

**ANNUAL REPORT**

**CENTRE FOR COMPARATIVE GENOMICS &  
EVOLUTIONARY BIOINFORMATICS**

**July 1, 2013 - June 30, 2014**

## SECTION 1 - OVERVIEW OF C/I AND ITS MISSION

### 1.1 MISSION STATEMENT

The Centre for Comparative Genomics & Evolutionary Bioinformatics (CGEB) was officially approved by the Dalhousie Senate (in June 2008), with the mission to foster collaborations amongst comparative genomics/bioinformatics and microbial evolution researchers and trainees at Dalhousie. The main focus of the Centre's research is fundamentally to discover how microbial genomes evolve and diversify, and our research programs collectively span computational biology, biological oceanography, computer science, statistical modeling and comparative genomics, with a strong focus on method and theory. However, through collaborations with new CGEB associates, our focus has expanded to include environmental microbiology and human disease microbiomics.

The CGEB Centre's primary goals are to: 1) recruit top-notch postdoctoral fellows and Ph.D. trainees to CGEB labs through the provision of Tula Foundation fellowships and research allowances; 2) maintain a CGEB Seminar Series to attract world-class speakers to interact with CGEB principal investigators and trainees; 3) fund CGEB trainees to attend and present their work at national and international scientific meetings; and 4) provide an intellectual forum that promotes collaborations between CGEB members and associates and facilitates applications for external research funding. For each of the last six years, we have met or exceeded all of these goals.

### 1.2 ACTIVITIES OF THE CENTRE

#### A. **(NEW) Formation of Dalhousie Microbiome User Group (DalMUG)** website: <http://dalmug.org/>

In January 2014, Morgan Langille (new CGEB faculty member), founded the Dalhousie Microbiome User Group (DalMUG) which is a part of and is sponsored by CGEB. This group is made up of researchers and clinicians that are primarily affiliated with Dalhousie University and who are interested in various aspects of microbiome research. DalMUG aims to foster collaborations, share resources, and build an interdisciplinary community. The group already contains over 35 members from various academic disciplines and through funding from CGEB has had several highly distinguished invited guest speakers including Dr. Curtis Huttenhower (Harvard), Dr. James Brown (GlaxoSmithKline), and Dr. Georgina Hold (Aberdeen). DalMUG has also sparked collaborations on several research projects and has resulted in the submission of several interdisciplinary grants to funding sources such as the Bill & Melinda Gates Foundation, Nova Scotia Health Research Fund, Canadian Institutes of Health Research, and Dalhousie's Strategic Research Initiatives Fund.

#### B. **(NEW) CGEB Trainee Fellowships**

CGEB Member Dr. W. Ford Doolittle was awarded the Gerhard Herzberg Gold Medal award by NSERC, Canada's top award for scientific achievement, for his work in the field of microbial evolution and the tree of Life. Dr. Doolittle has pledged roughly half of the Herzberg award (a total of ~\$500,000 over 5 years) to support the newly created CGEB Trainee

Fellowships (1 postdoctoral award and three graduate fellowships), as well as \$32,000/year toward CGEB administration budget.

### **C. (NEW) CGEB - Integrated Microbiome Resource (CGEB-IMR)**

Dr. Doolittle and the CGEB microbiome group, together with several others at the university (CGEB Associates Sean Myles, Julie LaRoche and Andy Stadnyk) applied for, and were awarded a Strategic Research Initiatives Fund (SRIF) grant from Dalhousie Research Services to set up the *CGEB-Integrated Microbiomics Resource (CGEB-IMR)* (\$200,000 over two years). This will fund the hiring of a 'wet-lab' researcher/project resource manager and a computational analysis research associate. CGEB-IMR and equipment of various CGEB members will provide a platform for microbiomics research and analysis at Dalhousie University that, ultimately, will be self-sustaining through collaborations, grants and contracts.

### **D. (NEW) CGEB Microbiome Initiatives**

A number of new microbiomic projects have been initiated in the last year through new CGEB collaborations. These include:

- Pan-African Study of Neonatal Sepsis: Advancing Science and Gathering Evidence (PASSAGE). This is an international collaboration investigating the efficacy and mechanism by which probiotic treatment can lower neonatal sepsis in Africa. Discussions with the Bill and Melinda Gates Foundation are ongoing, and proposal writing will be starting soon. The CGEB Microbiome group (Rob Beiko, Morgan Langille, Joe Bielawski, Andrew Roger, Johan van Limbergen) are the leading the computational analysis for this project).
- MAREEN (Metagenomic approach to Remission in Crohn's disease using enteral nutrition): A 16S-rDNA based and whole-metagenome study of mucosa-associated microbiota in treatment-naive pediatric Crohn's disease and investigation of changes in microbiome community structure during induction and maintenance of remission in pediatric Crohn's disease using exclusive enteral nutrition (funded by NASPGHAN/CCFA awarded to CGEB Associate Johan van Limbergen in collaboration with CGEB members Morgan Langille and Joe Bielawski).
- Microbiomic studies of children affected by IBD and their healthy siblings: 16S-rDNA based and whole-metagenome at diagnosis and after induction of remission in pediatric IBD (in collaboration with Nikhil Thomas, Tony Otley, CGEB member Joe Bielawski).
- Microbiome metagenome changes associated with exclusive and partial enteral nutrition in a randomized clinical trial in pediatric Crohn's disease (in collaboration with Arie Levine (Israel), Tony Otley and CGEB member Joe Bielawski).
- Role of microbiome in response to methotrexate (MTX) in children with chronic inflammatory disease (led by CGEB member Morgan Langille in collaboration with Johan van Limbergen (Pediatric Gastroenterology) and Adam Huber (pediatric Rheumatology)).

- The role of the complement system in post-colitis colonization and recovery from injury (Andy Stadnyk (lead), CGEB member Rob Beiko). This involves conducting 16S rDNA profiling of the gut microbiome in a mouse model that has gene knockouts in the immune complement system.
- Microbiome of the aging mouse: (CGEB member Rob Beiko and Morgan Langille as collaborator, together with Ken Rockwood and Sue Howlett). They will be using established mouse models of frailty and to investigate changes in the microbiome associated with aging.
- A pilot project to assess the gut microbes of patients in an assisted living facility: (CGEB members Beiko, Bielawski, Doolittle and Roger in collaboration with Ken Rockwood and Sue Howlett). Fecal samples from 48 patients in an assisted care facility will be collected, and the composition of the fecal microbiota will be evaluated using marker genes, metagenome data, and metatranscriptome data, along with a comprehensive frailty assessment, to identify if linkages between frailty and the microbiome exist.

#### **E. CGEB Seminar Series**

The seminar series successfully hosted 11 well-attended seminars (July 2013 - June 2014), all sponsored or co-sponsored by funding from the Tula Foundation.

- Dr. Adrian Reyes, University of New Brunswick, June 2014. "*Genomic tales of the blue-green plants*"
- Dr. Curtis Huttenhower, Harvard University, May 2014. "*Identifiability of the human microbiome*"
- Austin Booth, Harvard University, April 2014. "*Evolution and the individuality of Fungi and Holobionts*"
- Dr. Eric Baptiste, Universite Pierre et Marie Curie, March 2014. "*Thoughts for a more pluralistic pragmatic approach in evolutionary biology*"
- Carlos Mariscal, Duke University, March 2014. "*Evaluating potential evolutionary systems in the universe*"
- Dr. Patrick Keeling, University of British Columbia, February 2014. "*Symbiosis and genome evolution*"
- Dr. Rosie Redfield, University of British Columbia, December 2013. "*Do bacteria have sex?*"
- Dr. T. Ryan Gregory, University of Guelph, November 2013. "*Animal genomes large and small*"
- Dr. Xuhua Xia, University of Ottawa, August 2013. "*Evolution of the translation machinery*"
- Dr. Trevor Lawley, Wellcome Trust Sanger Institute, UK, July 2013. "*Emergence and global spread of healthcare-associated Clostridium difficile*"
- Dr. Maureen O'Malley, University of Sydney, July 2013. "*Microbes as model systems*"

## **F. Sponsorship of Local and International Meetings**

CGEB financially supported three events this past year through its Seminar Series fund.

