000	$ 31,600	$ 1,000,000	**$ 2,813,600**	**5%**
	Equipment	$ -	$ 11,756,856	$ 143,000	$ -	**$ 11,899,856**	**22%**
	Research	$ 4,220,000	$ -	$ 95,000	$ -	**$ 4,315,000**	**8%**
	Knowledge Translation Activities	$ -	$ -	$ -	$ 1,100,000	**$ 1,100,000**	**2%**
	5-year Total	**$ 13,118,150**	**$ 34,095,010**	**$ 2,388,739**	**$ 4,269,117**	**$ 53,871,015**	**100%**
	Percentage	**24%**	**63%**	**4%**	**8%**	**100%**	

[30] Note, the income projections were calculated as of June 2016 and will be updated in Dec. 2016 to include new grant funding.

ADMIN & OPERATIONS

Summary 4-year Admin/Management and Additional Support Costs

Core Admin Costs	2016-17	2017-18	2018-19	2019-20	Total	Total Secured	Shortfall	%
Admin Director (AD)	$ 103,000	$ 106,090	$ 109,273	$ 112,551	$ 430,914	$ 103,000	$ (327,914)	-76%
Scientist Director S/D Funds ($50Kx3)	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 600,000	$ 150,000	$ (450,000)	-75%
Finance Officer (shared 20/80 with MCIN)	$ 12,000	$ 12,360	$ 12,731	$ 13,113	$ 50,204	$ -	$ (50,204)	-100%
Development Officer (DO)	$ 81,000	$ 81,000	$ 81,000	$ 81,000	$ 324,000	$ 324,000	$ -	0%
Scientific Advisory Committee (SAC)	$ 25,000	$ -	$ 25,000	$ -	$ 50,000	$ 25,000	$ (25,000)	-50%
Governance Committees (e.g. DAC, ExCom)	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 16,000	$ -	$ (16,000)	-100%
Communications/Public Relations activities	$ 45,000	$ 45,000	$ 45,000	$ 45,000	$ 180,000	$ 25,000	$ (155,000)	-86%
Office supplies, equip, services	$ 500	$ 500	$ 500	$ 500	$ 2,000	$ 2,000	$ -	0%
Travel (e.g., AD, DA, LC member)	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 16,000	$ 4,000	$ (12,000)	-75%
Admin. SubTotal	**$ 424,500**	**$ 402,950**	**$ 431,504**	**$ 410,164**	**$ 1,669,117**	$ 633,000	$ (1,036,117)	-62%
Additional Operational Costs	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**Total**	**Total Secured**	**Shortfall**	
Knowledge Translatoin	$ 275,000	$ 275,000	$ 275,000	$ 275,000	$ 1,100,000	$ -	$ (1,100,000)	-100%
Student Support/research	$ 125,000	$ 125,000	$ 125,000	$ 125,000	$ 500,000	$ -	$ (500,000)	-100%
Faculty/PI Support	$ 250,000	$ 250,000	$ 250,000	$ 250,000	$ 1,000,000	$ -	$ (1,000,000)	-100%
Additional Costs Subtotal	**$ 650,000**	**$ 650,000**	**$ 650,000**	**$ 650,000**	**$ 2,600,000**	**$ -**	**$(2,600,000)**	-100%
Total	**$ 1,074,500**	**$ 1,052,950**	**$ 1,081,504**	**$ 1,060,164**	**$ 4,269,117**	**$ 633,000**	**$(3,636,117)**	-85%

2016-17	Projected Budget	GA1	McGill	Donations	Total Secured	Shortfall
Admin Director (AD)	$ 103,000.00	$ 103,000.00	$ -	$ -	$ 103,000.00	$ -
Scientist Director S/D Funds ($50Kx3)	$ 150,000.00	$ 150,000.00	$ -	$ -	$ 150,000.00	$ -
Finance Officer (shared 20/80 with MCIN)	$ 12,000.00	$ -	$ -	$ -	$ -	$ (12,000.00)
Development Officer (DO)	$ 81,000.00	$ -	$ 81,000.00	$ -	$ 81,000.00	$ -
Scientific Advisory Committee (SAC)	$ 25,000.00	$ -	$ -	$ 25,000.00	$ 25,000.00	$ -
Governance Committees (e.g. DAC, ExCom)	$ 4,000.00	$ -	$ -	$ -	$ -	$ (4,000.00)
Communications/Public Relations activities	$ 45,000.00	$ 25,000.00	$ -	$ -	$ 25,000.00	$ (20,000.00)
Office supplies, equip, services	$ 500.00		$ 500.00	$ -	$ 500.00	$ -
Travel (e.g., AD, DA, LC member)	$ 4,000.00	$ 4,000.00	$ -	$ -	$ 4,000.00	$ -
Total	**$ 424,500.00**	**$ 282,000.00**	**$ 81,500.00**	**$ 25,000.00**	**$ 388,500.00**	**$ (36,000.00)**

2017-18	Projected Budget	GA1	McGill	Donations	Total Secured	Shortfall
Admin Director (AD)	$ 106,090.00	$ -	$ -	$ -	$ -	$ (106,090.00)
Scientist Director S/D Funds ($50Kx3)	$ 150,000.00	$ -	$ -	$ -	$ -	$ (150,000.00)
Finance Officer (shared 20/80 with MCIN)	$ 12,360.00	$ -	$ -	$ -	$ -	$ (12,360.00)
Development Officer (DO)	$ 81,000.00	$ -	$ 81,000.00	$ -	$ 81,000.00	$ -
Scientific Advisory Committee (SAC)		$ -	$ -	$ -	$ -	$ -
Governance Committees (e.g. DAC, ExCom)	$ 4,000.00	$ -	$ -	$ -	$ -	$ (4,000.00)
Communications/Public Relations activities	$ 45,000.00	$ -	$ -	$ -	$ -	$ (45,000.00)
Office supplies, equip, services	$ 500.00	$ -	$ 500.00	$ -	$ 500.00	$ -
Travel (e.g., AD, DA, LC member)	$ 4,000.00	$ -	$ -	$ -	$ -	$ (4,000.00)
Total	**$ 402,950.00**	**$ -**	**$ 81,500.00**	**$ -**	**$ 81,500.00**	**$ (321,450.00)**

2018-19	Projected Budget	GA1	McGill	Donations	Total Secured	Shortfall
Admin Director (AD)	$ 109,272.70	$ -	$ -	$ -	$ -	$ (109,272.70)
Scientist Director S/D Funds ($50Kx3)	$ 150,000.00	$ -	$ -	$ -	$ -	$ (150,000.00)
Finance Officer (shared 20/80 with MCIN)	$ 12,730.80	$ -	$ -	$ -	$ -	$ (12,730.80)
Development Officer (DO)	$ 81,000.00	$ -	$ 81,000.00	$ -	$ 81,000.00	$ -
Scientific Advisory Committee (SAC)	$ 25,000.00	$ -	$ -	$ -	$ -	$ (25,000.00)
Governance Committees (e.g. DAC, ExCom)	$ 4,000.00	$ -	$ -	$ -	$ -	$ (4,000.00)
Communications/Public Relations activities	$ 45,000.00	$ -	$ -	$ -	$ -	$ (45,000.00)
Office supplies, equip, services	$ 500.00	$ -	$ 500.00	$ -	$ 500.00	$ -
Travel (e.g., AD, DA, LC member)	$ 4,000.00	$ -	$ -	$ -	$ -	$ (4,000.00)
Total	**$ 431,503.50**	**$ -**	**$ 81,500.00**	**$ -**	**$ 81,500.00**	**$ (350,003.50)**

2019-20	Projected Budget	GA1	McGill	Donations	Total Secured	Shortfall
Admin Director (AD)	$ 112,550.88	$ -	$ -	$ -	$ -	$ (112,550.88)
Scientist Director S/D Funds ($50Kx3)	$ 150,000.00	$ -	$ -	$ -	$ -	$ (150,000.00)
Finance Officer (shared 20/80 with MCIN)	$ 13,112.72	$ -	$ -	$ -	$ -	$ (13,112.72)
Development Officer (DO)	$ 81,000.00	$ -	$ 81,000.00	$ -	$ 81,000.00	$ -
Scientific Advisory Committee (SAC)		$ -	$ -	$ -	$ -	$ -
Governance Committees (e.g. DAC, ExCom)	$ 4,000.00	$ -	$ -	$ -	$ -	$ (4,000.00)
Communications/Public Relations activities	$ 45,000.00	$ -	$ -	$ -	$ -	$ (45,000.00)
Office supplies, equip, services	$ 500.00	$ -	$ 500.00	$ -	$ 500.00	$ -
Travel (e.g., AD, DA, LC member)	$ 4,000.00	$ -	$ -	$ -	$ -	$ (4,000.00)
Total	**$ 410,163.61**	**$ -**	**$ 81,500.00**	**$ -**	**$ 81,500.00**	**$ (328,663.61)**

Breakdown of Knowledge Translation Costs

Knowledge Translation (KT)	2016-17	2017-18	2018-19	2019-20	Total	Shortfall
Knowledge Translation Project/Expert	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 400,000	$ (400,000)
Annual Symposium/Workshop	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 400,000	$ (400,000)
Research Seminar Series (Dr Bagot)	$ 55,000	$ 55,000	$ 55,000	$ 55,000	$ 220,000	$ (220,000)
Research & Peer Exchange	$ -	$ -	$ -	$ -	$ -	$ -
Awards Fund	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 80,000	$ (80,000)
KT Sub-Total	**$ 275,000**	**$ 275,000**	**$ 275,000**	**$ 275,000**	**$ 1,100,000**	**$ (1,100,000)**

NEUROIMAGING & NEUROINFORMATICS PILLAR

Summary 4-year Neuroimaging & Neuroinformatics Pillar Costs

Budget Lines	Projected budget	GA2 Funds	McGill Funds	Grants Funds	Total Secured	Shortfall	%
Research management	$ 8,593,300	$ 932,449	$ 732,000	$ 854,705	$ 2,519,153	$ 6,074,147	18%
Research / Neuroinformatics Personnel	$ 10,917,733	$ 1,260,923	$ -	$ 4,406,630	$ 5,667,553	$ 5,250,180	15%
Students & Fellows	$ 2,227,120	$ 52,250	$ -	$ 1,279,669	$ 1,331,919	$ 895,201	3%
Faculty/PI Support	$ 600,000	$ 215,000	$ 180,000	$ -	$ 395,000	$ 205,000	1%
Equipment	$ 11,756,856	$ 450,000	$ -	$ 351,714	$ 801,714	$ 10,955,142	32%
Research	$ -	$ -	$ -	$ -	$ -	$ -	0%
4-YearTotal	**$ 34,095,010**	**$ 2,910,622**	**$ 912,000**	**$ 6,892,718**	**$ 10,715,340**	**$ 23,379,670**	**69%**
	100%	**9%**	**3%**	**20%**	**31%**	**69%**	

2016-17	Projected budget	GA2 Funds	McGill Funds	Grants Funds	Total Secured	Shortfall
Research management	$ 1,979,637	$ 847,449	$ 183,000	$ 373,025	$ 1,403,474	$ 576,163
Research / Neuroinformatics Personnel	$ 2,574,703	$ 1,141,432		$ 1,366,434	$ 2,507,866	$ 66,837
Students & Fellows	$ 535,627	$ 52,250		$ 483,377	$ 535,627	$ -
Faculty/PI Support	$ 150,000	$ 150,000		$ -	$ 150,000	$ -
Equipment	$ 5,439,214	$ 312,500		$ 126,714	$ 439,214	$ 5,000,000
Research	$ -	$ -		$ -	$ -	$ -
Total	**$ 10,679,181**	**$ 2,503,631**	**$ 183,000**	**$ 2,349,550**	**$ 5,036,181**	**$ 5,643,000**

2017-18	Projected	ıdmer/McGill GA	McGill	Grants	Income	Shortfall
Research management	$ 2,139,618	$ 85,000	$ 183,000	$ 329,513	$ 597,513	$ 1,542,105
Research / Neuroinformatics Personnel	$ 2,661,683	$ 119,491		$ 1,655,038	$ 1,774,529	$ 887,155
Students & Fellows	$ 548,827	$ -		$ 540,042	$ 540,042	$ 8,785
Faculty/PI Support	$ 150,000	$ -		$ -	$ -	$ 150,000
Equipment	$ 5,439,214	$ 137,500		$ 100,000	$ 237,500	$ 5,201,714
Research	$ -	$ -		$ -	$ -	$ -
Total	**$ 10,939,342**	**$ 341,991**	**$ 183,000**	**$ 2,624,593**	**$ 3,149,584**	**$ 7,789,758**

2018-19	Projected	ıdmer/McGill GA	McGill	Grants	Income	Shortfall
Research management	$ 2,207,847	$ -	$ 183,000	$ 99,667	$ 282,667	$ 1,925,180
Research / Neuroinformatics Personnel	$ 2,777,161	$ -		$ 1,073,128	$ 1,073,128	$ 1,704,033
Students & Fellows	$ 563,347	$ -		$ 145,000	$ 145,000	$ 418,347
Faculty/PI Support	$ 150,000	$ 65,000	$ 90,000	$ -	$ 155,000	$ (5,000)
Equipment	$ 439,214	$ -		$ 100,000	$ 100,000	$ 339,214
Research	$ -	$ -		$ -	$ -	$ -
Total	**$ 6,137,569**	**$ 65,000**	**$ 273,000**	**$ 1,417,794**	**$ 1,755,794**	**$ 4,381,775**

2019-20	Projected	ıdmer/McGill GA	McGill	Grants	Income	Shortfall
Research management	$ 2,266,199	$ -	$ 183,000	$ 52,500	$ 235,500	$ 2,030,699
Research / Neuroinformatics Personnel	$ 2,904,186	$ -		$ 312,031	$ 312,031	$ 2,592,155
Students & Fellows	$ 579,319	$ -		$ 111,250	$ 111,250	$ 468,069
Faculty/PI Support	$ 150,000	$ -	$ 90,000	$ -	$ 90,000	$ 60,000
Equipment	$ 439,214	$ -		$ 25,000	$ 25,000	$ 414,214
Research	$ -	$ -		$ -	$ -	$ -
Total	**$ 6,338,918**	**$ -**	**$ 273,000**	**$ 500,781**	**$ 773,781**	**$ 5,565,137**

EPIGENETICS & MENTAL HEALTH PILLAR

Summary 4-year Epigenetics & Mental Health Costs

Budget Lines	Projected Budget	GA1	Douglas/McGill Funds	Grant funds	In-Kind Funds	Total Secured	Shortfall	%
1. Research Management	$ 1,470,150	$ 113,370	$ 816,000	$ 233,000	$ -	$ 1,162,370	**$ 307,780**	2%
2. Research Personnel	$ 4,691,000	$ 574,000	$ -	$ 3,161,000	$ -	$ 3,735,000	**$ 956,000**	7%
3. Students & Fellows	$ 1,555,000	$ 70,000	$ -	$ 1,275,000	$ -	$ 1,345,000	**$ 210,000**	2%
4. Faculty/PI Support	$ 1,182,000	$ 100,000	$ 270,000	$ 632,000	$ -	$ 1,002,000	**$ 180,000**	1%
5. Equipment & inputs	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**	0%
6. Research	$ 4,220,000	$ 565,000	$ -	$ 1,435,000	$ 270,000	$ 2,270,000	**$ 1,950,000**	15%
4-YearTotal	**$ 13,118,150**	**$ 1,422,370**	**$ 1,086,000**	**$ 6,736,000**	**$ 270,000**	**$ 9,514,370**	**$ 3,603,780**	27%
	100%	**11%**	**8%**	**51%**	**2%**	**73%**	**27%**	

2016-17	Projected Budget	GA1	DH/M funds	Grant funds	In-Kind Funds	Total Secured	Shortfall
1. Research Management	$ 372,870	$ 113,370	$ 204,000	$ 55,500	$ -	**$ 372,870**	**$ -**
2. Research Personnel	$ 1,210,500	$ 574,000		$ 636,500	$ -	**$ 1,210,500**	**$ -**
3. Students & Fellows	$ 370,000	$ 70,000		$ 300,000	$ -	**$ 370,000**	**$ -**
4. Faculty/PI Support	$ 200,000	$ 100,000		$ 100,000	$ -	**$ 200,000**	**$ -**
5. Equipment & inputs	$ -			$ -	$ -	**$ -**	**$ -**
6. Research	$ 1,020,000	$ 565,000		$ 335,000	$ 120,000	**$ 1,020,000**	**$ -**
Total	**$ 3,173,370**	**$ 1,422,370**	**$ 204,000**	**$ 1,427,000**	**$ 120,000**	**$ 3,173,370**	**$ -**