1. \$5,120 for symposium speakers at the *14th International Congress for Protistology (ICOP XIV)*, Vancouver, July 28-Aug. 2, 2013.
2. \$4,000 for symposium speakers at the *12th International Colloquium on Endocytobiology and Symbiosis*, Dalhousie University, August 18-22, 2013.
3. \$500.00 contribution to a one-day workshop (Dec. 7, 2013) at King's College entitled "*Death of Evidence: Fashion-driven distortion in science publishing*" to which several high-profile speakers were invited [Dr. Sarah Richardson (Harvard), Dr. Rosemary Redfield (UBC), and Dr. Florian Maderspacher (Elsevier Publishers)].

## **G. CGEB Journal Clubs**

The *CGEB Journal Club* (since 2007) meets bi-weekly throughout the year, and is open to all CGEB faculty and trainees. Participants select and present a current research paper for analysis and discussion, often outside their own immediate research area. Many of our trainees have stated that this activity is invaluable and an integral part of their overall training.

In 2013 a more specialized *Microbiome Journal Club* met weekly in Computer Science, and involved faculty and trainees from several CGEB labs. This group focussed more specifically on methods of metagenomic and bioinformatic analysis as they apply to human (microbiomic) and environmental microbial communities. Last year, such discussion formed the foundation of a major review article (Boon *et al.*, 2013). This journal club will resume in September 2014 for members of the Dalhousie Microbiome User Group (DalMUG – see A. above).

## **H. CGEB Lab Meetings**

In addition to weekly lab meetings of the Roger/Archibald/Doolittle/Gray/Slamovits/Simpson labs, we also hold monthly CGEB 'joint lab meetings' that include our 11 CGEB faculty members, associates, lab personnel and trainees. The purpose of these meetings is to introduce CGEB faculty and trainees to the ever-expanding group of new trainees in the various labs and to initiate collaborative projects between departments. Faculty members and/or their trainees provide an overview of their research in a seminar-style format, with adequate time allotted for questions, constructive criticism, and open discussion.

## **I. Publications and Presentations**

During the reporting period, CGEB faculty and trainees have published **69** refereed papers, **6** book chapters and **1** trade book (*see Section 2.2.1*), including contributions in high impact journals such as *Nature*, *Current Biology*, *Proceedings of the National Academy of Sciences USA*, and *PLoS Biology*. The international profile of CGEB researchers is further demonstrated by the **36** invited presentations by CGEB faculty given at international conferences and invited seminars (*see Section 2.3*). In addition, CGEB trainees collectively contributed approximately **37** presentations at domestic and international events (*see Section 2.4*).

## **J. CGEB Developed Software**

A large portion of CGEB research efforts is directed at development of computer software tools for evolutionary modeling analyses and bioinformatics. Since 2007, CGEB has produced 33 bioinformatics software tools (*see Section 2.9 for new software development*). These are ‘open-source’ software tools (or suites of tools) for analysis of genomic data that have been created, published and made available (or soon will be) to the international scientific community through free web access.

## **K. External Funding**

CGEB researchers have been extremely successful in attracting external funding, collectively garnering a total of ~\$2,290,000 of external grant support and research awards over 2013-2014 from NSERC, CIHR, CFI, Canada Research Chairs, Canadian Institute for Advanced Research, NSHRF, CIHR-Regional Partnership Program N.S., and the Tula Foundation (*see Section 3.2.1*).

### 1.3 COMING YEAR'S ACTIVITIES

The main core activities that have really sustained the productivity of the CGEB Centre to date (see above descriptions) will continue in the next year. These include:

- weekly lab meetings and monthly joint lab meetings
- bi-weekly CGEB Journal club, and DalMUG Journal Club
- CGEB Seminar Series (invited speakers)
- continued sponsorship of student presentations at domestic and international events
- meetings of CGEB PIs to discuss Centre business (annual meetings, plus occasional *ad hoc* meetings)

In addition to the above regular activities, in the coming year we plan to host several special events that will be partially sponsored by the CGEB New Opportunities Fund (Section 3.1 – III, p. 26).

1. Co-sponsorship of a Public Lecture (“*The Maritimes Origin of ‘Creation Science’*”) by Prof. Ronald L. Numbers, October 21, 2014, at University of King’s College. Event organized by Dr. Ford Doolittle and Dr. Gordon McOuat, Situating Science Strategic Knowledge Cluster, King’s College.
2. Co-sponsorship of a 2-day Dal-CAU Kiel “*Workshop on Evolutionary Genomics of Symbiosis,*” Dalhousie University, December 1-2, 2014. Event organized by Dr. John Archibald. CGEB will sponsor one of the two guest speakers at this event.
3. In addition to these activities, in 2015 we will try to convene a “CGEB Research Day- Mixer” on campus to take place on an afternoon/early evening to which all members of the CGEB community will be invited. The purpose of this activity will be to further the opportunities for CGEB PIs, associates and trainees to interact to discuss their research and to facilitate future collaborative research projects or grant applications.

## SECTION 2 – DETAILED DESCRIPTION OF C/I ACTIVITIES

### 2.1 CORE GROUP OF PERSONNEL (July 2013 – June 2014)

Position	Number
Faculty Members	11
Administrative Staff	1
Technical Staff	8
Research Associates	2
Other 'Associate' Members	7
Postdoctoral Fellows	18
Doctoral Students	12
Master's Students	10
Other (Honours, undergraduate, co-op & summer students)	13
<b>Total:</b>	<b>82</b>

#### 2.1.1 CGEB Faculty Members (*name, rank, affiliation*)

1. Dr. Andrew Roger, Professor and Tier I Canada Research Chair, Biochemistry and Molecular Biology
2. Dr. W. Ford Doolittle, Professor Emeritus, Biochemistry and Molecular Biology
3. Dr. John Archibald, Professor, Biochemistry and Molecular Biology
4. Dr. Claudio Slamovits, Assistant Professor, Biochemistry and Molecular Biology
5. Dr. Michael Gray, Professor Emeritus, Biochemistry and Molecular Biology
6. Dr. Joseph Bielawski, Associate Professor, Biology
7. Dr. Alastair Simpson, Professor, Biology
8. Dr. Robert Beiko, Associate Professor and Tier II Canada Research Chair, Computer Science
9. Dr. Christian Blouin, Associate Professor, Computer Science, and Biochemistry and Molecular Biology
10. Dr. Edward Susko, Professor, Mathematics and Statistics
11. Dr. Morgan Langille, Assistant Professor, Pharmacology (newly appointed Faculty in 2014)

#### 2.1.2 Administrative and Technical Staff (*name, role, faculty lab*)

1. Katherine Dunn, Research Associate – Bielawski lab
2. André Comeau, Research Associate – Langille lab
3. Wanda Danilchuk, CGEB Research Assistant – Roger & Doolittle lab
3. Jacque De Mestral, Lab Technician/Manager – Roger lab
4. Marlena Dlutek, Lab Technician/Manager – Archibald lab
5. Yana Eglit, Lab Technician – Simpson lab
6. Nehil Jain, Bioinformatician – Beiko lab
7. Eyre Sale-Schenk, Research Assistant – Beiko Lab
8. Naoko Tanifuji, Lab Technician – Archibald lab (finished in August 2013)
9. Danielle Wentzell, Lab Technician – Slamovits lab (finished in December 2013)
10. Jessica Johnson-MacKinnon, Lab Technician – Archibald lab (finished in December 2013)
11. Katherine Rutherford, Lab Technician – Beiko lab (finished in 2014)



**2.1.3 Other research personnel in categories not covered in 2.1.1 and 2.1.2.**  
**Note that Student Trainees are listed in Section 2.5**

**POSTDOCTORAL FELLOWS in CGEB labs (July 2013 – June 2014).**

<b>Name - Status</b>	<b>Department</b>	<b>Supervisor(s)</b>
Eme, Laura (in progress)	Biochemistry & Mol. Biol.	A.J. Roger
Brown, Matt (completed 06/13)	Biochemistry & Mol. Biol.	A.J. Roger
Gentekaki, Eleni (completed 04/14)	Biochemistry & Mol. Biol.	A.J. Roger
Wang, Huaichun (in progress)	Mathematics & Statistics	E. Susko / A. Roger
Curtis, Bruce (in progress)	Biochemistry & Mol. Biol.	J. Archibald / A. Roger C. Slamovits
Gile, Gillian (in progress)	Biochemistry & Mol. Biol.	J. Archibald
Ugo Cenci (in progress)	Biochemistry & Mol. Biol.	J. Archibald
Daniel Moog (in progress)	Biochemistry & Mol. Biol.	J. Archibald
Gruber, Ansgar (completed 08/13)	Biochemistry & Mol. Biol.	J. Archibald
Hua, Jimeng (completed 07/13)	Biochemistry & Mol. Biol.	J. Archibald
Tanifuji, Goro (completed 08/13)	Biochemistry & Mol. Biol.	J. Archibald
Boon, Eva (completed 12/13)	Biology	J. Bielawski
Akhilesh Dhanani	Computer Science	R. Beiko
Jeremy Koenig (in progress)	Computer Science	R. Beiko
Langille, Morgan (completed 12/13)	Computer Science	R. Beiko
Meehan, Conor (completed 02/14)	Computer Science	R. Beiko / J. Bielawski
Breglia, Susana (in progress)	Biochemistry & Mol. Biol.	C. Slamovits
Swan, Vicki (in progress)	Biochemistry & Mol. Biol.	C. Slamovits

**Visiting (International) Students and Researchers:**

1. Vojta David, Master's student from University of South Bohemia, Czech Republic  
(in Archibald lab; July 17-Sept. 17, 2013)
2. Tomas Panek, PhD student from Charles University, Czech Republic  
(in Roger lab; June 26-Oct. 1, 2013)
3. Sebastien Najle, Visiting Scientist from Instituto de Biologia Molecular y Celular de Rosario, Argentina (in Slamovits lab; April 1 – July 30, 2013)
4. Sohta Ishikawa, Research Fellow from University of Tsukuba, Japan  
(in Beiko lab; November 1-30, 2013)
5. Sergio Morales, Master's student from Universidad de Antofagasta, Chile  
(in Slamovits lab; February-May, 2014)
6. Sergio Ivan Castro, Master's student from Universidad del Valle, Columbia  
(in Archibald & Blouin labs; April 2014-present)

### **CGEB ‘Associate’ Members:**

1. Dr. Julie LaRoche, Professor of Biology (Marine Geochemistry), and Tier I Canada Research Chair
2. Dr. Sean Myles, Assistant Professor, Faculty of Agriculture, and Tier I Canada Research Chair
3. Dr. Hong Gu, Associate Professor, Mathematics and Statistics
4. Dr. Johan Van Limbergen, Clinician Scientist & Assistant Professor, IWK Health Centre Pediatrics
5. Dr. John Rohde, Assistant Professor, Microbiology and Immunology
6. Dr. Christopher Field, Professor Emeritus, Mathematics and Statistics
7. Dr. Robert Lee, Adjunct Professor, Biology

### **2.2 PUBLICATIONS ASSOCIATED WITH C/I (July 2013 – June 2014)**

<b>Publication Type</b>	<b>#</b>
Peer-reviewed journals	69
Book chapters & books	7
Other publications	1
<b>Total:</b>	<b>77</b>

Note: CGEB faculty and trainees’ names are in bold.

#### **I. Peer-Reviewed Publications**

Abad, M.G., Long, Y., Kinchen, D., Schindel, E.T., **Gray, M.W.** and Jackman, J.E. (2014) Mitochondrial tRNA 5'-editing in *Dictyostelium discoideum* and *Polysphondylium pallidum*. *J. Biol. Chem.* 289: 15155-15165.

Bay, R.A. and **Bielawski, J.P.** (2013) Inference of functional divergence among proteins when the evolutionary process is non-stationary. *J. Mol. Evol.* 76: 205-215.

**Bielawski, J.P.** (2013) Detecting the signatures of adaptive evolution in protein-coding genes. *Curr. Protoc. Mol. Biol.* Jan; Chapter 19: Unit 19.1.

**Boon, E., Meehan, C.J., Whidden, C., Wong, D.H., Langille, M.G. and Beiko, R.G.** (2014). Interactions in the microbiome: communities of organisms and communities of genes. *FEMS Microbiol. Rev.* 38: 90-118.

**Breglia, S.A., Yubuki, N. and Leander, B.S.** (2013) Ultrastructure and molecular phylogenetic position of *Heteronema scaphurum*: a eukaryovorous euglenid with a cytoproct. *J. Eukaryot. Microbiol.* 60: 107-120.

**Brown, M.W., Sharpe, S.C., Silberman, J.D., Heiss, A.A., Lang, B.F., Simpson, A.G.B. and Roger, A.J.** (2013) Phylogenomics demonstrates that breviate flagellates are related to opisthokonts and apusomonads. *Proc. Royal Soc. Biol. Sci.* 280: 20131755.

**Brunet, T.D.P. and Doolittle, W.F.** (2014) Getting “function” right. *Proc. Natl. Acad. Sci. USA* 111: E3365.

Burger, G., **Gray, M.W.**, Forget, L. and Lang, B.F. (2013) Strikingly bacteria-like and gene-rich mitochondrial genomes throughout jakobid protists. *Genome Biol. Evol.* 5: 418-438.

Dhillon, B.K., Chiu, T.A., Laird, M.R., **Langille, M.G.** and Brinkman, F.S. (2013) IslandViewer update: Improved genomic island discovery and visualization. *Nucleic Acids Res.* Jul; 41 (Web Server issue): W129-32.

**Doolittle, W.F.** (2013) The spliceosomal catalytic core arose in the RNA world ... or did it? *Genome Biol.* 14: 141.

**Doolittle, W.F.** (2013) Is junk DNA bunk? A critique of ENCODE. *Proc. Natl. Acad. Sci. USA* 110: 5294-5300.

**Doolittle, W.F.**, Fraser, P., Gerstein, M.B., Graveley, B.R., Henikoff, S., Huttenhower, C., Oshlack, A., Ponting, C.P., Rinn, J.L., Schatz, M.C., Ule, J., Weigel, D. and Weinstock, G.M. (2013) Sixty years of genome biology. *Genome Biol.* 14: 113.