2017-18	Projected Budget	GA1	DH/M funds	Grant funds	In-Kind Funds	Total Secured	Shortfall
1. Research Management	$ 374,356		$ 204,000	$ 57,500	$ -	**$ 261,500**	**$ 112,856**
2. Research Personnel	$ 1,078,000			$ 819,000	$ -	**$ 819,000**	**$ 259,000**
3. Students & Fellows	$ 395,000			$ 325,000	$ -	**$ 325,000**	**$ 70,000**
4. Faculty/PI Support	$ 322,000		$ 90,000	$ 172,000	$ -	**$ 262,000**	**$ 60,000**
5. Equipment & inputs	$ -			$ -	$ -	**$ -**	**$ -**
6. Research	$ 1,150,000			$ 400,000	$ 50,000	**$ 450,000**	**$ 700,000**
Total	**$ 3,319,356**	**$ -**	**$ 294,000**	**$ 1,773,500**	**$ 50,000**	**$ 2,117,500**	**$ 1,201,856**

2018-19	Projected Budget	GA1	DH/M funds	Grant funds	In-Kind Funds	Total Secured	Shortfall
1. Research Management	$ 378,462		$ 204,000	$ 60,000	$ -	**$ 264,000**	**$ 114,462**
2. Research Personnel	$ 1,192,000			$ 848,000	$ -	**$ 848,000**	**$ 344,000**
3. Students & Fellows	$ 395,000			$ 325,000	$ -	**$ 325,000**	**$ 70,000**
4. Faculty/PI Support	$ 330,000		$ 90,000	$ 180,000	$ -	**$ 270,000**	**$ 60,000**
5. Equipment & inputs	$ -			$ -	$ -	**$ -**	**$ -**
6. Research	$ 1,150,000			$ 400,000	$ 50,000	**$ 450,000**	**$ 700,000**
Total	**$ 3,445,462**	**$ -**	**$ 294,000**	**$ 1,813,000**	**$ 50,000**	**$ 2,157,000**	**$ 1,288,462**

2019-20	Projected Budget	GA1	DH/M funds	Grant funds	In-Kind Funds	Total Secured	Shortfall
1. Research Management	$ 344,462		$ 204,000	$ 60,000	$ -	**$ 264,000**	**$ 80,462**
2. Research Personnel	$ 1,210,500			$ 857,500	$ -	**$ 857,500**	**$ 353,000**
3. Students & Fellows	$ 395,000			$ 325,000	$ -	**$ 325,000**	**$ 70,000**
4. Faculty/PI Support	$ 330,000		$ 90,000	$ 180,000	$ -	**$ 270,000**	**$ 60,000**
5. Equipment & inputs	$ -			$ -	$ -	**$ -**	**$ -**
6. Research	$ 900,000			$ 300,000	$ 50,000	**$ 350,000**	**$ 550,000**
Total	**$ 3,179,962**	**$ -**	**$ 294,000**	**$ 1,722,500**	**$ 50,000**	**$ 2,066,500**	**$ 1,113,462**

GENOMICS, BIOINFORMATICS & STATISTICAL GENETICS PILLAR

Summary 4-year Genomics, Bioinformatics & Statistical Genetics Costs

Budget Lines	Projected Budget	GA1 Funds	Grants Funds	LDI Funds	Total Secured	Shortfall	%
Research management	$ 856,000	$ 41,000	$ -	$ 460,000	$ 501,000	$ 355,000	15%
Research / Neuroinformatics Personnel	$ 756,880	$ 277,790	$ 57,000	$ -	$ 334,790	$ 422,090	18%
Students & Fellows	$ 506,259	$ 168,759	$ -	$ -	$ 168,759	$ 337,500	14%
Faculty/PI Support	$ 31,600	$ 1,600	$ -	$ -	$ 1,600	$ 30,000	1%
Equipment	$ 143,000	$ 25,000	$ -	$ -	$ 25,000	$ 118,000	5%
Research	$ 95,000	$ 20,000	$ -	$ -	$ 20,000	$ 75,000	3%
Knowledge Translation Activtites	$ -	$ -	$ -	$ -	$ -	$ -	0%
4-Year Total	**$ 2,388,739**	**$ 534,149**	**$ 57,000**	**$ 460,000**	**$ 1,051,149**	**$ 1,337,590**	56%
	100%	**22%**	**2%**	**19%**	**44%**	**56%**	

2016-17	Projected Budget	GA1 Funds	Grants Funds	LDI Funds	Total Secured	Shortfall
Research management	$ 211,000	$ 41,000		$ 115,000	$ 156,000	$ 55,000
Research / Neuroinformatics Personnel	$ 277,790	$ 277,790			$ 277,790	$ -
Students & Fellows	$ 168,759	$ 168,759			$ 168,759	$ -
Faculty/PI Support	$ 1,600	$ 1,600			$ 1,600	$ -
Equipment	$ 25,000	$ 25,000			$ 25,000	$ -
Research	$ 20,000	$ 20,000			$ 20,000	$ -
Knowledge Translation Activtites	$ -	$ -			$ -	$ -
2016-17 Total	**$ 704,149**	**$ 534,149**	**$ -**	**$ 115,000**	**$ 649,149**	**$ 55,000**

2017-18	Projected Budget	GA1 Funds	Grants Funds	LDI Funds	Total Secured	Shortfall
Research management	$ 215,000	$ -		$ 115,000	$ 115,000	$ 100,000
Research / Neuroinformatics Personnel	$ 155,000	$ -	$ 24,000		$ 24,000	$ 131,000
Students & Fellows	$ 125,000	$ -			$ -	$ 125,000
Faculty/PI Support	$ 10,000	$ -			$ -	$ 10,000
Equipment	$ 34,000	$ -			$ -	$ 34,000
Research	$ 25,000	$ -			$ -	$ 25,000
Knowledge Translation Activtites	$ -	$ -			$ -	$ -
2017-18 Total	**$ 564,000**	**$ -**	**$ 24,000**	**$ 115,000**	**$ 139,000**	**$ 425,000**

2018-19	Projected Budget	534149	0	115000	649149	55000
Research management	$ 215,000	$ -		$ 115,000	$ 115,000	$ 100,000
Research / Neuroinformatics Personnel	$ 159,650	$ -	$ 19,000		$ 19,000	$ 140,650
Students & Fellows	$ 112,500	$ -			$ -	$ 112,500
Faculty/PI Support	$ 10,000	$ -			$ -	$ 10,000
Equipment	$ 42,000	$ -			$ -	$ 42,000
Research	$ 25,000	$ -			$ -	$ 25,000
Knowledge Translation Activtites	$ -	$ -			$ -	$ -
2018-19 Total	**$ 564,150**	**$ 534,149**	**$ 19,000**	**$ 230,000**	**$ 783,149**	**$ 485,150**

2019-20	Projected Budget	GA1 Funds	Grants Funds	LDI Funds	Total Secured	Shortfall
Research management	$ 215,000	$ -		$ 115,000	$ 115,000	$ 100,000
Research / Neuroinformatics Personnel	$ 164,440	$ -	$ 14,000		$ 14,000	$ 150,440
Students & Fellows	$ 100,000	$ -			$ -	$ 100,000
Faculty/PI Support	$ 10,000	$ -			$ -	$ 10,000
Equipment	$ 42,000	$ -			$ -	$ 42,000
Research	$ 25,000	$ -			$ -	$ 25,000
Knowledge Translation Activtites	$ -	$ -			$ -	$ -
2019-20 Total	**$ 556,440**	**$ -**	**$ 14,000**	**$ 115,000**	**$ 129,000**	**$ 427,440**

VI. SCHEDULE C, COLLABORATION AGREEMENT

The Executive Committee is responsible for the oversight, development and sustainability of the Ludmer Centre, final approval of all operational and financial reports, and accountability to the collaborating Parties (Institutions and Fundraising Bodies) and all donors.

The ExCom meeting will be expanded for the mid- and end-of-year meetings (currently May and December), to include additional members in line with McGill's policy[31] on research centre accreditation. The membership will be posted on the centre's website and listed in the Annual Report.

EXCOM MANDATE

Ultimately, the ExCom, Institution Representative, voting members (refer to Collaboration Agreement, Section 10.1), as the primary fiduciaries, supported by the non-voting members (see below) will steer the Ludmer Centre towards a sustainable future by adopting sound, ethical, and legal governance and financial management policies and ensure the Ludmer Centre has adequate resources to advance its mission. To assure the Ludmer Centre's sustainability and innovative edge, the ExCom will:

- contribute to, approve and implement the Ludmer Centre's 5-year Strategic Plan, Business Plan and Budgets;
- approve and oversee implementation of annual work plans (AWP) and budgets;
- receive and approve Institutions' financial and narrative reports, ensuring coherence with donor agreements and to the Ludmer Centre's requirements and reporting needs;
- support identified funding needs and priorities as agreed;
- consider and approve the appointment of Ludmer Centre staff and Co-Directors; and
- consider and approve new institutional partnerships aimed at facilitating future innovations.

EXCOM MEMBERSHIP

The ExCom members will be posted on the centre's website and listed in the Annual Report.

- **Institution Representative** or designate, voting members.
    - McGill: Vice-Principal Health Affairs; Dean, Faculty of Medicine,
    - Douglas: President and CEO of the Centre intégré universitaire de santé et de services sociaux (CIUSSS) de l'Ouest-de-l'Île-de-Montréal
    - JGH: President-Director General of the Centre intégré universitaire de santé et de services sociaux (CIUSSS) du Centre-Ouest-de-l'Île-de-Montréal
- **Research Centre/Institution Representatives,** or designate, non-voting:
    - McGill University: Director, Montreal Neurological Institute
    - Douglas: Director, Douglas Hospital Research Centre
    - JGH: Director, Lady Davis Institute for Medical Research
- **Institutions' Fundraising Bodies,** or designate, non-voting:
    - MNI External Affairs, Neuro/MNI
    - Douglas Mental Health University Institute Foundation
    - Jewish General Hospital Foundation
- **Management Committee** (MgtCom), non-voting ExCom members: The following MgtCom members will advise, report to, and participate in the ExCom:
    - Administrative Director
    - Ludmer Centre Scientific Co-Directors
    - Administrative Assistant (responsible for minutes and agenda)

[31] Policy for Research Centres. The web site is now up and running: http://www.mcgill.ca/secretariat/files/secretariat/research_centres_policy_on_1.pdf.

- **Vice-Principal, University Advancement,** McGill, or designate, non-voting
- Donor Representative(s): a leading donor and/or the Chair of the Donor Advisory Committee, non-voting
- **Expanded Membership for the Board of Directors (twice annually),** non-voting, for the mid- and end-of-year meetings (currently May and December) includes the following additional members in line with McGill's policy[32] on research centre accreditation:
    - Vice-Principal, McGill Research & International Relations (or delegate);
    - McGill Provost (or delegate);
    - Institutions' Student Representatives (3 total, graduate/post-graduate)

EXCOM CHAIR

Recognising that the Ludmer Centre is a unique collaborative undertaking between three institutions and to maintain an equitable power balance, the ExCom Chair will be nominated by the ExCom from among the non-voting ExCom membership for a renewable two-year term of office with no restriction on reappointment. In line with McGill's policy[33] on research centre accreditation, the Dean of the Faculty of Medicine (as the lead Faculty), or delegated designate, will chair the two expanded membership meetings that constitute the Board of Directors (currently May and December) and will assure participation from all Ludmer Centre participating Institutions

EXCOM DECISION-MAKING & QUORUM

The ExCom will apply consensus decision making, whereby quorum for voting purposes is considered to be the three voting members, with one vote per Institution as executed by their respective Institution-Representative or designates. Motions must be unanimous to pass (3 out 3); however, if an Institution exercises it right to abstain from a vote, a motion may pass based on the unanimous vote of the remaining institutions (e.g., 2 out 2 votes).

EXCOM MEETINGS

Quarterly meetings will be hosted by the Institutions on a rotational basis. Meetings will be held on the Institutions' premises, or a designated alternative location. Any Institution can call a special meeting to resolve issues that require a vote by providing all Parties with reasonable notice. The minutes will be recorded in French and English and maintained by the Ludmer Centre's Administrative Assistant. The expanded membership meeting will be reserved for bi-law revisions and approval of the admittance of new Institutions into the collaboration.

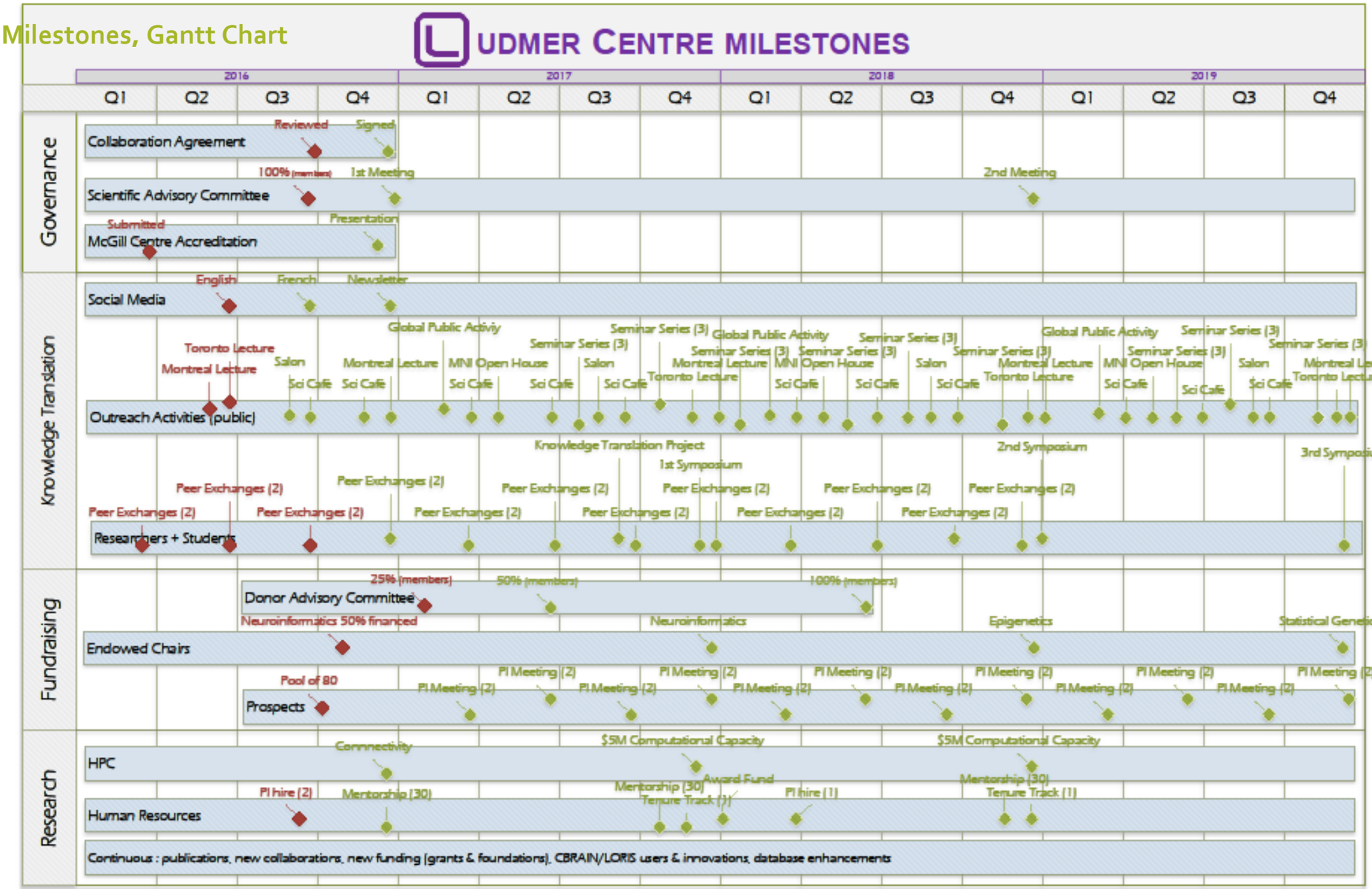
EXCOM REPORTING

The Institution Representative, voting members, are ultimately accountable to the Parties' management structures as well as to the Ludmer Centre Donors through financial reports and an annual narrative report (refer to Schedule B).