**Doolittle, W.F.** (2013) Carl R. Woese (1928-2012). *Current Biol.* 23: R183-185.

**Doolittle, W.F.** (2014) How natural a kind is ‘eukaryote?’ *Cold Spring Harbor Perspective Biol.* 6: pii: a015974.

**Doolittle, W.F.** (2014) The trouble with (group II) introns. *Proc. Natl. Acad. Sci. USA* 111: 6536-6537.

**Doolittle, W.F., Brunet, T.D.P.,** Linquist, S. and Gregory, T.R. (2014) Distinguishing between “function” and “effect” in genome biology. *Genome Biol. Evol.* 6: 1234-1237.

**Doolittle, W.F.** (2014) Natural selection through survival alone, and the possibility of Gaia. *Biology and Philosophy* 29: 415-423.

**Dunn, K.A.,** Jiang, W., **Field, C.** and **Bielawski, J.P.** (2013) Improving evolutionary models for mitochondrial protein data with site-class specific amino acid exchangeability matrices. *PLoS One* 8: e55816.

Eveleigh, R.J.M., **Meehan, C.J., Archibald, J.M.** and **Beiko, R.G.** (2013) Being *Aquifex aeolicus*: untangling a hyperthermophile’s checkered past. *Genome Biol. Evol.* 5: 2478-2497.

Feehan, C.J., **Johnson-Mackinnon, J.,** Scheibling, R.E., Lauzon-Guay, J.-S. and **Simpson, A.G.B.** (2013) Validating the identity of *Paramoeba invadens*, the causative agent of recurrent mass mortality of sea urchins in Nova Scotia. *Diseases of Aquatic Organisms* 103: 209-227.

Flegontov, P., Votypka, J., Skalicky, T., Logacheva, M.D., Penin, A.A., **Tanifuji, G.**, Onodera, N. T., Kondrashov, A.S., **Archibald, J.M.** and Lukeš, J. (2013) *Paratrypanosoma*—a novel trypanosomatid. *Curr. Biol.* 23: 1787-1793.

Gaston, D. and **Roger, A.J.** (2013) Functional divergence and convergent evolution in the plastid-targeted glyceraldehyde-3-phosphate dehydrogenases of diverse eukaryotic algae. *PLoS ONE* 8: e7039.

**Gawryluk, R.M.R.**, Chisholm, K.A., Pinto, D.M. and **Gray, M.W.** (2014) Compositional complexity of the mitochondrial proteome of a unicellular eukaryote (*Acanthamoeba castellanii*, supergroup Amoebozoa) rivals that of animals, fungi, and plants. *J. Proteomics* 109C: 400-416.

**Gentekaki, E.**, **Kolisko, M.**, Boscaro, V., Bright, K.J., Dini, F., Di Giuseppe, G., Gong, Y., Miceli, C., Modeo, L., Molestina, R.E., Petroni, G., Pucciarelli, S., **Roger, A.J.**, Strom, S.L. and Lynn, D.H. (2014) Large-scale phylogenomic analysis reveals the phylogenetic position of the problematic taxon *Protocruzia* and unravels the deep phylogenetic affinities of the ciliate lineages. *Mol. Phylogenet. Evol.* 78C: 36-42.

**Gile, G.H.**, Carpenter, K.J., James, E.R., Scheffrahn, R.H. and Keeling, P.J. (2013) Morphology and molecular phylogeny of *Staurojoenina mulleri* sp. nov. (Trichonymphida, Parabasalia) from the hindgut of the kalotermitid *Neotermes jouteli*. *J. Eukaryot. Microbiol.* 60: 203-213.

Gile, G. and Slamovits, C.H. (2014) Transcriptomic analysis reveals evidence for a cryptic plastid in the colpodellid *Voromonas pontica*, a close relative of Chromerids and Apicomplexan parasites. *PLoS One* 9: e96258.

**Gray, M.W.** (2013) The pre-endosymbiont hypothesis: an updated perspective on the origin and evolution of mitochondria. *Cold Spring Harb. Perspect. Biol.* 6: a016097.

**Gray, M.W.** (2014) Organelle evolution, fragmented ribosomal RNAs, and Carl. *RNA Biol.* 11: 213-216.

Hahn, M.W., Schmidt, J., Taipale, S.J., **Doolittle, W.F.** and Koll, U. (2014). *Rhodoluna lacicola* gen. nov., sp. nov., a planktonic freshwater bacterium with a stream-lined genome. *Int. J. Syst. Evol. Microbiol.* 64: 3254-3263.

**Heiss, A.A.**, Walker, G. and **Simpson, A.G.B.** (2013) The microtubular cytoskeleton of the apusomonad *Thecamonas*, a sister lineage to the opisthokonts. *Protist* 164: 598–621.

Hirakawa, Y., Suzuki, S., **Archibald, J.M.**, Keeling, P.J. and Ishida, K. (2014) Overexpression of molecular chaperone genes in nucleomorph genomes. *Mol. Biol. Evol.* 31: 1437-1443.

Hleap, J.S., **Susko, E.** and **Blouin, C.** (2013) Defining structural and evolutionary modules in proteins: a community detection approach to explore sub-domain architecture. *BMC Struct. Biol.* 13: 20.

Kamikawa, R., **Brown, M.W.**, Nishimura, Y., Sako, Y., **Heiss, A.A.**, Yubuki, N., **Gawryluk, R.**, **Simpson, A.G.B.**, **Roger, A.J.**, Hashimoto, T. and Inagaki, Y. (2013) Parallel re-modeling of EF-1a function: divergent EF-1 a genes co-occur with EFL genes in diverse distantly related eukaryotes. *BMC Evol. Biol.* 13: e131.

Kamikawa, R., **Kolisko, M.**, Nishimura, Y., Yabuki, A., **Brown, M.W.**, Ishikawa, S.A., Ishida, K., **Roger, A.J.**, Hashimoto, T. and Inagaki, Y. (2014) Gene content evolution in Discobid mitochondria deduced from the phylogenetic position and complete mitochondrial genome of *Tsukubamonas globosa*. *Genome Biol. Evol.* 6: 306-315.

Keeling, P.J. et al. (81 authors, including **Simpson, A.G.B.** and **Slamovits, C.**) (2014) The Marine Microbial Eukaryote Transcriptome Sequencing Project (MMETSP): Illuminating the functional diversity of eukaryotic life in the oceans through transcriptome sequencing. *PLoS Biology* 12: e1001889.

**Kim, E.** and **Archibald, J.M.** (2013) Ultrastructure and molecular phylogeny of the cryptomonad *Goniomonas avonlea* sp. nov. *Protist* 164: 160-182.

**Langille, M.G.I.**, Zaneveld, J., Caporaso, J.G., McDonald, D., Knights, D., Reyes, J.A., Clemente, J.C., Burkepille, D.E., Vega Thurber, R.L., Knight, R., **Beiko, R.G.** and Huttenhower, C. (2013) Predictive functional profiling of microbial communities using 16S rRNA marker gene sequences. *Nature Biotech.* 31: 814-821.

**Lax, G.** and **Simpson, A.G.B.** (2013) Combining molecular data with classical morphology for uncultured phagotrophic euglenids (Excavata); A single-cell approach. *J. Euk. Microbiol.* 60: 615-625.

Lee, R., Lai, H., Malik, S.B., Saldarriaga, J.F., Keeling, P.K. and **Slamovits, C.H.** (2014) Analysis of EST data of the marine protist *Oxyrrhis marina*, an emerging model for alveolates biology and evolution. *BMC Genomics* 15: 122.