[32] Policy for Research Centres. The web site is now up and running: http://www.mcgill.ca/secretariat/files/secretariat/research_centres_policy_on_1.pdf.

[33] Policy for Research Centres. The web site is now up and running: http://www.mcgill.ca/secretariat/files/secretariat/research_centres_policy_on_1.pdf.

VII. Milestones, Gantt Chart



CENTRE CENTER
LUDMER
NEUROINFORMATIQUE & SANTÉ MENTALE | NEUROINFORMATICS & MENTAL HEALTH

Ludmer Centre for Neuroinformatics & Mental Health Collaboration Agreement

As per the Ludmer Centre Gift Agreements with the Ludmer Family Foundation, this agreement, the Ludmer Centre Collaboration Agreement, establishes the Ludmer Centre.

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Ludmer Centre Collaboration Agreement

Made and entered into on the 3rd Day of October, 2016

Between: **McGill University**, having its place of business at 845 Sherbrooke Street West, Montréal, Quebec, Canada, H3A 0G4 ("**McGill**");

AND: **Centre intégré universitaire de santé et de services sociaux (CIUSSS) de l'Ouest-de-l'Île-de-Montréal**, on behalf of the Douglas Research Centre, having its place of business at 6875 Boulevard LaSalle, Montréal, Quebec, Canada, H4H 1R3 ("**the Douglas**");

AND: **Jewish General Hospital**, a public healthcare establishment administered by the Centre intégré universitaire de santé et de services sociaux (CIUSSS) Centre-ouest-de-l'Île-de-Montréal, on behalf of the Lady Davis Institute (LDI), having its place of business at 3755 Chemin de la Côte-Sainte-Catherine, Montréal, Quebec, Canada, H3T 1E2 ("**JGH**")

McGill, the Douglas and JGH are herein referred to individually as a "Party" to this Agreement and collectively as the "Parties".

The above Parties to this *Ludmer Centre for Neuroinformatics & Mental Health Collaboration Agreement* (the "**Collaboration Agreement**") are referred to severally as an "**Institution**", and collectively, as the "**Institutions**".

1. INSTITUTIONAL INFORMATION

The Parties to this Collaboration Agreement may carry out their rights and responsibilities hereunder through the following entities which form part of each institution, or in another manner, at each Institution's discretion.

McGill University

- Faculty of Medicine ("McGill Medicine")
- Montreal Neurological Institute ("McGill MNI")
- University Advancement ("McGill UA")

CIUSSS de l'Ouest-de-l'Île-de-Montréal

- The Douglas Research Centre

Jewish General Hospital (CIUSSS Centre-Ouest-de-l'Île-de-Montréal)

- JGH's Lady Davis Institute for Medical Research ("JGH/LDI")

Additionally, this Collaboration Agreement recognises the vital role and need to work collaboratively with the Institutions' fundraising entities ("**Fundraising Bodies**"):

- MNI External Affairs, Neuro/MNI;
- Douglas Mental Health University Institute Foundation; and
- Jewish General Hospital Foundation.

2. BACKGROUND

The Irving Ludmer Family Foundation established an initial gift agreement ("**Gift Agreement #1**") on September 23, 2013 with the JGH Foundation, the Douglas Foundation, the JGH (now part of CIUSSS du Centre-Ouest-de-l'Île-de-Montréal), the Douglas Research Centre, and the Douglas Mental Health

University Institute (now part of the CIUSSS de l'Ouest-de-l'Île-de-Montréal)and a second gift agreement ("**Gift Agreement #2**") with McGill on March 7th, 2014 to support the creation of the Ludmer Centre for Neuroinformatics & Mental Health (the "**Ludmer Centre**"). The Parties, in line with their health and research mandates and their commitments under the above-mentioned gift agreements, want to unite their Institutions as Ludmer Centre collaborators.

Each Institution is considered an equal in relation to their Ludmer collaboration, as described herein (the "**Ludmer Collaboration**"), and so will have equal representation within the governance structures and be expected to contribute, to the best of their capacity, to establishing, maintaining and advancing the Ludmer Centre and its goals and mission as described in Schedule A: Business Plan Summary and in line with their annual Ludmer Centre budgets as approved by the Executive Committee.

Since the Institutions include McGill-affiliated teaching institutes and their Primary Investigators are McGill professors, McGill University Advancement ("**McGill UA**") will provide fundraising guidance to all Institutions, as defined herein and in Schedule C: Staff & Governance Structures.

No part of this agreement will supersede or void the commitments made to the Ludmer Family Foundation in Gift Agreements #1 or #2.

The terms and conditions of the Ludmer Collaboration are set out in this Collaboration Agreement.

3. SCHEDULES

The following Schedules form an integral part of this Collaborative Agreement:

- Schedule A: Business Plan Summary
- Schedule B: Project Management, Evaluation & Reporting
- Schedule C: Staff & Governance Structures
- Schedule D: Ludmer Centre Fund
- Schedule E: Prospect Clearance Protocol

4. NAME

In honour of the founding donor the Ludmer Family Foundation and its continued financial support, the name of the centre established by the Ludmer Collaboration will be the "*Ludmer Centre for Neuroinformatics & Mental Health"* (abbreviated as the "**Ludmer Centre**").

5. PURPOSE

The purpose of the Ludmer Collaboration is to establish the Ludmer Centre as a global centre of excellence and incubator for neuroinformatics (big data) research and training, thereby, increasing multi-, inter- and trans-disciplinary big-data mental-health research to advance the prevention, diagnosis and treatment of brain disorders (mental illnesses, cognitive disorders, and learning disabilities).

The Institutions will work together for their mutual benefit in the field of neuroscience and mental health. In particular, the Institutions have agreed to develop their collaborative work through cooperation and expansion of existing research teams and infrastructure in each Institution, as follows:

- implementation of the Ludmer Centre's goals and mission as described in Schedule A (Business Plan Summary) and detailed in the Business Plan (as agreed and signed by the Institutions' authorized representatives).
- support and development of each Institution for its institutional component ("**Ludmer Centre Components**") underpinning the Ludmer Collaboration, i.e.:
    - at the MNI: the McGill Centre for Integrative Neuroscience[1] ("**MCIN**") computational infrastructure (including CBRAIN/LORIS platform and support team) and research component, currently directed by Dr Alan Evans (the **"MNI Component"**);
    - at the Douglas: the epigenetics and mental health research component (including the MAVAN datasets, infrastructure and team), currently directed by Dr Michael Meaney (the "**Douglas Component**"); and
    - at the JGH/LDI: the statistical development component, currently directed by Dr Celia Greenwood (the "**JGH/LDI Component**").
- support of each Institution for all subsequent components developed within their Institutions as part of the Ludmer Centre and as agreed by them and the Executive Committee (e.g., addition of more primary researchers and their related research needs);
- shared use of designated resources made available by each Institution, as may be separately agreed to in writing by the Parties concerned;
- hosting of joint public and academic conferences;
- development of common research projects; and
- exploration of opportunities for and the undertaking of collaborations on funded research programmes.

Moreover, the Parties have agreed to develop their collaborative work through cooperation in the following activities:

- support the Ludmer Centre's Administrative Director, continued administrative needs, and the search for funding sources for their respective Ludmer Centre Components and as follows:
    - McGill External Affairs: the MNI/MCIN Component
    - Douglas Foundation: the Douglas Component
    - The JGH Foundation: the JGH/LDI Component
- exploration and coordination of opportunities for and the undertaking of joint fundraising for the Ludmer Centre (as described in Schedule E).

6. TERM

The Ludmer Collaboration, which began in 2013 with the signing of Gift Agreement #1 and expanded in 2014 with the signing of Gift Agreement 2, is officially acknowledged in this document and will continue until terminated, as provided in this Collaboration Agreement.

This Collaboration Agreement is effective as of the date of signature and will continue until terminated, as provided in this Collaboration.

[1] MCIN, which Is not is not a recognized McGill Centre, refers to the team established by Dr Evans to create and support the LORIS and CBRAIN platforms.

7. PLACE OF BUSINESS

The Ludmer Centre was conceived to be and, unless the Parties agree otherwise, will remain a collaboration of the three Institutions. It does not exist as a separate physical structure, thereby, minimising unnecessary costs entailed in establishing a separate brick-and-mortar facility, building parallel infrastructures (labs, tools, etc.), and relocating scientists. Although the Ludmer Centre does not have a single physical location, physical space will be allocated and infrastructure investments undertaken to accommodate Ludmer Centre staff, informatics/research infrastructure and research cadres in each of the Institutions, as provided for in this Collaboration Agreement and Executive Committee decisions. As such, each of the Institutions will house a Ludmer Centre Component reflecting its specific expertise, resources and support relative to the Ludmer Collaboration (as defined in Section 5):

(a) at the MNI: the MNI/MCIN Component;
(b) at the Douglas: the Douglas Component; and
(c) at the JGH/LDI: the JGH/LDI Component.

7.1. Correspondence

For all **general correspondence** (non-research and non-donor-relations specific), the Douglas will serve as the primary mailing address and contact point, unless otherwise agreed by the Executive Committee:

Ludmer Centre for Neuroinformatics & Mental Health
Centre Ludmer en neuroinformatique et santé mentale
Douglas Hospital Research Centre | Centre de recherche de l'Hôpital Douglas
6875, boul. LaSalle, Montréal, Québec, Canada, H4H 1R3
T: 514-761-6131, poste 2839
Fax | Téléc: 514-762-3033
E-mail | courriel: info@LudmerCentre.ca

Research-related correspondence will be directed to the lead researcher and host Institution.

Donor related correspondence will be directed to the lead fundraiser, either an Institution's foundation lead (i.e., their Fundraising Body) or the Ludmer Centre's Administrative Director, and reported to the Ludmer Centre's Communication & Fundraising Group (CFG, as described in Schedule C: Staff & Governance Structures).

7.2. Business Presence

As a collaborative initiative, the Internet/web presence of the Ludmer Centre is critical to its brand and mission promotion. As the Ludmer Centre represents a multi-party collaboration, the Ludmer Centre website has been established separately from those of the Institutions: www.LudmerCentre.ca. The Ludmer Centre website will focus on promoting the Ludmer Centre's goals and achievements to the general public and potential funders. It will outline potentials for research collaborations and link to each Institution's Ludmer Centre Component's website, which will provide the detailed, scientific aspects of their respective primary investigators' (each, a "**PI**") research. The Institution may elect to host multiple Ludmer Centre Component websites, each centred on the activities of an individual primary investigator.

The Ludmer Centre Component websites are the responsibility of the relevant Institution and their PIs and will align with the institution's relevant policies for web content and communications. The Institutions acknowledge the need to maintain a consistent and professional branding across all Ludmer Centre-affiliated websites. Each of the Ludmer Centre Components will represent the relevant PIs, their work, and team, in a professional well-developed website; be updated minimally every 3 months by their respective personnel; indicate that the PIs are a part of the Ludmer Centre; and link to the Ludmer Centre website.

A goal of the Ludmer Centre and all Ludmer-Centre-affiliated websites will be mutual promotion.

8. COMUNICATIONS & BRANDING

A Ludmer Centre Communications and Brand Guideline (the "**LC Communications Guidelines**") will be developed by the Communication & Fundraising Group (CFG, as described in Schedule C: Staff & Governance Structures) and agreed to by the Institutions.

The Institutions and their primary investigators will acknowledge the Ludmer Centre in all their internal and external communications and publications related to the Ludmer Centre, including research output, press releases, grant applications as well as any public communications referencing the staff, researchers or affiliated research (i.e., research utilising Ludmer Centre infrastructure and funded personnel in any form).

8.1. Branding & Co-branding

The Ludmer Centre brand will, in a manner satisfactory to the Executive Committee, be indicated on appropriate signage, websites and other physical and virtual materials Administratived with the Ludmer Centre. Each PI's team's locale (team workspace) within their Institution will be identified as being part of the Ludmer Centre through appropriate signage.

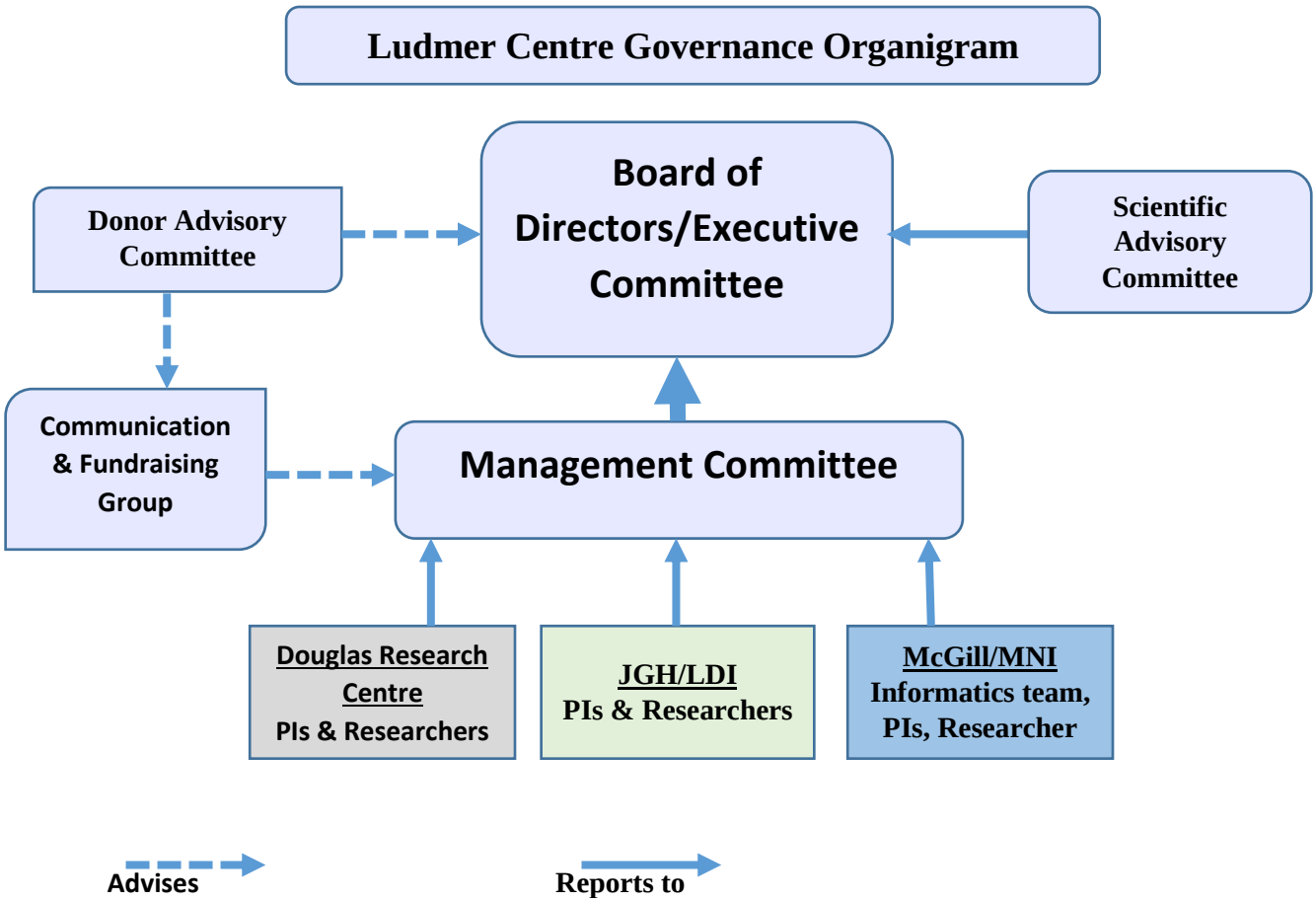
The LC Communications Guidelines will include co-branding instructions to ensure that the Ludmer Centre logo and the Institutions' logos appear on all Ludmer Centre correspondence, print and web-based publications, and promotional materials and during activities as agreed by the Institutions in the Guidelines.

No Institution shall use the name or any trademark or logo of another Institution for activities not related to the Ludmer Centre in any press release or product advertising, or for any other commercial purpose, without the prior written consent of the relevant Institution, which consent may be given or withheld at the relevant Institution's sole discretion.