**Leger, M.M.**, **Gawryluk, R.M.R.**, **Gray, M.W.** and **Roger, A.J.** (2013) Evidence for a hydrogenosomal type anaerobic ATP generation pathway in *Acanthamoeba castellanii*. *PLoS ONE* 8: e6953.

Lepetit, B., Sturm, S., Rogato, A., **Gruber, A.**, Sachse, M., Falciatore, A., Kroth, P.G., Lavaud, J. (2013) High light acclimation in the secondary plastids containing diatom *Phaeodactylum tricorutum* is triggered by the redox state of the plastoquinone pool. *Plant Physiol.* 161: 853–865.

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**Meehan, C.J.** and **Beiko, R.G.** (2014) A phylogenomic view of ecological specialization in the Lachnospiraceae, a family of digestive tract-associated bacteria. *Genome Biol.Evol.* 6: 703-713.

**Panek, T.**, **Simpson, A.G.B.**, Hampl, V. and Cepicka, I. (2014) *Creneis carolina* gen. et sp. nov. (Heterolobosea), a novel marine anaerobic protist with strikingly derived morphology and life cycle. *Protist* 165: 542-567.

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**Porter, M.S.** and **Beiko, R.G.** (2013) SPANNER: Taxonomic assignment of sequences using pyramid matching of similarity profiles. *Bioinformatics* 29: 1858-1864.

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**Smith, D.R.**, Hua, J., **Archibald, J.M.** and **Lee, R.W.** (2013) Palindromic genes in the linear mitochondrial genome of the nonphotosynthetic green alga *polytomella magna*. *Genome Biol. Evol.* 5: 1661-1667.

**Stairs, C.W.**, **Eme, L.**, **Brown, M.W.**, **Mutsaers, C.**, **Susko, E.**, Dellaire, G., Soanes, D.M., van der Giezen, M. and **Roger, A.J.** (2014). A SUF Fe-S Cluster Biogenesis System in the Mitochondrion-Related Organelles of the Anaerobic Protist *Pygsuia*. *Current Biol.* 24: 1176-1186.

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**Susko, E.** (2013) Likelihood ratio tests with boundary constraints using data-dependent degrees of freedom. *Biometrika* - advance access doi: 10.1093/biomet/ast032.

**Susko, E.** (2014) Tests for two trees using likelihood methods. *Mol. Biol. Evol.* 31: 1029-1039.

**Tanifuji, G.**, Onodera, N.T., Moore, C.E. and **Archibald, J.M.** (2014) Reduced nuclear genomes maintain high levels of gene transcription. *Mol. Biol. Evol.* 31: 625-635.

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**Wang, H.-C.**, **Susko, E.** and **Roger, A.J.** (2013) The site-wise log-likelihood score is a good predictor of genes under positive selection. *J. Mol. Evol.* 76: 280-294.

**Wang, H.-C.**, **Susko, E.** and **Roger, A.J.** (2014) An amino acid substitution-selection model adjusts residue fitness to improve phylogenetic estimation. *Mol. Biol. Evol.* 31: 779-792.

Wideman, J.G., **Gawryluk, R.M.R.**, **Gray, M.W.** and Dacks, J.B. (2013) The ancient and widespread nature of the ER-Mitochondria encounter structure. *Mol. Biol. Evol.* 30: 2044-2049.

**Whidden, C.**, **Beiko, R.G.**, and Zeh, N. (2013) Fixed-parameter and approximation algorithms for maximum agreement forests. *SIAM Journal on Computation* 42: 1431-1466.

Yoder, A.D., Chan, L.M., Dos Reis, M., Larsen, P.A., Campbell, C.R., Rasoloarison, R., Barrett, M., Roos, C., Kappeler, P., **Bielawski, J.** and Yang, Z. (2014) Molecular evolutionary characterization of a V1R subfamily unique to Strepsirrhine primates. *Genome Biol. Evol.* 6: 213-227.

Yubuki, N., **Simpson, A.G.B.** and Leander, B.S. (2013) Comprehensive ultrastructure of *Kipferlia bialata* provides evidence for character evolution within the Fornicata (Excavata). *Protist* 164: 423-439.

Yubuki, N., **Simpson, A.G.B.** and Leander, B.S. (2013) Reconstruction of the feeding apparatus in *Postgaardia mariagerensis* provides evidence for character evolution within the *Symbiontida* (Euglenozoa). *Eur. J. Protistology*, 49: 32-39.

## **II. Invited Book Chapters and Trade Books**

**Archibald, J.M.** (2014) *One plus one equals one: Symbiosis and the Evolution of Complex Life*. 224 pp. Oxford University Press.

**Brown, M.W.** and Silberman, J.D. (2013) The non-dictyostelid sorocarpic amoebae. In: *Dictyostelia - Evolutionary Patterns and Processes in a Social Amoeba*, Baldauf, Romeralo & Escalante (Eds.), Springer, Heidelberg, Germany.

**Doolittle, W.F.** and Zhaxybayeva, O. (2013) What is a prokaryote? In: *The Prokaryotes – Vol. 1: Prokaryotic Biology and Symbiotic Associations*, edited by E. Rosenberg *et al.*, pp. 41-58, Springer-Verlag.

**Gray, M.W.** (2013) RNA Editing: Evolutionary implications. In *eLS 2013*, John Wiley & Sons, Ltd., Chichester. DOI: 10.1002/9780470015902.a0003069.pub3.

**Gray, M.** (2013) Mitochondrial genomes. In: Bell, E., Bond, J., Klinman, J., Masters, B. and Wells, R. (Eds.), *Molecular Life Sciences: An Encyclopedic Reference*: Springer Reference, Springer-Verlag Berlin Heidelberg, DOI: 10.1007/SpringerReference\_333640 2014-03-20 13:49:09 UTC.

**Slamovits, C.H.** (2013) Extreme genome reduction in microbial parasites. In: *Comparative Genomics in Neglected Human Parasites*, M.C. López-Camarillo & L.A. Marchat (Eds.), Nova Publishers.

Tanifuji, G. and **Archibald, J.M.** (2014) Nucleomorph comparative genomics. In: *Endosymbiosis*, Löffelhardt, W. (Ed.), pp. 197-213, Springer Wein, New York.

## **III. Other Contributions – Non-Refereed**

Keeling, P.J. (and 75 other authors, including **Archibald, J.M.**) (2014) The Marine Microbial Eukaryote Transcriptome Sequencing Project (MMETSP): illuminating the functional diversity of eukaryotic life in the oceans through transcriptome sequencing. *PLoS Biol.* 12: e1001889.



## 2.3 PARTICIPATION IN RELEVANT EVENTS FOR RESEARCH DISSEMINATION

(including conferences, workshops, symposia, etc.)

### Invited Presentations by CGEB Faculty: July 1, 2013 – June 30, 2014

John Archibald (2013) “Genomic perspectives on the origin and spread of photosynthesis in eukaryotes.” Invited symposium speaker, Microbial Diversity Summer Course, Marine Biological Laboratory, Woods Hole, MA, July 2013.

John Archibald (2013) “Euks in euks: new perspectives from the Ichthyobodo-related endosymbionts of pathogenic amoebae.” ICOP XIV Congress, Vancouver, July 28-August 2, 2013.

John Archibald (2013) “Euks in euks: new perspectives from the Ichthyobodo-related endosymbionts of pathogenic amoebae.” EMBO Conference on Comparative Genomics of Eukaryotic microorganisms, San Feliu de Guixols, Spain, October 19-24, 2013.