8.2. Communications

All public communications on behalf of the Ludmer Centre will be approved and made by the Executive Committee and/or Administrative Director. All communications, including media and public relations communications, will include recognition of the Ludmer Centre and the Institutions and include their respective logos.

No Institution will make or permit any announcement or press release or disclosure of any matter relating to the Ludmer Collaboration or Ludmer Centre unless agreed in writing in advance by the Executive or Management committees or the Communication & Fundraising Group.



9. GOVERNANCE STRUCTURE

The Institutions agree to the organigram and governance structures (above) and their mandates as detailed in **Schedule C: Staff & Governance Structures**; these include the following:

- **Executive Committee/Board of Directors:** The Executive Committee, whose membership temporarily expands twice annually to form the Board of Directors, will meet quarterly and is responsible for the oversight, development and sustainability of the Ludmer Centre and Institutional/donor accountability, including final approval of all operational and financial reports and budgets. The Executive Committee's membership will be expanded for the mid- and end-of-year meetings, to include additional members from the three Institutions in line with McGill's policy[2] on research centre accreditation.
- **Management Committee:** Led by the Administrative Director (once appointed, and by the Administrative Director, in the interim), the Management Committee is responsible for the daily operational oversight and management of the Ludmer Centre and is accountable to the Executive Committee.
- **Communication & Fundraising Group (CFG):** The CFG, recognising that fundraising will require both Institution-specific and collaborative efforts, delineates and implements the Ludmer

[2] Policy for Research Centres. The web site is now up and running: http://www.mcgill.ca/secretariat/files/secretariat/research_centres_policy_on_1.pdf.

Centre's communication and fundraising strategy and retains primary responsibility for fundraising.

- **Donor Advisory Committee** (the "**DAC**")**:** The DAC provides counsel to the Ludmer Centre's Executive and Management Committees, Administrative Director and CFG on interpreting and promoting the Ludmer Centre to external constituencies and offers advice and support on fundraising and promotional issues.
- **Scientific Advisory Committee** (the "**SAC**")**:** The SAC provides advice and guidance to the Ludmer Centre to help ensure the centre achieves its stated objectives and remains at the leading edge of research in neuroinformatics and mental health.

10. PARTNER REPRESENTATION

Each Institution is considered an equal partner in governance, hence, has equal representation at all levels of the Ludmer Collaboration's governance structures (refer to Schedule C: Staff & Governance Structures). To ensure the smooth operation in line with the Ludmer Centre's mission and goals (Schedule A), the Parties recognize the need for multi-party institutional representation as follows:

10.1 Executive Committee, Institution-Representative, voting member: Each Institution will have one primary representative with voting status on the Executive Committee ("ExCom") who has authority to make binding decisions on behalf of their respective Institution in relation to the Ludmer Collaboration.

- The Douglas: President-Director General, Centre intégré universitaire de santé et de services sociaux de l'Ouest-de-l'Île-de-Montréal or designate with the appropriate authority to make binding decisions on behalf of the Institution ("Designate").
- JGH: President-Director General, Jewish General Hospital (CIUSSS Centre-Ouest-de-l'Île-de-Montréal or Designate
- McGill: The Dean of Medicine, Faculty of Medicine or Designate.

The ExCom will apply consensus decision-making; however, where a vote is required, each Institution will have one vote executed by the above-mentioned representatives or their Designates; thus, three out of three votes is required to pass a motion; however, an institution may opt out of a vote in which case two out of two votes is required. The Institutions commit to ensuring that a representative with the authority to exercise its voting authority is always present at the Executive Committee meetings.

10.2 Executive Committee, *ex-officio* (non-voting) member: To ensure decision-making reflects the needs and capacities of the implicated Institutions' research units (the MNI, the Douglas Research Centre and the LDI), in which the Ludmer Centre Components reside, each Institution will be represented as follows:

- Douglas: Scientific Director, Douglas Hospital Research Centre or Designate
- JGH: Director, Lady Davis Institute or Designate
- McGill: Director of the MNI or Designate

10.3 Communication & Fundraising Group ("CFG"), *ex-officio* (non-voting) member: Recognising that fundraising will require both Institution-specific and collaborative efforts, the Parties designate the following *ex-officio* (non-voting) fundraising experts to sit on the CFG:

- Douglas: Executive Director, Douglas Institute Foundation or Designate
- JGH: President and CEO, JGH Foundation or Designate
- McGill: MNI External Affairs or Designate

10.4 Co-Directors, Ludmer Centre, nominated (non-voting) member: Each Institution will build a cadre of primary investigators and supporting teams/laboratories, either by identifying appropriate individuals from within their institutions or through targeted hiring; thus, each Institution, in consultation with the Executive Committee, will nominate a Ludmer Centre Scientific Co-Director (each, a "**Co-Director**") for their Institution, to a six-year renewable term and provide adequate administrative support, as provided for in the budget and funding permitting (i.e., an administrative assistant) to enable them to represent the ensemble of their Institution's Ludmer Centre primary investigators, research personnel and informatics teams on the Management Committee. They, in collaboration with the Administrative Director, will provide daily leadership of the Ludmer Centre, implement the Business Plan through the Management Committee, and report to the Executive Committee.

10.6 Student Representatives, nominated (non-voting) member: The training of new researchers is a key pillar of the Ludmer Centre (Schedule A, see Logic Model Output 1.2.1); thus, each Institution will nominate a graduate or post-graduate student representative to the Management Committee to represent and ensure students are adequately informed about and engaged in Ludmer Centre activities and decision-making. Each Institution will provide adequate administrative support to assist in a democratic selection process and, thereafter, regular student meetings among students implicated or interested in Ludmer Centre research. The term student is defined as being inclusive of graduate and post-graduate students and research fellows.

11. STAFF

11.1. Ludmer Centre Staff

To ensure the coordination and smooth operation of the Ludmer Centre, as per the Gift Agreement #1 budget, at the time of execution of this Collaboration Agreement, the Institutions acknowledge the need for the following dedicated staff, as defined in Schedule C: Staff & Governance Structures, to be appointed by the Executive Committee:

- **Administrative Director (**the "**Adm Dir**"**), fulltime, McGill UA**;
- **Development Administrative or Officer ("Dev. Officer), full-time, McGill UA,** and
- **Administrative Assistant, part-time, Douglas (1 day/week);**

The above are included in the Ludmer Centre's budget and other staff may be added as required and agreed by the Executive Committee.

11.2. Institutions' Staff

The Institutions commit to establishing a number of key positions, as defined in Schedule C: Staff & Governance Structures, as part of maintaining their respective Ludmer Centre Component which are essential to achieving the Ludmer Centre's objectives within their own Institution. These include:

- Institutional cadre of Ludmer Centre Primary Investigators (PIs)
- Institutional cadre of Ludmer Centre graduate and post-doctoral students and fellows

- Ludmer Centre research support staff/teams (e.g., IT, informatics, research assistants, etc.)
- Institutional Administrative Support for Co-Director; fulltime equivalent to be determined by each institution as provided for in the budget.

12. BUSINESS PLAN

A 5-year results-based management business plan, including a project management, evaluation and reporting (PMER) plan with key metrics, milestones and deliverables, will be produced by the Management Committee and approved by the Executive Committee and revised annually and updated every five years to ensure it reflects best practices in academic reporting-metrics research.

13. BUDGETS

The Institutions' PIs will be required to prepare 5-year projections and to update these annually. The Institutions will approve the budgets and confirm space for existing and new hires and indicate to the Executive Committee, on an annual basis their available financial support for all relevant costs (salaries, infrastructure, students, etc.) and identify the support required from other funding sources (e.g., Ludmer Centre donors).

Beyond commitment to the provision of space and administrative support for the Ludmer Centre PIs and personnel, the Ludmer Collaboration does not require the Institutions to commit to fixed annual amounts, except where such conditions are imposed through individual donor gifts (as is the case for Gift Agreements #1 and #2).

14. REPORTING RESPONSIBILITIES

To facilitate reporting, the Institutions agree to share (through the Ludmer Centre's Administrative Director) operational budgets for their component of the Ludmer Centre and any relevant (to the Ludmer Centre) documentation and agreements on donors and peer reviewed grants obtained by PIs with each other via the Executive Committee, to the extent permitted considering each Institution's own confidentiality obligations. Where there are limitations on such disclosure among the Institutions, due to an Institution's existing obligations to a third party, the Institution bound by such confidentiality obligations shall reasonably seek permission to disclose relevant documentation and agreements to the other Institutions, in the context of the Ludmer Collaboration. Each party agrees to hold the terms of these documents (and related information) in confidence, including budgets, publication rights, the sections on confidentiality, and intellectual property rights. This paragraph shall not apply to any specific disclosures which may be required by law.

For reporting purposes, all work performed by Ludmer Centre PIs that utilise Ludmer Centre staff, infrastructure (virtual and physical) or its name, shall be considered to be a part of the Ludmer Centre portfolio of supported activities and the amounts received and progress reported on.

All Institutions commit to providing adequate resources to enable their responsible staff to adhere to the reporting schedule and requirements as detailed in Schedule B: Project Management, Evaluation & Reporting.

To streamline the reporting process and improve the quality of reports all Parties agree to follow standardized report formats and mediums, which will be selected by the Management Committee.

15. FUNDING

By combining their institutional strengths, the Institutions recognise that this not only enables them to improve neuroinformatics and mental health research but provides a unique opportunity to leverage better and more diverse donor funding through the potential for research outcomes inherent in the Ludmer Centre concept. Thus, nothing in this Collaboration Agreement shall be construed as a basis for the Institutions to reduce pre-existing funding to their respective components of the Ludmer Centre. Further, the Institutions agree that fundraising will be a collaborative undertaking through the CFG, supported by the Administrative Director.

15.1. Financial Contributions

All Institutions will provide their respective financial contributions in accordance with Gift Agreement 1, Gift Agreement 2, and their agreed annual budgets, and under any subsequent agreements that may relate to the Ludmer Collaboration, fully and on time.

15.2. Books of Accounts

Each Institution will maintain accounts and records for their individual financial contributions and expenditures, in accordance with Gift Agreement 1, Gift Agreement 2, and agreed annual budgets for their respective Ludmer Centre activities, and under any subsequent agreements that may relate to the Ludmer Collaboration, and report these to the Ludmer Centre Administrative Director Accurate and complete books of account of the Institutions' transactions supporting the Ludmer Centre will be kept in accordance with generally held practices of accounting.

15.3. Donations to Institutions

Donations from donors identified by each Institution or its Fundraising Body will go directly to the respective Institution's (respecting the established mechanisms of the relevant Fundraising Body), unless the terms agreed between the relevant Institution and/or Fundraising Bodies and donor require otherwise. Receipts (with mention of allocations to the Ludmer Centre, as appropriate), will be issued by the same Institution or funding body that received the donation, in accordance with the receiving Institution's or Fundraising Body's receipting practices in effect. The donors' names, gifts and, where relevant, gift conditions will be reported by the relevant Institution or Fundraising Body to the Executive Committee and the CFG to ensure each donor's contribution is duly noted in the financial and annual Ludmer Centre reports and that specific reporting conditions in the gift agreements are respected, subject to any anonymity or privacy limitations agreed with the donor and in accordance with applicable laws. Donor stewardship will be the responsibility of the relevant recipient Institution or Fundraising Body or, on request of either, the Administrative Director. The Communications & Fundraising Group (CFG), chaired by the Administrative Director, will meet to coordinate fundraising endeavours in line with the agreed prospect clearance system (Schedule E: Prospect Clearance Protocol).

15.4. Ludmer Centre Fund

The Administrative Director will fundraise for the Ludmer Centre in general, including management of the donate page on the Ludmer Centre website. A centralised holding fund, the 'Ludmer Centre Fund' including receipting, will be established and managed by McGill UA in accordance with Schedule D (Ludmer Centre Fund) to facilitate the fundraising activities of the Administrative Director. Quarterly

statements will be prepared by McGill UA for each Ludmer Centre Executive Committee meeting. The Executive Committee will, based on budgetary analysis, the recommendations of the Management Committee and the donors' directives, determine disbursement of the funds among the Institutions and communicate this in writing to McGill UA, which will then disburse the agreed amounts.

The donors' names will be reported to the Executive Committee and CFG by the Administrative Director, who will ensure donor stewardship and reporting, subject to any anonymity or privacy limitations agreed with the donor and in accordance with applicable laws.

15.5. Financial Decisions

Distribution of operating funds, research funds, and other approved funds, will be in accordance with the Ludmer Centre's annual budget. Decisions regarding the annual budget, requirements for additional funding and all other financial matters will be decided by a unanimous vote of the voting members of the Executive Committee (i.e., the Institution's representatives).

To facilitate the daily management of the Ludmer Centre, the co-Directors and the Administrative Director will be given spending authority in line with their relevant budgetary lines, which will be agreed in advance by the Executive Committee and duly noted in the minutes.

15.6. Audit

Each Institution is a non-profit entity with stringent, well established audit systems; to minimise duplication of resources, funds disbursed to and contributed by the Institutions will be subject to the relevant Institution's internal and external audit systems. Where these audits for a single Institution implicate or encompass other Institutions, the Ludmer Centre accounts or research grants in which the Ludmer Centre is implicitly or explicitly implicated, the results of these audits will be reported to the Executive Committee.

15.7. Contract Binding Authority

Contracts or agreements shall be entered into by the relevant Party(ies) only. The Parties acknowledge and agree that the Ludmer Centre itself has no legal personality to contract in its own name. The Executive Committee shall make recommendations on those contracts that are required for the benefit of the Ludmer Centre, and as the case may be, shall unanimously agree upon which Institution(s) shall enter into the contracts in this regard, and upon whether and how the rights and responsibilities flowing from these contracts will be shared among the Institutions, for the benefit of the Ludmer Centre. All contracts are subject to the procurement practices and procedures of the relevant Institution(s) and nothing in this Collaboration Agreement shall be construed to the contrary.

16. ADMITTING A NEW INSTITUTION

A new Institution may be admitted to the Ludmer Collaboration with the unanimous vote of the founding Institutions' voting representatives to the Executive Committee and an amendment of the collaboration agreement among all parties concerned. Where required by active donor agreements, donor approval will also be sought.

17. WITHDRAWAL OF AN INSTITUTION FROM THE LUDMER COLLABORATION

Should an Institution be unable or unwilling to continue in the Ludmer Collaboration, continuation of the Ludmer Centre and its mission could be jeopardised by the sudden withdrawal of a key Ludmer Centre pillar or Ludmer Centre Component. Therefore, in order to provide the necessary transition assistance should an Institution wish to cease its full participation as one of the Institutions central to the Ludmer Centre, as described in this Collaboration Agreement, the withdrawing Institution shall:

- Allow the remaining Institutions 12 months, from written notification of the intent-to-withdraw, to identify a replacement institution (which will become an "Institution" under the terms hereof), during which time the withdrawing Institution will continue to meet its financial obligations under this Collaboration Agreement as defined by the most recent annual budget;
- Provide support to enable researchers to complete or transfer ongoing research commitments (i.e., ongoing grants or funded research) that are reliant on the expertise of Ludmer Centre staff or technical infrastructure provided by the Institution;
- Respect the withdrawing Institution's legal requirements as established by gift agreements and grants, and
- Facilitate the transfer of the research team and, where relevant, their infrastructure housed in the withdrawing Institution to an existing or new Institution as agreed by the Executive Committee.

In the case of permanent withdrawal from the Ludmer Collaboration by an Institution, and subsequent to the permanent withdrawal date (this date to be determined by the the Institution and identified in its withdrawal notification and then endorsed by the Executive Committee based on the above terms and any continued obligations), the withdrawing Institution shall be relieved of any further obligations under this Collaboration Agreement other than the reporting obligations set forth in this Collaboration Agreement, for which reporting obligations shall continue to apply for twelve (12) months. As of the withdrawal date, reporting obligations will be transferred to the new institution, if one has been identified, if not, the reporting obligations for remaining research projects implicating the Ludmer Centre will be assumed by of the existing Institutions.

Notwithstanding any part of this Collaboration Agreement to the contrary, a withdrawing Institution shall respect all expressly surviving obligations agreed to in writing by the Institution concerned, including without limitation, its confidentiality obligations.

18. WINDING UP OF LUDMER COLLABORATION

Except as otherwise provided in the Collaboration Agreement, the Ludmer Collaboration may be terminated only with the unanimous agreement of the Institutions' voting representatives to the Executive Committee.

In the event of a termination of the Ludmer Collaboration, each Institution commits to:

- provide the necessary support to enable researchers to complete ongoing research commitments (grants) that are reliant on the Ludmer Centre expertise of technical infrastructure for a period of 6 months.
- redirect endowments and any other funds established on behalf of the Ludmer Centre into neuroinformatics or mental health research,

19. CONFIDENTIALITY

The Parties agree to hold in confidence all data, materials, documents and information disclosed to them pursuant to this Agreement, and all materials, documents and information gathered or developed pursuant to this Agreement (collectively the "Confidential Information"). The Party receiving Confidential Information ("Receiving Party") from a disclosing Party ("Disclosing Party") shall not disclose or transfer any Confidential Information to any employees or agents, except those employees, advisors, consultants or agents who have a need to know such Confidential Information and provided the Receiving Party agrees:

i) to require that each such employee, advisor, consultant and/or agent treats the Confidential Information as confidential;
ii) to require that each such employee, advisor, consultant and/or agent is aware of and complies with the obligations of confidentiality under this agreement; and
iii) to hold all Confidential Information in confidence and use it only in accordance with this Agreement.

This obligation of confidentiality shall not apply to data, materials, documents and information which:

i) can be shown through documentary records by the Receiving Party to have been known to the Receiving Party prior to receipt of Confidential Information from the Disclosing Party;
ii) at time of disclosure, or thereafter becomes, through no fault of the Receiving Party, part of the public domain by publication or otherwise;
iii) is received by the Receiving Party from another party, provided that to the knowledge of Receiving Party, such third party is not subject to an obligation in favour of Disclosing Party to keep such information confidential;
iv) is developed by the Receiving Party independently of the disclosure by the Disclosing Party, as evidenced by its written records;
v) is published in accordance with this Agreement;
vi) is must be disclosed to Research Ethics Board or other administrative personnel of Site reviewing the Protocol in order to coordinate the review of the Study; or
vii) is required by law, regulation or legal process to be disclose.

The above shall not apply to any specific disclosures which may be required by law. All confidentiality obligations hereunder survive the termination of this Collaboration Agreement and the withdrawal of any Party from it.

20. ENTIRE AGREEMENT & AMENDMENTS

Upon execution by all Parties, this Collaboration Agreement constitutes the entire agreement among the Parties in relation to the Ludmer Collaboration, without prejudice to the separate existence of Gift Agreement #1 and Gift Agreement #2, which continue to remain in effect according to their terms. This Agreement may be amended only by further written agreement signed by each of the Parties or their duly authorized representatives.

21. INTENT OF INSTITUTIONS

The Institutions affirm their mutual intention that any decision concerning appointments, the awarding of scholarships, admission, teaching and research programs and curriculum be made by each Institution

in its sole discretion, in keeping with their academic and health-services-related mission, and its policies and practices, with particular attention paid to relevant naming policies and procedures, with vigilant protection of freedom of speech and academic freedom.

Similarly, staff appointments, granting of institutional privileges and similar personnel matters at each Institution shall be made by the respective Institution consistent with each of their existing policies concerning such matters.

22. LANGUAGE

The parties hereby confirm that they each require this Agreement and all documents and notices in connection therewith be drafted in English. *Les parties reconnaissent par les présents qu'elles ont exigé que cette entente et tout document ou avis y afférent soient rédigés en anglais.*

23. APPLLICABLE LAW & DISPUTE RESOLUTION PROCESS

This Agreement shall be governed by, construed and interpreted in accordance with the laws of the Province of Quebec and the laws of Canada applicable therein. The Parties hereby acknowledge that the Courts of Montreal shall have exclusive and preferential jurisdiction to entertain any complaint, demand, claim or cause of action whatsoever arising out of this Agreement.

If any dispute occurs between the Parties relating to the application, interpretation, implementation or validity of this Agreement, the Parties agree to seek to resolve the dispute through good faith negotiations, and then by mediation before pursuing any other proceedings.

Any Party to the dispute may serve notice on the others of its desire to resolve a particular dispute by mediation. The mediator shall be appointed by agreement between the Parties or, if the Parties cannot agree within thirty (30) days after receipt of the notice of intention to mediate, the mediator will be appointed by the Tribunal that would have jurisdiction over the ligation, according to section 625 of the Civil Code of Procedure. The costs of the mediator shall be shared equally by the Parties. If the dispute has not been resolved within sixty (60) days of the nomination of the mediation, any Party may terminate the mediation and intent legal action in any court of competent jurisdiction.

24. INDEPENDENT CONTRACTORS

The relationship among the Parties hereto is that of independent contractors and nothing in this Agreement shall be deemed or construed to constitute an agency relationship or a partnership between or among the parties hereto. No Party hereto shall have the authority to act on behalf of any other Party hereto or to bind another Party hereto in any manner.

25. USE OF NAME

No Party shall use, or authorize others to use, the name, trademark, trade name, logo, symbol, mark or any adaptation thereof, of any other Party hereto in any publication, news release, promotional material, promotional activity, advertisement, or other public announcement, whether written or oral, or make any form of representation or statement in relation to the Study that would constitute an express or implied endorsement by such other Party of any product or service of the first Party without the prior written consent of the affected Party, except as otherwise provided herein.

26. SIGNATURES

IN WITNESS WHEREOF the Parties have signed this Agreement.

MCGILL UNIVERSITY

Name: Dr David Eidelman, MD CM

Title: Vice-Principal Health Affairs; Dean, Faculty of Medicine,

Per: _____

Centre intégré universitaire de santé et de services sociaux (CIUSSS) de l'Ouest-de-l'Île-de-Montréal, on behalf of the Douglas Research Centre

Name: Dr Benoit Morin

President and CEO of the Centre intégré universitaire de santé et de services sociaux (CIUSSS) de l'Ouest-de-l'Île-de-Montréal

Per: _____

JEWISH GENERAL HOSPITAL (JGH)

Name: Dr Lawrence Rosenberg, M.D., Ph.D.

Title: Executive Director of the JGH & President-CEO of the Centre intégré universitaire de santé et de services sociaux (CIUSSS) du Centre-Ouest-de-l'Île-de-Montréal,

Per: _____

Schedule A: Business Plan Summary

Schedule A may be revised by unanimous approval of the Executive Committee voting members and this Agreement will be amended in accordance with section 20 of the Agreement.

Vision: The Ludmer Centre, based on the promising potentials of big-data research, envisages a future where mental illnesses, cognitive disorders, and learning disabilities are significantly reduced through preventive strategies and their diagnoses, based on biological metrics, lead to more effective, individually-tailored treatment approaches.

Mission: Our mission is to establish the Ludmer Centre as a global centre of excellence and incubator for neuroinformatics, genetics and epigenetics (big data) research and training, thereby, increasing multi-, inter- and trans-disciplinary big-data mental-health research to advance the prevention, diagnosis and treatment of mental disorders: mental illnesses, cognitive disorders, and learning disabilities.

Science is on the cusps of a 'big data' revolution. The **Ludmer Centre for Neuroinformatics & Mental Health,** building on existing expertise, is leading the research revolution in neuroinformatics and mental health and, in so doing, has positioned itself as the global state-of-the-art hub for big-data sharing and analytics in neuroscience and as a centre of excellence. The centre is leading research and training scientists to embrace big data, thereby, encouraging greater transdisciplinary research in mental health and, more specifically, mental disorders, including mental illnesses, cognitive disorders, and learning disabilities, such as, depression, anxiety, schizophrenia, bi-polar, autism spectrum, attention deficit/hyperactive disorders, Alzheimer's and dementia to name a few.

Initiated in 2013, the Ludmer Centre is an innovative collaboration between three cutting-edge research institutions, brought together through the generous donation and ongoing support of the Irving Ludmer Family Foundation: the Douglas Mental Health University Institute (Douglas) Research Centre, now part of the Centre intégré universitaire de santé et de services sociaux de l'Ouest-de-l'Île-de-Montréal, the Jewish General Hospital's (JGH) Lady Davis Institute for Medical Research (LDI), now part of the Centre intégré universitaire de santé et de services sociaux du Centre Ouest-de-l'Île-de-Montréal, and McGill University's Montreal Neurological Institute (MNI). It also brings together world-renown researchers, the founding Co-Directors, and their cutting-edge laboratories:

- **Dr Michael Meaney** (Douglas Institute Research Centre), a world authority on epigenetics and mental health, ranks among the world's most cited scientists.
- **Dr Alan Evans** (MNI), a world authority on brain mapping and imaging technologies, ranks among the top 1% of researchers in neuroscience.
- **Dr Celia Greenwood** (LDI), a senior statistician, who has made significant contributions in genetics, genomics, and genetic epidemiology.

Both mental health and mental disorders result from a complex interplay of factors: genetic, biological, behavioural and environmental. Converging evidence from neurobiology and epidemiology, illustrating how early exposure to adversity can become biologically embedded, is challenging the idea that our genetic code determines our gene expression by demonstrating how childhood experiences can 'turn genes on and off' resulting in increased vulnerabilities to mental disorders[3,4].

[3] Boivin, Michel, & Hertzman, Clyde. (Eds.). (2012). Early Childhood Development: adverse experiences and developmental health. Royal Society of Canada - Canadian Academy of Health Sciences Expert Panel

[4] Meaney, M. J. (2010). Epigenetics and the biological definition of gene x environment interactions. Child

Currently, we separate and categorise mental disorders according to sets of observable symptoms; however, a 2014 study showed genetic overlap between several psychiatric disorders[5]. The high incidence of comorbidity among mental disorders also suggests genetic and epigenetic overlap. Yet, despite the complexity and overlap, researchers continue to work in disciplinary- and illness-specific silos, accumulating vast amounts of unique and disparate data across an ever widening range of disciplines.

The Ludmer Centre was founded on the belief that a more holistic approach is required. This is only possible through a better, more complete understanding of childhood development aimed at characterizing how mental health and disorders function in the body. We need to identify the sets of genetic factors that work together to carry out essential processes, to understand how these are impacted by epigenetics, and, ultimately, how they find expression in mental disorders across the human lifespan—from Autism to Alzheimer's.

Considered the next frontier across multiple sectors, from marketing to scientific research, within mental health research a big-data approach —neuroinformatics— holds promise for developing this holistic approach. The Ludmer Centre believes that the ability to build, merge and cross-reference multidisciplinary datasets, providing a more system-wide view of mental health, could dramatically advance and provide unique perspectives in our understanding of mental disorders and, ultimately, prevention, diagnosis and treatment.

The Ludmer Centre believes research must embrace a big-data approach and encourage more transdisciplinary research, an approach that holds promise for a transformative impact on mental health on par with the 1950s' development of psychopharmacological treatments. Leveraging over 20 years of research and neuroinformatics expertise, informatics infrastructure and international collaborations, the Ludmer Centre is uniquely poised to become a world leader in big-data analysis for brain and mental-health research.

Our goal is to advance understanding of the factors that give rise to individual variations and dynamic changes in mental health over time and within individuals. The Centre's research area encompasses the human lifespan, within which early childhood is a priority area as susceptibilities to mental health disorders often find their genesis during these crucial developmental years. The immediate goal is to establish the infrastructure, datasets, algorithms, and technical capacities within the Ludmer Centre and, globally, through researcher collaborations to undertake and advance neuroinformatics and mental-health research, through three pillars:

1. **Building neuroinformatics infrastructure, datasets & algorithms:** Harnessing CBRAIN/LORIS's proven computational infrastructure and building on new and existing (e.g., MAVAN, GUSTO) datasets, the Ludmer Centre will expand and develop databases populated with multidisciplinary datasets (genetic, epigenetic, neuroimaging) and develop the complex algorithms capable of identifying the elusive threads that interconnect these disparate datasets—essential innovations if researchers are to fully exploit new and exist datasets.
2. **Leading & supporting big-data research:** The Ludmer Centre's lead researchers and their teams will ensure access to the neuroinformatics infrastructure and datasets by leading research as well as engaging in multidisciplinary collaborations nationally and globally. Additionally, researchers around the globe will be

Development, 81(20331654), 41-79.

[5] The Network and Pathway Analysis Subgroup of the Psychiatric Genomics Consortium, Psychiatric genome-wide association study analyses implicate neuronal, immune and histone pathways, Nature Neuroscience, 18, 199–209 (2015) doi:10.1038/nn.3922

trained, mentored and supported by the Ludmer Centre's informatics and research teams to use the Ludmer Centre's open-access resources, maximizing the potential impact of the datasets, software (algorithms/informatics) and neuroinformatics infrastructure.

3. **Investing in the future:** The Ludmer Centre will develop big-data research capacities through the recruitment, mentoring and training of new researchers across varied disciplines, thereby, ensuring a 'big data approach' underpins future research endeavours with the ultimate goal of developing transdisciplinary research cadres capable of maximising the potential of the centre's neuroinformatics datasets and vision.

Logic Model

The logic model below, which was prepared for the 5-year Business Plan, provides details for each of the three pillars laying out the roadmap to achieving the centre's short- and long-term objectives.

Logic Model
Ludmer Centre for Neuroinformatics & Mental Health

Ultimate Outcome	**Mental illnesses, cognitive disorders, and learning disabilities are significantly reduced through preventive strategies and their diagnoses, based on biological metrics, lead to more effective, individually-tailored treatment approaches.**		
Intermediate Outcome	1. The Ludmer Centre is established as a global centre of excellence and incubator for neuroinformatics (big data) research and training, thereby, increasing multi-, inter- and trans-disciplinary mental-health research to advance the prevention, diagnosis and treatment of mental disorders.		
Immediate Outcome	1.1 Neuroinformatics and mental health research, utlising the Ludmer Centre databases, datasets, software and expertise, is advanced in terms of our understanding of mental disorders and their prevention, diagnosis and treatment.		1.2 Number of scientists engaged in transdisciplinary research in neuroinformatics (big-data) and mental health utilising the Ludmer Centre infrastructure is increased.
Outputs	1.1.1 Dynamic databases comprising genetic, epigenetic, neuroimaging and phenotype datasets from human cohort studies and relevant animal models are established, expanded, maintained and meet the needs of researchers globally.	1.1.2 The number and diversity of neuroinformatics and mental health research projects, undertaken by the Ludmer Centre's PI teams and collaborators, increased globally.	1.2.1 Awareness of and research capacities to utlise and undertake multi- and inter-disciplinary neuroinformatics and mental health research are increased among scientific cadres.
Activities	1.1.1.1 Using the CBRAIN/LORIS platform, create neuroinformatics databases to consolidate and integrate diverse datasets from multiple sources.	1.1.2.1 Expand the number of national and international researchers (collaborations) undertaking neuroinformatics and mental health research utlising the centre's	1.2.1.1 Hire and provide mentorship and an incubator/training environment for graduate students, post-graduate researchers and fellows.
	1.1.1.2 Populate the databases with existing and new high-quality datasets derived from longitudinal human cohort studies (e.g., genetic, epigenetic, neuroimaging & phenotype datasets) and relevant animal models.	1.1.2.2 Expand the number of direct research projects undertaken by the Ludmer Centre's Primary Investigator (PI) team.	1.2.1.2 Organise and/or deliver training workshops or conference that transcend mental-health research disciplines to prospective and current researchers.
	1.1.1.3 Develop complex algorithms to enable the resulting datasets to be analysed for trends and predictive outcomes.		1.2.1.3 Publish manuscripts on research outcomes and improving understanding of neuroinformatics research/tools including data-acquisition standardisation protocols.
	1.1.1.4 Expand cutting-edge technologies, software, processes and procedures in neuroinformatics.		1.2.1.4 Increase awareness of the need for multi-, inter- and trans-disciplinary neuroinformatics research among public and funders.

Schedule B: Project Management, Evaluation & Reporting (PMER)

Schedule B may be revised by unanimous approval of the Executive Committee voting members, and this Agreement will be amended in accordance with section 20 of the Agreement.

To facilitate reporting, the Institutions agree to share, in confidence, all copies of Ludmer Centre donor and or Gift Agreements with the Ludmer Centre's Administrative Director. While donor reporting will, at times, be specifically tailored to donor requirements, the Parties agree that the following donor reporting cycles and reporting mechanisms (narrative reports described below) will form the core Ludmer Centre reporting. To the extent possible, the Parties will encourage all donors to accept these reporting formats and schedules.

All annual and semi-annual reporting as well as an Annual Work Plan will be produced by and be the responsibility of the Management Committee led by the Administrative Director.

Unless otherwise required by specific donor agreements, planning and reporting will respect the following.