John Archibald (2014) “One plus one equals one: endosymbiosis and genome mosaicism in the diversification of complex life.” Concordia University, Department of Biology Seminar Series, April 17, 2014.

John Archibald (2014) “One plus one equals one: symbiosis and the evolution of complex life.” Kieler Woche Public Lecture - invited by Natural & Mathematical Faculty, Kiel University, Germany, June 21-29, 2014.

John Archibald (2014) “One plus one equals one: endosymbiosis and genome evolution in microbial eukaryotes.” Biochemistry Department Seminar, Dalhousie University, January 9, 2014.

John Archibald (2014) “Serial Endosymbiosis Theory - who said what, when and why.” Annual Meeting of the CIFAR Integrated Microbial Biodiversity Program, Czech Academy of Sciences, June 25-29, 2014.

Robert Beiko (2013) “Evolution and Ecology of GI Tract-Associated Lachnospiraceae: Drop Acid, Lose Your Coat, Leave In Someone Else’s Genes.” SMBE, July 7-11, Chicago, Ill.

Robert Beiko (2013) “Biology’s big data revolution. Using computers and DNA to unlock the secrets of biodiversity.” Computer Science Seminar, Dalhousie University, October 4, 2013.

Robert Beiko (2014) “Gènes sans frontières in the evolving human microbiome.” Biology Department Seminar, Dalhousie University, April 17, 2014.

Joseph Bielawski (2013) “Codon substitution models and phylogenetic analysis of protein coding genes”, and “Using the PAML package of computer programs to analyze gene sequences.” MBL Workshop on Molecular Evolution, Woods Hole, MA, July-August 2013.

Joseph Bielawski (2013) “*The genomics and metagenomics of human aging.*” Special symposium on the Biology of Aging, Conference on Aging...from Cells to Society, Hosted by the Division of Geriatric Medicine, Dalhousie University, October 2013.

W. Ford Doolittle (2013) “The ENCODE project and the meaning of ‘function’ in biology and biomedical research.” Biochemistry Department Seminar, Dalhousie University, September 12, 2013.

W. Ford Doolittle (2014) University of Iowa Darwin Days speaker. Two talks (1) “ENCODE and the problematics of ‘function’, and (2) “The Tree? Of Life.” Iowa City, February 21-22, 2014.

W. Ford Doolittle (2014) “Tree of Life uprooted, updated.” Biology Department Seminar, Dalhousie University, February 13, 2014.

W. Ford Doolittle (2014) McGill University, Bierman Lecture, Department of Physiology. “Is ‘junk bunk? The ENCODE debate and the meaning of “function”, Montreal, May 1-2, 2014.

W. Ford Doolittle (2014) American Society of Microbiology, 1) Plenary Session Convenor: “How Modern Microbiology ‘Jeopardizes’ the neoDarwinian Synthesis” and 2) speaker: “What is the Tree of Life?”, Boston, May 18-19, 2014.

Michael Gray (2013) “Mitochondrial evolution: genome vs. proteome.” ICOP XIV Congress, Vancouver, July 28-August 2, 2013.

Michael Gray (2013) “Historical perspectives on the endosymbiont hypothesis.” 12<sup>th</sup> International Colloquium on Endocytobiology and Symbiosis, Dalhousie University, August 18-22, 2013.

Michael Gray (2013) “The pre-endosymbiont hypothesis: An updated perspective on the origin of mitochondria.” Biochemistry Department Seminar, Dalhousie University, September 19, 2013.

Morgan Langille (2013) “Discovering human microbial interactions using next-gen bioinformatics.” Faculty Interview Lecture, Department of Pharmacology, Dalhousie University, June 17, 2013.

Morgan Langille (2013) “Frailty and the microbiome in mice.” CAG2013 Aging: From cells to Society, Halifax, October 17, 2013.

Morgan Langille (2014) “Discovering human microbial interactions.” Division of Haematology/Oncology Academic Rounds at the IWK, Halifax, January 10, 2014.

Morgan Langille (2014) “Exploring the human microbiome.” Department of Biology Seminar Series, Dalhousie University, January 23, 2014.

Morgan Langille (2014) “Microbiome Tutorial: PICRUSt & STAMP.” Exploiting and Understanding Chemical Biotransformations in the Human Microbiome, Big Sky, Montana, April 3, 2014.

Morgan Langille (2014) “Discovering human microbial interactions.” Division of Otolaryngology Academic Rounds at the IWK, Halifax, April 15, 2014.

Morgan Langille (2014) “Exploring the human microbiome.” Faculty of Medicine – Tom Marrie Lecture Series, Dalhousie University, April 25, 2014.

Andrew Roger (2013) “Phylogenomic approaches to clarifying the deep structure of the tree of eukaryotes.” The 25<sup>th</sup> Commemorative Symposium for the 29<sup>th</sup> International Prize in Biology, Fukuoka, Japan, November 21-22, 2013.

Andrew Roger (2013) “The deep structure of the tree of eukaryotes inferred from phylogenomic analyses.” ICOP XIV-International Congress of Protistology, Vancouver, July 28–August 2, 2013.

Andrew Roger (2013) “Evolution of mitochondrion-related organelles in anaerobic protists.” 12<sup>th</sup> International Colloquium on Endocytobiology and Symbiosis, Dalhousie University, August 18-22, 2013.

Andrew Roger (2013) “Overview of Centre for Comparative Genomics & Evolutionary Bioinformatics.” Dalhousie-CAU-Kiel Joint Workshop (Life Sciences), Dalhousie University, December 6, 2013.

Alastair Simpson (2013) Plenary Lecture: “Eukaryote evolution; a story told by free-living protozoa.” 14<sup>th</sup> International Congress of Protistology (ICOP XIV), Vancouver, July 28-Aug. 2, 2013.

Alastair Simpson (2014) "Eukaryote evolution: A story told by free-living protozoa." Biology Seminar Series, University of Western Ontario, April 4, 2014.

Claudio Slamovits (2014) “Sequencing the MSX genome.” Aquatic Invasive Species and Disease Workshop – Aquaculture Association of Nova Scotia, Delta Halifax Hotel, January 29, 2014.

Claudio Slamovits (2014) “Insights into the molecular genetics of dinoflagellates.” Bigelow Laboratory for Ocean Sciences, East Boothbay, Maine, May 29, 2014.

Ed Susko (2013) “Test for two trees using likelihood methods.” Workshop on Mathematics of Sequence Evolution: Biological Models and Applications, Université de Montréal, September 23-27, 2013.