1. Ludmer Centre's Fiscal Cycle

The Institutions agree that the Ludmer Centre's Fiscal Year starts October 1st and ends September 30th every year. Fiscal reporting quarters will be as follows:

- **Fiscal year**: starts October 1st and ends September 30th
- **Fiscal quarters** for reporting will be as follows:
  - October 1 to December 31
  - January 1 to March 31 (end of semi-annual report period)
  - April 1 to June 30
  - July 1 to September 30 (end of annual-report period)

2. Planning Tools

2.1. Budgets

The Institutions' PIs will be required to prepare 5-year projections and to update these annually by August 7th of each year. The Institutes will approve the budgets and present these to the Executive committee and confirm space for existing and new hires and indicated on an annual basis their available financial support for all relevant costs (salaries, infrastructure, students, etc.) and identify the support required from other funding sources (e.g., Ludmer Centre donors).

Beyond commitment to the provision of space and administrative support for their Ludmer Centre PIs and personnel, the Ludmer Collaborations does not require the Institutions to commit to fixed annual amounts, except where such conditions are imposed through individual donor gifts (as is the case for Gift Agreements #1 and #2).

2.2. Annual Work Plan

The Institutions' Co-Directors and PIs will produce a list of planned activities, milestones and budget for their respective Institution for the next year and present these to the Administrative Director by August 7th of each year for compilation in the Annual Work Plan (AWP).

An AWP covering the October 1 to September 30 period will be produced by August 31st and presented to the Executive Committee one week prior to the subsequent meeting for approval. It will include a narrative and budget for planned activities and a list of key milestones for the subsequent year.

3. Narrative Reports

Annual reports, both internal and public, will be produced by the Management Committee, led by the Administrative Director, for submission to the last Executive Committee meeting in the calendar year for approval.

3.1. Annual Internal Report

Within 45-days of the close of the Ludmer Centre's fiscal year on September 30 (November 15th at the latest), all PIs supported by their Institutions will furnish an annual narrative and financial report to the Ludmer Centre Administrative Director.

The combined narrative and financial report will be prepared by the Administrative Director and be distributed to the Executive Committee no later than one week prior to the subsequent Executive Committee meeting for approval and publication. It will include:

- Narrative of key successes and bottlenecks as well as an update against identified milestones and metrics as agreed in the Performance Measurement Framework (PMF) in the Business Plan. The PMF will be reviewed annually to ensure the Ludmer Centre remains in line with credible and acceptable academic and research metrics. Metrics will be collected quarterly or semi-annually.
    - Each PI, supported by their Institution, will produce a comprehensive narrative, including milestones and metrics no later than November 15th.
    - The Administrative Director will report on all other activities, e.g., social media platforms (web, Facebook, etc.) and public events (e.g., the lecture series).
- Brief reports from the various committees will be submitted to the Administrative Director no later than November 15th, these include:
    - The Donor Advisory Committee
    - The Communications & Fundraising Group (CFG)
    - Scientific Advisory Committee (SAC)
- Financial report for October 1 to September 30.
    - The Institutions and PIs will provide their financial reports to the Administrative Director no later than November 15th.

3.2. Annual Public Report

Parallel to the above, a condensed Public Report will be prepared as a PDF publication by the Administrative Director. This will be the Ludmer Centre's only public report and the primary donor report. The Institutions, where feasible, agree to encourage all donors to accept this as the main Ludmer Centre report. Once approved by the Executive Committee, copies of the Public Report will be mailed to all major donors to ensure compliance with the agreements and good donor practices and posted on the Ludmer Centre's website. Where required, additional supplemental reporting to donors will be provided as required by their individual donor agreements and informed by the internal Report to the Executive Committee.

3.3. Quarterly Narrative Reports

All PIs will provide brief quarterly, point-form activity updates to the Administrative Director and Co-Directors for presentation to the Executive Committee.

The Administrative Director and Co-Directors will provide a brief point-form update at the Executive Committee meeting including the status of planned activities and research milestones elaborated in the annual work plan as well as any challenges, unforeseen opportunities or activities added thereafter.

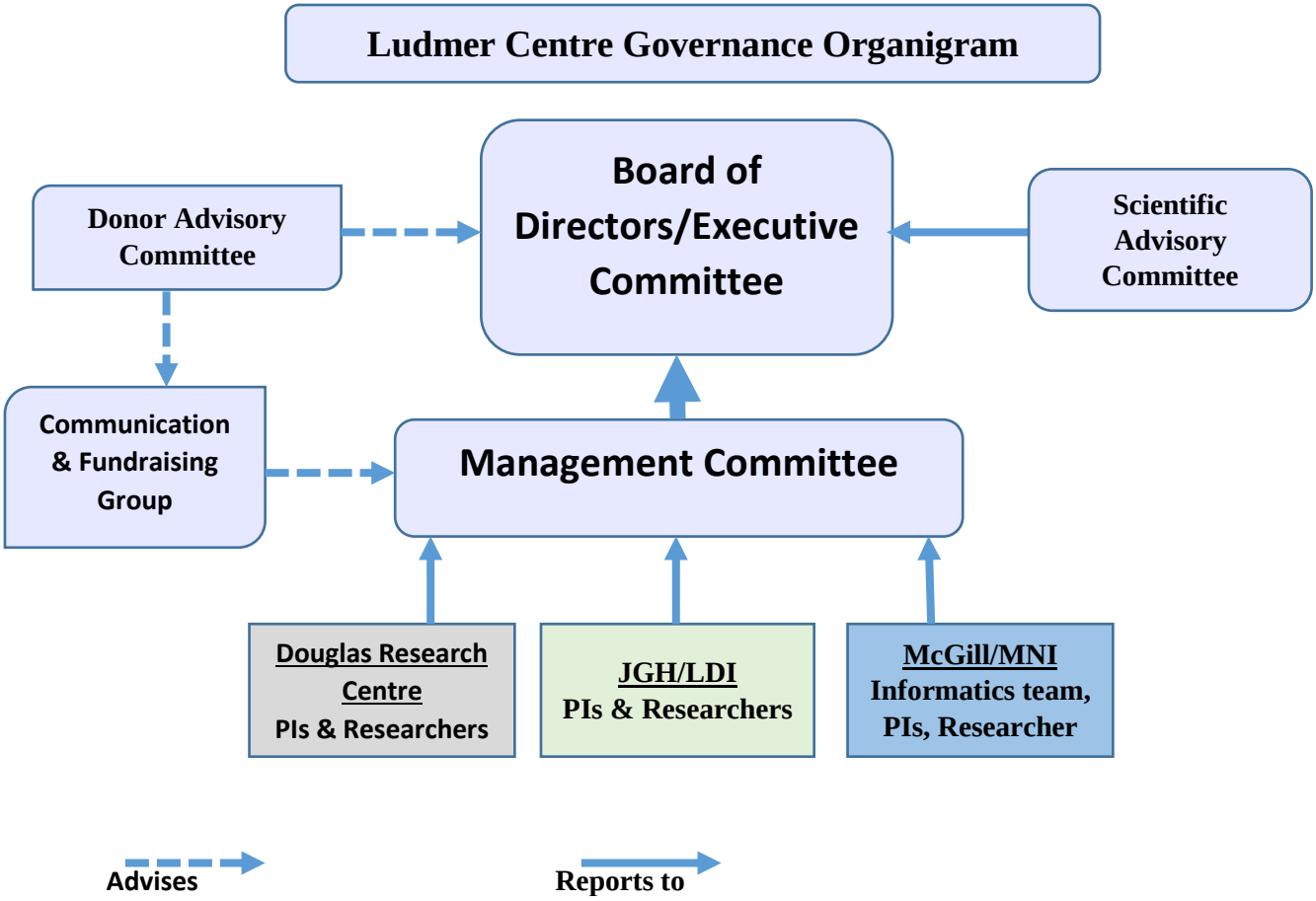
4. Semi-annual & Annual Fiscal Reports

Unless quarterly reports are required by a donor, each Institution will transmit semi-annual and annual financial reports, including a brief narrative, via e-mail (or using another agreed-upon and secure transmittal or collaborative tool or method) within 45 days of the end (March 15th & November 15th) of the two fiscal quarters comprising the report period to the Ludmer Centre's Administrative Director for compilation into one report for presentation to the Executive Committee. Financial Reporting against the annual budgets will include scheduled Capital Contributions, donations, all other income, and all expenditures against budgetary projections. The reports will be distributed to the Executive Committee no later than one week prior to the subsequent Executive Committee meetings.

Schedule C: Staff & Governance Structures

Schedule C may be revised by unanimous approval of the Executive Committee voting members, and this Agreement will be amended in accordance with section 20 of the Agreement.

The Ludmer Centre harnesses the power of the cutting-edge Institutions in the Ludmer Collaboration, while minimising unnecessary infrastructure costs entailed in establishing a separate brick-and-mortar facility. It is not only a new research initiative but a new approach to long-term research built on shared, open-access infrastructure and expertise across the collaborating Institutions and with research collaborators globally. As a long-term initiative it requires a modus operando with clear governance roles and responsibilities.



The organigram above and the following details the Ludmer Centre's staffing requirements and governance structures and the Parties' representation, rights and obligations therein.

1 LUDMER CENTRE STAFF

1.1 Ludmer Centre Staff

To ensure the coordination and smooth operation of the Ludmer Centre, the Parties acknowledge the need for the following core Ludmer Centre staff, to be appointed by the Executive Committee with office space provided by the collaborating Institutions as agreed at the time of appointment (referred to

as the "host Institution"). The staff person will be hired and subject to the rules and regulations governing staff appointments in the host Institution.

- **Co-Directors, Ludmer Centre, nominated member:** Each Institution will build a cadre of primary investigators and supporting teams/laboratories, either by identifying appropriate individuals from within their institutions or through targeted hiring; thus, each Institution, in consultation with the Executive Committee (which includes the Dean of the lead faculty), will nominate a Ludmer Centre Scientific Co-Director (each, a "**Co-Director**") for their Institution, to a six-year renewable term and provide adequate administrative support as provided in the budget (i.e., an administrative assistant) to enable them to represent the ensemble of their Institution's Ludmer Centre primary investigators, research personnel and informatics teams on the Management Committee. They, in collaboration with the Administrative Director, will provide daily leadership of the Ludmer Centre, implement the Business Plan through the Management Committee, and report to the Executive Committee.
- **Administrative / Administrative Director (**"**Adm Dir**"**), fulltime, hosted by McGill UA:** The Adm Dir will assist the Scientific Co-Directors to develop strategic documents, business plans, annual work plans and reports. The Adm Dir will lead the Management Committee and provide oversight of all Ludmer Centre operations including budgetary adherence, fundraising, and donor stewardship. The Adm Dir will report to the Executive Committee and will be the legal co-signing authority in partnership with the Ludmer Centre's Scientific Directors. The Adm Dir will inform the Executive Committee of any unplanned or major changes in the approved budget or expenses.
- **Development Administrative or Officer ("Dev. Officer"), full-time, hosted by McGill UA:** The Dev. Officer, hosted by McGill and based in McGill's University Advancement (UA) team, will report to the Adm Dir and support UA, the Communication & Fundraising Group, and the Donor Advisory Committee with events, reporting, fundraising and donor stewardship for the Ludmer Centre.
- **Administrative Assistant, part-time:** The Administrative Assistant, based in the Douglas, will report to the Adm Dir and provide support to the Executive Committee, the Management Committee, the Dev. Officer, and the 3 Co-Directors.

1.2 Institutions' Staff Commitments

The Institutions commit to establishing a number of key positions essential to achieving the Ludmer Centre's objectives within their own Institution.

- **Primary Investigators (PIs):** To ensure sustainability of the Centre, a cadre of PIs with transdisciplinary research expertise is required in order to maximize the potential of the Ludmer Centre's neuroinformatics infrastructure and the Parties' investments as well as to fully exploit existing and future research opportunities[6]. This requires the expansion of the existing PI cadre (currently three (3) researchers) to enable the Ludmer Centre to increase the number of external research collaborations, through collaborative research grants, and to expand into and

[6] A key pillar of the Ludmer Centre Logic model (Schedule A) is to increase the number and diversity of neuroinformatics and mental-health research projects undertaken by the Ludmer Centre's PI teams and research collaborators (Logic Model Output 1.1.2, Schedule A).

exploit new avenues of research. The McGill research centre accreditation also requires the Ludmer centre to build a critical mass of PIs (9-10 minimum).

The Institutions agree to apply their reasonable effort to provide space for new PIs hires, as agreed in the Executive Committee meetings, including support to establish their laboratories (infrastructure) and teams as dictated by their areas of research. Funding sources (partner institutes, donors, etc.) for these positions will be discussed and agreed in the Executive Committee meetings.

PIs will be expected to obtain independent grant funding within three (3) years. It is understood that some of these PIs could be recruited from existing McGill faculty members or Ludmer Centre Institutions. The Institutions will account for these staff/research positions in their financial and narrative reporting and advise when new funding sources are secured.

The need and financial capacity to expand the Institutions' PI cadres will be analysed and revised annually by the Executive Committee under advisement of the Scientific Advisory Committee and the Co-Director's and in line with stated financial capacity and space availability of each Institution. Recognizing the difficulty in placing transdisciplinary professors within existing faculties, McGill Medicine commits to liaising with other McGill faculties to help identify faculty appointments. PIs will liaise with faculty from other learning institutions in Quebec if required.

- **Post-doctoral Students & Fellows:** The Institutions agree to provide space for student cadres (graduate/post-doctoral students and fellows) as required by the Institution's Ludmer Centre PIs. Although temporary funding may be extended to this cadre, they are encouraged to identify their own funding sources (e.g., grants, fellowships).
- **Research Support Staff:** Each Institution has and will continue to engage cadres of full-time, part-time, and temporary research-related staff under the direction of the Institutions' Ludmer Centre Co-Directors and PIs, as and when required, to advance their specific research commitments.
- **Informatics & Information Technology (IT) Staff:** Neuroinformatics and IT support for CBRAIN/LORIS is a foundational pillar on which the Ludmer Centre's services are predicated. Neuroinformatics and other IT expertise is crucial to the integration and analysis of the large-volume, high-dimensional, and fine-grain experimental mental health data as well as to support existing and future research collaborations.
- **Administrative Support (for Co-Directors):** The Institutions recognize the Co-Directors, as active PIs, will require ongoing support to meet their management and reporting obligations to the Ludmer Centre. Each Institution will provide appropriate administrative support to enable the Co-Director to fulfil his/her functions and maintain the relevant Institution's PI/research team's website.

2 LUDMER CENTRE MEMBERSHIP POLICY

2.1 Institution Membership

The Parties constitute the founding membership. A new Institution (either one requesting membership or one identified as a potential collaborating Institution) that enhances or expands the Ludmer Centre's capacity to achieve its mandate may be actively recruited by the Co-Directors and Administrative Director, upon agreement of the Executive Committee (ExCom). A new Institution may only be admitted

to the Ludmer Collaboration with the unanimous vote of the Institutions' voting representatives to the ExCom and the execution of a separate collaboration agreement among all parties concerned.

McGill's Faculty of Medicine is the Ludmer Centre's founding faculty membership within McGill. In compliance with the McGill Policy on Research Centres,[7] the Ludmer Centre is formally connected to the Faculty of Medicine and reports to the Dean of Medicine in addition to the other collaborating Institutions (the Douglas and JGH/LDI). Within McGill, the Faculty of Medicine will remain the "Lead Faculty" for reporting purposes. Should other McGill Faculties opt to join the Ludmer Collaboration as full members, the designated Lead Faculty can be changed (e.g. alternate), providing that the affected deans and collaborating Institutions are in agreement (i.e., Executive Committee approval).

2.2 Primary Investigators (PIs) membership

The Ludmer Centre, in collaboration with the Institutions and subsequent to the identification of appropriate academic positions and funding thereof, will actively recruit leading researchers/academics to meet and expand the Ludmer Centre's research mandate.

Primary Investigators (PIs) from the collaborating Institutions who wish to join the Ludmer Centre as a permanent or temporary member may submit an official request to the Executive Committee via the Co-Directors. The application will include the PI's CV, 1-page summary of his/her research focus and relevance to the Ludmer Centre, duration of requested membership, and a cover letter. The application will be reviewed by the Co-Directors in consultation with the Institutions in which the applicant works (McGill, Douglas Research Centre, or JGH/LDI). The review process will include an interview between the applicant and a Co-Director and at least one other member of the Ludmer Centre. Subsequent to this process, the interview team will make a recommendation to approve or reject the application to the Executive Committee. Upon acceptance, all applicants will be required to provide an agreed set of reporting metrics, detailed budget and funding sources for their activities, and to sign a form indicating that they have read and understood the business plan and agree to abide by the Ludmer Centre's policies and procedures, reporting requirements, and communication and fundraising guidelines. Failure to meet these obligations can result in the termination of membership subsequent to a review by the Executive Committee.

PIs may withdraw from the Ludmer Centre at any time, but must complete their reporting obligations to the Ludmer Centre including regular reporting on ongoing grants and activities that have explicitly or implicitly leveraged the Ludmer Centre or its reputation.

2.3 Membership

Ludmer Centre membership criteria and Ludmer Centre support will be developed by Sept. 2016 for approval of the ExCom, taking into account the following categories:

- Full member
- Administrative member
- Visiting member
- Postdoctoral scholar/researcher/fellow

[7] Policy for Research Centres. The web site is now up and running: http://www.mcgill.ca/secretariat/files/secretariat/research_centres_policy_on_1.pdf.

- Graduate students

3 GOVERNANCE STRUCTURES

3.1 Executive Committee/ Board of Directors

The Executive Committee is responsible for the oversight, development and sustainability of the Ludmer Centre, final approval of all operational and financial reports, and accountability to the collaborating Parties (Institutions and Fundraising Bodies) and all donors.

The ExCom meeting will be expanded for the mid- and end-of-year meetings (currently May and December), to include additional members in line with McGill's policy[8] on research centre accreditation. The membership will be posted on the centre's website and listed in the Annual Report.

3.1.1 ExCom Mandate

Ultimately, the ExCom, Institution Representative, voting members (refer to Collaboration Agreement, Section 10.1), as the primary fiduciaries, supported by the non-voting members (see below) will steer the Ludmer Centre towards a sustainable future by adopting sound, ethical, and legal governance and financial management policies and ensure the Ludmer Centre has adequate resources to advance its mission. To assure the Ludmer Centre's sustainability and innovative edge, the ExCom will:

- contribute to, approve and implement the Ludmer Centre's 5-year Strategic Plan, Business Plan and Budgets;
- approve and oversee implementation of annual work plans (AWP) and budgets;
- receive and approve Institutions' financial and narrative reports, ensuring coherence with donor agreements and to the Ludmer Centre's requirements and reporting needs;
- support identified funding needs and priorities as agreed;
- consider and approve the appointment of Ludmer Centre staff and Co-Directors; and
- consider and approve new institutional partnerships aimed at facilitating future innovations.

3.1.2 ExCom Membership

The ExCom members will be posted on the centre's website and listed in the Annual Report.

- **Institution Representative** or designate, voting members.
    - McGill: Vice-Principal Health Affairs; Dean, Faculty of Medicine,
    - Douglas: President and CEO of the Centre intégré universitaire de santé et de services sociaux (CIUSSS) de l'Ouest-de-l'Île-de-Montréal
    - JGH: President-Director General of the Centre intégré universitaire de santé et de services sociaux (CIUSSS) du Centre-Ouest-de-l'Île-de-Montréal
- **Research Centre/Institution Representatives**, or designate, non-voting:
    - McGill University: Director, Montreal Neurological Institute
    - Douglas: Director, Douglas Hospital Research Centre
    - JGH: Director, Lady Davis Institute for Medical Research
- **Institutions' Fundraising Bodies**, or designate, non-voting:
    - MNI External Affairs, Neuro/MNI
    - Douglas Mental Health University Institute Foundation

[8] Policy for Research Centres. The web site is now up and running: http://www.mcgill.ca/secretariat/files/secretariat/research_centres_policy_on_1.pdf.

  - Jewish General Hospital Foundation
- **Management Committee** (MgtCom), non-voting ExCom members: The following MgtCom members will advise, report to, and participate in the ExCom:
  - Administrative Director
  - Ludmer Centre Scientific Co-Directors
  - Administrative Assistant (responsible for minutes and agenda)
- **Vice-Principal, University Advancement,** McGill, or designate, non-voting
- Donor Representative(s): a leading donor and/or the Chair of the Donor Advisory Committee, non-voting
- **Expanded Membership for the Board of Directors (twice annually)**, non-voting, for the mid- and end-of-year meetings (currently May and December) includes the following additional members in line with McGill's policy[9] on research centre accreditation:
  - Vice-Principal, McGill Research & International Relations (or delegate);
  - McGill Provost (or delegate);
  - Institutions' Student Representatives (3 total, graduate/post-graduate)

3.1.3 ExCom Chair

Recognising that the Ludmer Centre is a unique collaborative undertaking between three institutions and to maintain an equitable power balance, the ExCom Chair will be nominated by the ExCom from among the non-voting ExCom membership for a renewable two-year term of office with no restriction on reappointment. In line with McGill's policy[10] on research centre accreditation, the Dean of the Faculty of Medicine (as the lead Faculty), or delegated designate, will chair the two expanded membership meetings that constitute the Board of Directors (currently May and December) and will assure participation from all Ludmer Centre participating Institutions

3.1.4 ExCom Decision-making & Quorum

The ExCom will apply consensus decision making, whereby quorum for voting purposes is considered to be the three voting members, with one vote per Institution as executed by their respective Institution-Representative or designates. Motions must be unanimous to pass (3 out 3); however, if an Institution exercises it right to abstain from a vote, a motion may pass based on the unanimous vote of the remaining institutions (e.g., 2 out 2 votes).

3.1.5 ExCom Meetings

Quarterly meetings will be hosted by the Institutions on a rotational basis. Meetings will be held on the Institutions' premises, or a designated alternative location. Any Institution can call a special meeting to resolve issues that require a vote by providing all Parties with reasonable notice. The minutes will be recorded in French and English and maintained by the Ludmer Centre's Administrative Assistant. The expanded membership meeting will be reserved for bi-law revisions and approval of the admittance of new Institutions into the collaboration.

[9] Policy for Research Centres. The web site is now up and running: http://www.mcgill.ca/secretariat/files/secretariat/research_centres_policy_on_1.pdf.
[10] Policy for Research Centres. The web site is now up and running: http://www.mcgill.ca/secretariat/files/secretariat/research_centres_policy_on_1.pdf.

3.1.6 ExCom Reporting

The Institution Representative, voting members, are ultimately accountable to the Parties' management structures as well as to the Ludmer Centre Donors through financial reports and an annual narrative report (refer to Schedule B).

3.2 MANAGEMENT COMMITTEE

Led by the Administrative Director ("Adm Dir"), the Management Committee ("MgtCom") is responsible for the daily operational oversight and management of the Ludmer Centre and is accountable to the ExCom.

3.2.1 MgtCom Mandate

- implement the Ludmer Centre's Strategic Plan, Business Plan and Budget;
- develop and implement annual work plans (AWP) and budgets;
- prepare Institutions' financial and narrative reports, ensuring coherence with donor agreements and to the Ludmer Centre's requirements and reporting needs;

3.2.2 MgtCom Membership

- Administrative Director (Adm Dir)
- Ludmer Centre Scientific Co-Directors (3: 1 per Institution)
- Administrative Assistant (responsible for minutes and agenda)
- Others, as invited

3.2.3 MgtCom Chair

The MgtCom will be chaired by the Administrative Director.

3.2.4 MgtCom Decision-making & Quorum

The MgtCom will utilise consensus decision making, and where a vote is required, quorum will require the unanimous approval of the three Scientific Co-directors.

3.2.5 MgtCom Meetings

Meetings will be held a minimum of eight (8) times annually and more frequently as need dictates; meetings will be hosted by the Institutions on a rotational basis or held in a location agreeable to all members.

3.2.6 MgtCom Reporting

The MgtCom, through the Adm Dir, reports to the ExCom and is responsible for drafting all strategic and reporting documents.

3.3 COMMUNICATION & FUNDRAISING GROUP (CFG)

The Ludmer Centre does not exist as a legal entity but as a collaboration between the Parties, which poses unique challenges for fundraising; not least of which include (1) where should donations be directed, (2) how will donor engagement and stewardship be managed, (3) how will funds be disbursed and accounted for, and (4) what level of engagement in fundraising is expected, required or anticipated from the Institution's Fundraising Bodies.

The engagement and strength of the Institutions' brands and reputations are recognised as key assets in the Ludmer Centre's fundraising strategy. Thus, members of the Institutions Fundraising Bodies are

signatories to the Ludmer Centre Gift Agreements (#1 & #2) and members of the Executive Committee. While the Adm Director assisted by the Development Administrative will promote fundraising for the Ludmer Centre generally or in line with new prospects' interests, there will be instances in which the Institutions and their Fundraising Bodies will need and have opportunities to leverage the Ludmer Centre to bring in additional funding through their current donor base in order to meet their Ludmer Collaboration commitments (i.e., funding for their respective component). Establishing a mechanism to support this process was deemed essential. Thus, recognizing that fundraising will require both institution-specific and collaborative efforts, the Institutions and their Fundraising Bodies agreed to establish a Communication & Fundraising Group (hereafter, CFG) and a Ludmer Centre Fund (Schedule D).

3.3.1 CFG Mandate

The CFG is the strategic fundraising and communication committee for the Ludmer Centre. It provides counsel to the Executive Committee on promoting the Ludmer Centre to external donor constituencies, identifies management issues impacting the Ludmer Centre's long-range fundraising plans, and identifies sources of additional revenue including initiating and supporting fundraising efforts. The CFG will:

- Adhere to the agreed prospect clearance system (Schedule E: Prospect Clearance Protocol) to coordinate prospect identification, clearance and management jointly and on a regular basis, thereby, ensuring a coordinated donor approach and minimising donor overlap. Donor engagements developed or led by a Fundraising Body will be channelled through their respective Institutions for receipting, unless the donor dictates otherwise, and stewardship supported by the Administrative Director. Donor engagements developed or led by the Administrative Director, including the Ludmer Centre website, will be channelled through the Ludmer Centre Fund at McGill University Advancement and receipted by McGill and reported to the Executive Committee, as per Schedule D, unless the donor dictates otherwise.
- Develop and implement Institution-specific and joint fundraising and communication strategies aimed at ensure financial stability for their Institution's component of the Ludmer Centre and a coordinated approach to donor stewardship.
- Provide support for and promote Ludmer Centre activities, including fundraising activities, through their member and donor networks and aid in communicating the Ludmer Centre's research objectives to these.
- Assist in the identification and cultivation of the Ludmer Centre's external constituencies beyond the Institutions networks and aid in communicating the Ludmer Centre's research objectives to these.
- Proactively cultivate, solicit and enlist financial support for the Ludmer Centre as a whole (i.e., all three components).
- Report on all donors and donations to the CFG to ensure their inclusion in Ludmer Centre reporting.
- Establish and support the Donor Advisory Committee.
- Report to the Executive Committee, through the CFG Chair, on current and potential fundraising activities.

3.3.2 CFG Membership

The CFG comprises the Administrative Director and the three (3) Institutions' ex-officio CFG members:

- Douglas: Administrative Director, Douglas foundation or designate.
- JGH: President and CEO, JGH Foundation or designate
- McGill/MNI: Administrative Director, External Affairs, MNI or designate

3.3.3 CFG Chair

The Ludmer Centre's Administrative Director will Chair the CFG.

3.3.4 CFG Decision-making & Quorum

The CFG will utilise consensus decision making, and where a vote is required, quorum is considered the unanimous approval of all CFG members.

3.3.5 CFG Meetings

The CFG meets quarterly and as required; meetings will be hosted by the Institutions on a rotational basis. Twice annually, in September and January, the CFG meeting will be expanded to include members of the Donor Advisory Committee (DAC); refer to Section 3.5.

3.3.6 CFG Reporting

The CFG advises the Administrative Director and works closely with the Co-Directors and UA.

3.3.7 CFG Staff Support

The Administrative Director, supported by the Ludmer Centre's Administrative Assistant, provides direct professional support to CFG members, meeting preparation and follow-up; specifically:

- Schedules CFG meetings.
- Prepares CFG agendas, briefing materials and minutes.
- Prepares Ludmer Centre briefs, reports and other material as requested in support of CFG members' fundraising activities.

3.4 SCIENTIFIC ADVISORY COMMITTEE (SAC)

The Ludmer Centre for Neuroinformatics & Mental Health and its collaborating Institutions recognise the need for objective guidance to ensure the Ludmer Centre's research direction remains cutting edge and focused on the needs of current and future collaborating scientists. To achieve this goal, the Ludmer Centre's collaborating Institutions agree to establish an independent Scientific Advisory Committee (SAC) that will meet every two (2) years to review the Ludmer Centre's accomplishments and portfolio of ongoing and planned activities and provide a written report, including recommendations, to the Executive Committee.

3.4.1 SAC Mandate

The SAC provides advice and guidance to the Ludmer Centre governance structures to help ensure the centre achieves its stated objectives and remains at the leading edge of research in neuroinformatics and mental health. The SAC will:

- Review and assess the scientific outputs and progress of the Ludmer Centre and the proposed Scientific Research Agenda as developed by the Primary Investigators (PIs) and the Scientific Directors.
- Identify new development, research, collaboration and funding opportunities that will help positon the Ludmer Centre as the leading neuroinformatics and mental health research centre.

- Prepare a report on the above, including recommendations, to help guide the Executive Committee's decision making.

3.4.2 SAC Membership

The SAC consists of three (3) to five (5) members, independent from the Ludmer Centre team, with no real or perceived conflicts, and with sufficient scientific expertise, collectively, to advise on the breadth of the technology and research areas offered by the Ludmer Centre. With the exception of the Chair, SAC members are specifically appointed for each meeting; members may and can be changed every meeting.

SAC members must sign a confidentiality agreement/undertaking and indicate any known or potential conflicts of interest. All such conflicts of interest will be reviewed by the Executive Committee, which reserves the right to withdraw the invitation to participate on the SAC.

The members of the SAC are elected by unanimous vote of the Executive Committee from a list of potential candidates presented by the Scientific Directors. The diversity of disciplines covered in the scope of the Ludmer Centre's research objectives are important factors considered in the nominations. Criteria for nomination are:

- Outstanding academic record and international visibility and reputation;
- Recent and active participation in neuroinformatics and mental health research, nationally or internationally;
- Broad vision of the challenges facing neuroinformatics and mental health; and
- Availability and commitment of the candidate.

3.4.3 SAC Chair

The Chair of the SAC will be appointed by the Ludmer Centre Executive Committee from among the candidates. The Chair is elected for a four (4) year renewable term. Ideally, the Chair will have had previous experience as a SAC member. The Chair:

- Leads the SAC and moderates the meeting.
- Leads development of the report (a writer will be provided to assist with actual report writing).
- Recommends candidates for SAC membership.

3.4.4 SAC Decision-making & Quorum

The SAC will operate by consensus. Where consensus is not achieved, opposing points of view will be noted in the final report to the Executive Committee.

3.4.5 SAC Meetings

The SAC will meet once every two (2) years at the invitation of the Executive Committee. The meeting will generally be held in Montreal, Quebec, hosted by one of the Ludmer Centre Institutions. A briefing package will be provided at least one (1) month prior to the meeting.

Tentative schedule (provided as a planning guide and subject to change based on need):

- Two working days.
- An evening dinner meeting with members of the Ludmer Centre and its Executive Committee.

The SAC will determine which members of the Ludmer Centre's research teams (primary investigators, post-docs and students) and governance structures they will want to receive presentations from and/or

interview as well as any site visits. Interviews with outside experts may also be requested. These will be communicated to the Administrative Director, who will endeavour to arrange the interviews (in person or via skype) and site visits.

3.4.6 SAC Reporting

The SAC will provide written recommendations to the Executive Committee through a SAC report. It will focus on the Ludmer Centre's Strategic Pillars (activities and areas of research), as identified in the Ludmer Centre's Business Plan, and make recommendations for improvements and expansion of these and, where relevant, new areas of research inquiry. The report will include a letter from the SAC Chair for the Ludmer Centre's annual report.

3.4.7 SAC Remunerations & Recognition

SAC members work in an honorary capacity and are not employed by the Ludmer Centre. Members and invited experts can be reimbursed for up to three (3) nights and three (3) days of work including hotel, daily-living and travel expenses for the SAC meeting as per McGill regulations.