## 2.4 COURSES TAUGHT BY MEMBERS OF THE C/I WITH SIGNIFICANT CONTENT RELATED TO THE C/I MISSION STATEMENT

- Please indicate if courses are graduate or undergraduate
- Provide Course Name and Number, Instructor, Course Enrolment (*if known*)

- NOT RELEVANT TO CGEB MISSION

## 2.5 STUDENT RESEARCH ACTIVITIES

### Student Name / Status / Supervisor Lab / Doctoral Thesis Title (if applicable)

Courtney Stairs; PhD student (in progress) - Roger lab  
Michelle Leger; PhD student (in progress) - Roger lab  
Susan Sharpe; PhD student (in progress) - Roger lab  
Tommy Harding; PhD student (in progress) - co-supervised by Roger & Simpson labs  
Tyler Brunet; Honours student (completed April 2014) - W. Ford Doolittle  
Sergio Hleap Lozano; PhD student (in progress) - Blouin lab  
Amin Khalafvand; Master's student (in progress) - Blouin lab  
Michelle Lu; PhD student (in progress) - Blouin lab  
Alex Safatli; Master's student (in progress) – Blouin lab  
Wilson Chan; Honours student (completed 2013) - Blouin lab  
Kyle Nguyenpi; summer student (completed 2013) – Blouin lab  
Gordon Lax; PhD student (in progress) - Simpson lab  
Robyn Buchwald; Honours student (completed April 2014) – Simpson lab  
Joshua Goodwin; Honours student (completed April 2014) – Simpson lab  
Jessica Johnson-Mackinnon; summer student (completed Aug. 2013) – Archibald lab  
Louis Martin; Honours student (completed April 2014) – Archibald lab  
Shannon Sibbald; Honours student (completed April 2014) – Archibald lab  
Renny Lee, PhD student (in progress) – Slamovits lab  
Sergio Munoz-Gomez; Master's student (in progress) – Slamovits lab  
Samuel Mundy; Undergraduate co-op student (Jan.-Aug. 2014) – Slamovits lab  
Luyao (Catherine) Zheng; Master's student (in progress) – Beiko lab  
Jie Ning; Master's student (in progress) – Beiko lab  
Christopher Whidden, PhD student (completed August 2013 – Beiko lab) Title: “Efficient computation and application of maximum agreement forests”  
Dennis Wong, PhD student (in progress); Beiko lab  
Noor Youssef; Undergraduate Student (Sept. 2013-Aug. 2014); now Honours – Beiko lab  
Benjamin Wright; Undergraduate Student (completed 2014) – Beiko lab  
Justin Trainor: Undergraduate Student (completed 2014) – Beiko lab  
Alex Keddy; Master's student (in progress) – Beiko lab  
Praveen Nakkulam Ravindram; Master's student (in progress) – Beiko lab  
Sophia Halassy; Master's/PhD student (entered Med. School Aug. 2013) – Bielawski lab  
Rana Bashwih, Master's student (in progress) – Bielawski lab  
Wei Chen; Masters student (in progress); co-supervised by Bielawski & H. Gu labs  
Shelley MacDonald; Honours student (completed April 2014); Bielawski lab  
Joseph Mingrone; PhD student (in progress); co-supervised by Susko & Bielawski labs  
Chris Jones; PhD student (in progress); co-supervised by Susko & Bielawski labs

**PRESENTATIONS BY CGEB TRAINEES** (i.e. students listed in Section 2.5 and postdocs in Section 2.1.3). Presenter's name underlined if presentation multi-authored.

NOTE: Select list only – some presentations by previous trainees (now gone) not available for inclusion in this report.

Jennifer Baker, K. Dunn, B.A. Karpinski, T.M. Maynard, J. Bielawski and B. Wood (2013) “Have genes involved in dental development in hominids been subjected to natural selection?”(poster presentation). Cell Symposia: Evolution of modern humans - insights from bones and genomes, November 24-26, Melia, Sitges, Spain.

Jennifer Baker, K. Dunn, B.A. Karpinski, T.M. Maynard, J. Bielawski and B. Wood (2014) “The Molecular Evolution of Odontogenesis” (oral presentation). 2014 Annual Meeting of the American Association of Physical Anthropologists, April 9-12, Calgary.

Jennifer Baker, K. Dunn, B.A. Karpinski, J. Bielawski, B. Wood and T.M. Maynard (2014) “Molecular Evolution in Primates” (oral presentation). The GW Institute for Neuroscience 2014 Neuroscience Symposium, May 1, Washington, D.C.

Eva Boon, M. Shafiei, K. Dunn, H. Chipman, H. Gu and J. Bielawski (2013) “BioMeNet: Bayesian inference of metabolic divergence among microbial communities” (poster presentation). Gordon Research Conference: Applied & Environmental Microbiology, July 7-12, South Hadley, MA.

Eva Boon (2013) Mathematics for an Evolving Biodiversity Conference (poster presentation), September 16-20, University of Montreal.

Susana Breglia (2013) “Combined proteomic and genomic approaches to study dinoflagellate nuclear biology” (poster presentation). ICOP XIV Congress, July 28-August 2, Vancouver.

Tyler Brunet (2014) “Investigating differences in the use of ‘function’ concepts amongst sub-disciplines of biochemistry: an historical and In silico approach” (oral presentation). Biochemistry Honours Student Presentation, March 19, Dalhousie University.

Ugo Cenci (2013) “Polysaccharide debranching a universal and polyphyletic mechanism for starch in bacteria and eukaryotes” (oral presentation). 12<sup>th</sup> International Colloquium on Endocytobiology and Symbiosis, August 18-22, Dalhousie University.

Ugo Cenci and J.M. Archibald (2014) “Genomic investigation of metabolic links between *Neoparamoeba pemaquidensis* and its kinetoplastid endosymbiont” (poster presentation). Annual Meeting of the Canadian Institute for Advanced Research, Program in Integrated Microbial Biodiversity, June 25-29, Prague, Czech Republic.

Laura Eme (2013) “Phylogenomic analysis of Blastocystis sp. subtype 1 reveals an important role for lateral gene transfer in adaptation to parasitism of the human gut” (oral presentation). ICOP XIV Congress, July 28-August 2, Vancouver.

Laura Eme (2014) “The role of lateral gene transfer in adaptation of protists to new environments” (invited speaker). Microbe Evolution 2014, March 24, Tsukuba, Japan.

Laura Eme (2014) “The role of lateral gene transfer in adaptation of anaerobic protists to new environments” (oral presentation). Annual Meeting of the CIFAR Integrated Microbial Biodiversity Program, June 25-29, Prague, Czech Republic.

Eleni Gentekaki (2013) “The draft genome sequence of *Blastocystis* sp. ST1 Nandll and comparative genomic analyses with *Blastocystis* sp. ST7” (oral presentation). ICOP XIV Congress, July 28-Aug. 2, Vancouver.

Gillian Gile (2013) “Evidence for a cryptic plastid in the colpodellid *Voromonas pontica*” (oral presentation). ICOP XIV Congress, July 28-August 2, Vancouver.

Gillian Gile (2013) “Evidence for a cryptic plastid in the colpodellid *Voromonas pontica*” (oral presentation). 12<sup>th</sup> International Colloquium on Endocytobiology and Symbiosis (ICES12), August 18-22, Dalhousie University.

Ansgar Gruber, G. Rocap, T. Mock, P.G. Kroth and E.V. Armbrust (2013) "Predicted plastid proteomes of algae with secondary plastids" (oral presentation). ICOP XIV Congress, July 28-August 2, Vancouver.

Ansgar Gruber and J.M. Archibald (2013) “Occurrence and significance of C-terminal targeting motifs in organisms with secondary plastids” (oral presentation). 12<sup>th</sup> International Colloquium on Endocytobiology and Symbiosis (ICES12), August 18-22, Dalhousie University.

Tommy Harding, L. Eme, A.G.B. Simpson and A.J. Roger (2014) “Gene expression analysis yields insights into the halophilic lifestyle of the heterotrophic protist *Halocafeteria seosinensis*” (poster presentation). CIFAR Integrated Microbial Biodiversity Program Annual Meeting, June 25-29, Prague, Czech Republic.

Tommy Harding (2014) “Adaptations to high salt concentrations: the case of *Halocafeteria seosinensis*” (oral presentation). Biochemistry Departmental Seminar, June 19, Dalhousie University.

Martin Kolisko (2013) “The origin of the *Giardia* mitosome demystified: comparative analyses of predicted organellar proteomes across free-living and parasitic metamonads” (oral presentation). ICOP XIV Congress, July 28-August 2, Vancouver.