SAC members will be listed on the website and in the annual report. A letter from the SAC Chair will appear in the annual report.

3.4.8 SAC Staff Support

The Ludmer Centre's Administrative (administrative) Director will be the main contact point and provide support to the SAC for:

- Meeting logistics (hotel, meeting room reservations, etc.)
- Preparation and circulation of the SAC background briefing package one (1) month prior to the meeting and, in consultation with the SAC Chair, preparation of the meeting agenda.
- Organising the interviews and site visits, as requested by the SAC Chair.
- Follow-up on the need for any additional information as identified by the SAC members.
- Provide assistance with the report writing, as required.

3.5 DONOR ADVISORY COMMITTEE (DAC)

In addition to governance, board members generally provide opportunities to connect with donors. As the Ludmer Centre does not have an external donor-derived board nor a predefined prospect pool, an alternative structure for connecting with key donors is required, one that recognises the roles and commitments of each Institution. Further, an increasing number of donors want to be included in or contribute to the success of the endeavours they invest in. Addressing these needs, the Ludmer Centre will establish a donor consultative body, the Donor Advisory Committee (DAC), which will meet twice annually as part of the two (2) expanded CFG meetings and the Chair will sit on the Executive Committee.

Donor members will be provincially and/or nationally based. International representation may be expanded in the second or third year within or as a separate committee; the benefits of expanding into national and international DACs will be reviewed in 2019.

DAC members will be listed on the website and in the annual report. A letter from the Chair will also appear in the annual report.

3.5.1 DAC Mandate

The DAC is a non-academic, outside advisory committee that provides counsel to the Ludmer Centre's Executive Committee on promoting the Ludmer Centre to external constituencies and offers advice and support on fundraising and management issues as requested. It is a source of intelligence on external economic, social, and cultural conditions impacting the Ludmer Centre's long-range planning and identifies sources of additional revenue.

3.5.2 DAC Membership

To initiate the DAC, each Institution through their CFG representative agrees to identify and approach a key donor to participate on the DAC; a fourth will be identified collaboratively based on recommendations from the ExCom and DAC members for a total of four (4) members. Thereafter, two (2) donors will be added in each subsequent year on the advisement of the CFG and existing DAC members. By year four, the addition of two (2) new members annually will result in a six (6)-member committee with an annual one-third turnover in membership. This ensures an injection of new ideas, the availability of older members for mentoring, and manageability in terms of new member recruitment.

Ludmer Centre representation on the DAC will comprise the three (3) Institutions' CFG members and the Administrative Director, bringing the membership to ten (10).

Mandate: The mandate of the DAC Member is to provide counsel to the Ludmer Centre's Executive Committee and Management Committee on promoting the Ludmer Centre to external constituencies and to lead and support fundraising initiatives. Members are appointed for a three (3) year term of office. Terms will be staggered to facilitate a one-third rotation, annually one-third of members' terms will come to an end. Responsibilities of DAC Members include:

- To provide philanthropic support to the Ludmer Centre;
- To serve as key ambassadors in promoting the mission and goals of the Ludmer Centre in view of identifying, cultivating and enlisting financial support for the Ludmer Centre from internal and external constituencies; and
- To advise the Executive Committee and CFG on fundraising strategies for the Ludmer Centre by providing informed outside perspectives and expertise.

3.5.3 DAC Chair

The mandate of the Chair is to assume a leadership role of the DAC working in close collaboration with the Ludmer Centre. The Chair will offer counsel to the Executive Committee, Co-Directors and CFG and support external relations activities pertaining to DAC activities. The Chair will serve as a key ambassador in promoting the mission and goals of the Ludmer Centre. The Chair will be nominated by the Executive Committee from among the DAC membership for a two (2) year term and may be reappointed for one (1) additional term.

3.5.4 DAC Decision-making & Quorum

Quorum will be considered a two third majority.

3.5.5 DAC Meetings

The DAC meets at least twice annually, once in the fall and once in the spring, as part of the CFG meetings (i.e., two CFG meetings will be expand to become the DAC). Members are also consulted on

an individual basis, as needed, throughout the year. Minutes and organizational support will be organized by the Ludmer Centre's Administrative Director.

3.5.6 DAC Reporting

The DAC reports to the Executive Committee and works closely with the Administrative Director, Co-Directors and the CFG. The DAC Chair, or nominated DAC member, will be invited to attend the Executive Committee meetings, ex-officio, and present the DAC recommendations and reports.

3.5.7 DAC Staff Support

The Administrative Director provides direct professional support to DAC members and the DAC preparation and follow-up:

- Schedule DAC meetings.
- Logistics for DAC meeting.
- Preparation of DAC agendas and briefing materials.

Schedule D: Ludmer Centre Fund

Schedule D may be revised by unanimous approval of the Executive Committee voting members, and this Agreement will be amended in accordance with section 20 of the Agreement.

The Institutions agree that a Ludmer Centre holding fund will be established and managed by University Advancement (UA) at McGill University to be disbursed in accordance with quarterly decisions made by the Ludmer Centre's Executive Committee.

The Institutions acknowledge that this fund is meant to facilitate fundraising by the Ludmer Centre's Administrative Director and Development Officer; it does not preclude donations being channelled through the Institutions and their Fundraising Bodies (the Douglas Foundation, JGH Foundation, or MNI External Affairs), particularly from their traditional donor base. Donor engagements developed or led by the Institutions Fundraising Bodies will be channelled through their respective Institutions for receipting and discernment as per the donor's instructions; donor engagements developed or led by the Administrative Director, including the Ludmer Centre website, will be channelled through the Ludmer Centre Fund at McGill University Advancement.

The Administrative Director and Development Officer will support UA as needed and ensure donor communications and stewardship, in line with UA protocols, and facilitate communications with and reporting to the Ludmer Centre's Communication & Fundraising Group (CFG) and the Executive Committee. This arrangement enables access to McGill's donor management tools, which would facilitate donor stewardship by the Development Administrative.

Donors: The Administrative Director will direct donors, for which Administrative Director or Development Administrative is the lead fundraiser, to make contributions to this fund unless the donor specifies otherwise. McGill University will issue donations receipts, under its Canada Revenue Agency (CRA) number, that specifically acknowledge receipt into the Ludmer Centre Fund. The Administrative Director will ensure proper follow-up with relevant thank-you communications.

Website donations: Donations gathered through the website donation page will be channelled to this fund.

Disbursement: A statement of donations will be prepared by UA for each Executive Committee meeting. This entails that a written request (e-mail/letter) for a report be provide to UA, by the Administrative Director, three (3) weeks in advance of pending meetings.

The Ludmer Centre Executive Committee will, based on budgetary analysis and the Co-Directors' recommendations, determine disbursement of the funds among the three Institutions and communicate this in writing to UA. The communication will include the full name of the Institutions (payee and complete address) to which the cheques will be sent and in the case of MNI/MCIN indicate the account (existing or new). The Institutions agree to designate the Administrative Director as signing authority for these communications and communicate this in writing to UA.

Funds will be transferred from the UA account to the Douglas Research Centre and Jewish General Hospital (JGH) by cheque and transferred internally to the designated MNI/MCIN fund, within two to three (2-3) weeks of UA's receipt of the Executive Committee's disbursement letter/e-mail.

Reporting: The funds will be tracked on the UA James database (McGill's donor tracking system) using three (3) designation codes, one (1) for each of the three (3) designated institution: the Douglas Research Centre, the JGH, and MNI/MCIN. Should donors earmark funds for specific activities, this will be included in the report and a separate allocation number applied.

UA will provide an annual statement of funds received and disbursements to the three Institutions covering the period 1 May to 31 April, four to six (4to 6) weeks after the close of the fiscal year (end of June).

No reporting by the Executive Committee or the Institutions to UA is required outside of the donor stewardship described above and the annual report to donors.

Schedule E: Prospect Clearance Protocol

Schedule E may be revised by unanimous approval of the Executive Committee voting members on advisement of the Communication & Fundraising Group (CFG), and this Agreement will be amended in accordance with section 20 of the Agreement.

1. Preamble

Each Institution, supported by its Fundraising Body, is committed to raising funds for their respective Ludmer Centre Component:

- at the MNI: the McGill Centre for Integrative Neuroscience's[11] ("**MCIN**") computational Infrastructure (including CBRAIN/LORIS platform and support team) and research component, currently directed by Dr Alan Evans (the **"MNI Component");**
- at the Douglas: the Epigenetics & Mental Health research component (including the MAVAN datasets, infrastructure and team), currently directed by Dr Michael Meaney (the "**Douglas Component**"); and
- at the JGH/LDI: the Statistical Development component, currently directed by Dr Celia Greenwood (the "**JGH/LDI Component**").

Thus, the Ludmer Centre Collaboration Agreement recognises the vital role and need to work collaboratively with the Institutions' **Fundraising Bodies**:

- MNI External Affairs, Neuro/MNI
- Douglas Mental Health University Institute Foundation
- Jewish General Hospital Foundation

The engagement of the Institutions and the strength of their brands and reputations are key assets in the Ludmer Centre's fundraising strategy; consequently, members of the Institutions' Fundraising Bodies are signatories to one of the Ludmer Family Foundation Gift Agreements and members of the Executive Committee.

The Ludmer Centre does not exist as a legal entity but as a collaboration between the three (3) Ludmer Centre Institutions, which poses unique challenges for fundraising: Where should donations be directed? How will donor engagement and stewardship be managed or tracked? How will funds be disbursed and accounted for? And, what level of engagement in fundraising is expected, required or anticipated from the Institutions and their Fundraising Bodies?

The purpose of a Prospect Coordination, Assignment & Clearance Protocols ("Prospect Protocols") addresses these issues and aims to optimize fundraising efforts by ensuring that donor solicitations are undertaken in a concerted manner and align to Ludmer Centre priorities.

The Prospect Clearance Policy establishes protocols for the Ludmer Collaboration in view of maximising fundraising and recognises that:

- A series of uncoordinated solicitations to the same donor by different institutions on behalf of the Ludmer Centre can undermine successful fundraising efforts. Each of the Institutions'

[11] MCIN, which is not is not a recognized McGill Centre, refers to the team established by Dr Evans to create and support the LORIS and CBRAIN platforms.

Fundraising Bodies has active overlapping prospect pools; hence, the potential for donors to be approached simultaneously by three (3) Institutions for the same project remains high.

- The Ludmer Centre offers a unique potential to leverage broader (expanded) donor engagement and support from each Institution's existing donors.
- The Ludmer Centre offers the potential to bring in funds under a different brand that may allow or entice funders to provide additional support.
- The Ludmer Centre offers the potential to bring in new donors.
- To effectively communicate the Ludmer Centre concept, collaboration and accomplishments, the Parties require support from someone knowledgeable in all aspects of the Ludmer Centre.
- To effectively coordinate fundraising activities, there needs to be a focal-point for managing the flow of information, the coordination of activities, and assistance requests.
- The Administrative Director and Development Administrative positions were established in June 2015 to undertake the lead solicitor role and to support all members of the Ludmer Collaboration with Ludmer Centre related fundraising and information requirements.

2. Coordination: Communication & Fundraising Group (CFG)

Each of the Institutions has committed to a predefined funding target in support of their Ludmer Centre component (per the Gift Agreements); this will be revised annually by each Institution, based on its financial capacity and its ongoing funding agreements with individual donors, in budgets submitted to the Executive Committee.

The Parties (Institutions & Fundraising Bodies) agree that monitoring and reporting on prospect activities at various stages of cultivation, solicitation, and stewardship facilitates the exchange and sharing of prospect information across the Ludmer Centre, provides a history of prospect assignments, and ensures that all Parties have up-to-date and accurate information on interactions with major gift prospects and projects. However, the Parties do not share a central donor contact-report-management (CRM) system; thus, contact management will adhere to the protocols of the lead fundraising body and the Administrative Director will maintain an up-to-date list of active prospects, activities and leads as reported by the Fundraising Bodies to the Communication & Fundraising Group (CFG).

The CFG, as established in the Ludmer Centre Collaboration Agreement, is the responsible body for overseeing the coordination and implementation of the Prospect Protocols. It meets quarterly and at the request of individual members (to the Chair). The Administrative Director chairs the CFG and supports all Ludmer Centre fundraising efforts.

The CFG meeting will be used to share the list of planned Ludmer Centre prospects (those leveraging the Ludmer Centre) being pursued by each Fundraising Body for the pending quarter, to identify the support needed from the Administrative Director, and to share updates. Activities and the potential to include the Ludmer Centre in planned fundraising and PR events organised by each Institution or fundraising body will be discussed and agreed, including the support required from the Administrative Director or other Ludmer Centre personnel or researchers (e.g., speakers for presentations).

Between meetings, opportune situations that arise to pursue new prospect (on behalf of or leveraging the Ludmer Centre) will be communicated to the Administrative Director, who will inform the remaining CFG members to ensure only one approach is being made on behalf of the Ludmer Centre. An updated list will be shared by email on a weekly basis.

3. Prospect Pool Development

A prospect pool of a hundred and twenty (120) potential donors will be develop for the Ludmer Centre, by early 2017, to be led by the Administrative Director, supported by the Development Administrative, on behalf of the Ludmer Centre.

Each Fundraising Body will identify an initial a list of ten (10) potential prospects for the Administrative Director to pursue on behalf of the Ludmer Centre. This list will include at least two (2) prospects ideally suited to sit on the Donor Advisory Committee.

4. Prospect Clearance & Assignment

To eliminate donor overlap in approaches on behalf of the Ludmer Centre, prospect targeting will be discussed and an agreed approach and lead fundraiser determined. Where all three (3) fundraising bodies plan to pursue the same donor, a strategy will be developed and agreed. Where disagreement persists, the funding lead can be assumed by the Administrative Director.

The goal of agreeing on assignments-for-cultivation is to match the interest of prospects with the Institution that has a reasonable probability of success in major gift cultivation and solicitation based on an identified strategic approach. If solicitation has not been completed within an agreed timeframe and the agreed lead is making significant progress towards solicitation, an extension will be granted; otherwise, the prospect may be reassigned as agreed by the CFG.

5. Fundraising Support

The Administrative Director will provide supporting documents and updates on the Ludmer Centre and provide donor briefings, as requested, to support any fundraising endeavours by the collaborating Institutions and their fundraising bodies. The Administrative Director will also develop a list of unique or shared fundraising projects/activities (e.g., collaborative funding for improved connectivity across all institutions), approved by the co-Directors. All donor proposals that require specific research engagements will be signed by the implicated Co-Director.

Any Ludmer Centre's Co-Directors can be called on to play a key role in cultivation and solicitation of prospects on behalf of any of the fundraising bodies. Where individual Co-Director, or other staff/researchers, may become the "face" of the cultivation, the CFG-agreed the lead fundraiser retains the lead prospect management status regardless of the Co-Director's or staff's place of work.

An Institution may also be asked to play the lead-facing role, supported by the Administrative Director, based on a variety of factors such as similarity between the Institution's areas of priority and programmatic interests of the prospect and/or geographic location.

6. Receipting & Stewardship of Donations

Donations from donors identified and cultivated by each Institution or its Fundraising Body will go directly into their respective systems for fund disbursement, unless the donor dictates otherwise. The receipts, mentioning the Ludmer Centre, will be issued by the same Institution or funding body that received the donation, in accordance with their receipting practices. Any funds raised to support other Ludmer Centre components will be transferred accordingly by the receipting agency. The donors' names, gifts and, where relevant, gift conditions will be reported by the relevant Institution or Fundraising Body to the CFG to ensure each donor's contribution is duly noted in the financial and annual Ludmer Centre reports and that specific reporting conditions in the gift agreements are

respected. Donor stewardship will be the responsibility of the relevant receipting Institution or Fundraising Body or, on request of either, the Administrative Director.

All prospect activities led by the Administrative Director and Development Administrative, including the Ludmer Centre website donation page, will be channelled through the Ludmer Centre Fund (per Schedule E) at McGill University Advancement (UA). UA will do the receipting and the Administrative Director will be responsible for reporting on the donation to the CFG and donor stewardship.

4. Application of this Policy

All Parties to the Ludmer Collaboration and their programs, projects, faculties, departments, and units affiliated with the Ludmer Centre, including the CFG members, are subject to the Prospect Protocols for all fundraising activities. Further, no Ludmer Centre fundraising activity, event or sponsorship arrangement, regardless of the need for charitable receipts, should occur without the knowledge and agreement of the CFG.

[End of Agreement]