Michelle Leger, L.A. Hug and A.J. Roger (2013) “Adaptations to hypoxia in the hydrogenosomes of *Andalucia incarcerata*” (oral presentation). 12<sup>th</sup> International Colloquium on Endocytobiology and Symbiosis (ICES12), August 18-22, Dalhousie University.

Conor Meehan (2013) “Evolution and ecology of the GI tract associated *Lachnospiraceae*” (poster presentation). Gordon Research Conference: Applied & Environmental Microbiology Conference, July 12, Mount Holyoke College, MA.

Conor Meehan (2013) Workshop on Molecular Evolution at Marine Biological Laboratory. Undertook the role of head teaching instructor and supervised twelve 3-hour computer practicals including the creation of an introduction to the UNIX environment, July-August 2013, Woods Hole, MA.

Daniel Moog (2013) “Investigating the protein composition of a minimized eukaryotic cytoplasm of the periplastidial compartment of the diatom *Phaeodactylum tricornerutum*” (oral presentation). 12<sup>th</sup> International Colloquium on Endocytobiology and Symbiosis, August 18-22, Dalhousie University.

Sergio Munoz (2014) “Evolution in action-deconstructing the cause of an evolutionary innovation in an experimental population of *E. coli*” (oral presentation). Graduate Student Symposium, March 6, Dalhousie University.

Sergio Munoz-Gomez, M.B. Saffo, C.E. Lane, C. Paight and C.H. Slamovits (2014) “*Nephromyces* and the evolution of apicoplast genomes among apicomplexans” (poster presentation). ESF-EMBO Biology of Plastids - Towards a Blueprint for Synthetic Organelles, June 21-26, Pułtusk, Poland.

Sergio Munoz-Gomez, M.B. Saffo, C.E. Lane, C. Paight and C.H. Slamovits (2014) “*Nephromyces*, a mutualistic endosymbiont representing a new major branch of the Apicomplexan tree” (oral presentation). Annual Meeting of the CIFAR Integrated Microbial Biodiversity Program, June 25-29, Prague, Czech Republic.

Tomas Panek (2013) “Hidden diversity of anaerobic jakobids in marine and brackish sediments” (oral presentation). ICOP XIV Congress, July 28-Aug. 2, Vancouver.

Susan Sharpe, M.W. Brown and A.J. Roger (2013) “The breviate *Pygmsuia biforma* expresses a near-complete integrin adhesome; implications for the origins of animal multicellularity” (oral presentation). ICOP XIV Congress, July 28-Aug. 2, Vancouver.

Susan Sharpe (2014) “The protist *Pygmsuia biforma* expresses integrins: implications for the origins of animal multicellularity” (oral presentation). Biochemistry Departmental Seminar, June 12, Dalhousie University.

Courtney Stairs, L. Eme, M.W. Brown, M. van der Giezen and A.J. Roger (2013) “Evolution of FeS cluster biosynthesis in the mitochondrion-related organelles of the breviate *Pygmsuia biforma*” (oral presentation). ICOP XIV Congress, July 28-Aug. 2, Vancouver.

Courtney Stairs, L. Eme, M.W. Brown, M. van der Giezen and A.J. Roger (2013) “Evolution of a sulphur mobilization (SUF) Fe-S cluster biosynthesis machinery in the mitochondrion-related organelles of the breviate *Pygmsuia biforma*” (oral presentation). 12<sup>th</sup> International Colloquium on Endocytobiology and Symbiosis (ICES12), August 18-22, Dalhousie University.

Goro Tanifuji and J.M. Archibald (2013) “Genome and transcriptome analyses of *Neoparamoeba pemaquidensis* and its kinetoplastid endosymbiont” (oral presentation).

12<sup>th</sup> International Colloquium on Endocytobiology and Symbiosis (ICES12), August 18-22, Dalhousie University.

Goro Tanifuji, and 4 others including J.M. Archibald (2013) “The complete nucleomorph genome sequence of *Lotharella oceanica*” (poster presentation). 12<sup>th</sup> International Colloquium on Endocytobiology and Symbiosis (ICES12), August 18-22, Dalhousie University.

Goro Tanifuji, and 8 others including J.M. Archibald (2013) “Assembly and annotation of a mitochondrial genome of kinetoplastid protest *Perkinsela*” (poster presentation). 12<sup>th</sup> International Colloquium on Endocytobiology and Symbiosis (ICES12), August 18-22, Dalhousie University.

Goro Tanifuji, and 9 others including J.M. Archibald (2013) “*Paratrypanosoma* – a novel ancestral trypanosomatid” (poster presentation). ICOP XIV Congress, July 28-Aug. 2, Vancouver.

Chris Whidden (2013) “Inferring highways of gene sharing in prokaryotes via agreement forest based models” (oral presentation). SMBE 2013, July 7-11, Chicago.

## 2.6 MEDIA ENGAGEMENT

### Broadcast Interviews

W. Ford Doolittle: CBC Radio – “Information Morning” (re. *Hype in Science Workshop* at King’s College, Dec. 7, 2013), interviewed December 4, 2013

W. Ford Doolittle: interviews on local CBC and CJNI-FM News 95.7 Halifax (TV & radio), re. discussion on Tree of Life and the Herzberg Medal; interviewed Feb. 3-4, 2014

W. Ford Doolittle: CBC Radio – “Quirks and Quarks” (re. Herzberg Medal), interviewed February 8, 2014

### Text Interviews

W. Ford Doolittle: feature articles in The Globe and Mail, Montreal Gazette, Chronicle-Herald; several Dalhousie press releases (re. Herzberg Medal)

John Archibald (2014) - *Author Blog*; “Microbes Matter.” Oxford University Press (blog.oup.com)

## 2.7 OUTREACH STRATEGY

- Provide information on events organized by C/I to meet the outreach strategy related to mission.
  - see Section 1.2 (A. Current Year’s Activities - CGEB seminar series); and Section 1.2 (B. Sponsorship of Local and International Meetings)

## 2.8 TECHNOLOGY DEVELOPMENT, PATENT OR COMMERCIALIZATION

- see Section 2.9 (below)



## 2.9 OTHER ACTIVITIES RELATED TO KNOWLEDGE EXCHANGE

### Updates to Previous Software Development

The program *PROTEUS* has been expanded. It is now up to 70,652 lines of code. This code is being used by PhD students in J. Bielawski's lab (J. Mingrone and C. Jones) to carry out their thesis research.

The program *BiomeNet* is published and now distributed via:  
SourceForge: <http://sourceforge.net/projects/biomenet/>

The program *BioMiCo* is now available to the community upon request.

### (New) CGEB Developed Software (2014)

Program name: *KHns*

Author: Edward Susko

Description: The programs give the results of tests for the significance of a phylogenetic tree. They implement the methods described in: Susko, E. (2014) Tests for two trees using likelihood methods. *Mol. Biol. Evol.* 31: 1029-1039.

<http://www.mathstat.dal.ca/~tsusko>

### 2013:

Program Name: *ExpressBetaDiversity, version 1.0*

Author: Donovan Parks *et al.* (Beiko lab)

Description: software to compute phylogenetic beta-diversity measures from DNA sample data

<http://kiwi.cs.dal.ca/Software/ExpressBetaDiversity>

Program Name: *NetworkDiversity, version 1.0*

Author: Donovan Parks *et al.* (Beiko lab)

Description: software to compute beta-diversity over phylogenetic networks

<http://kiwi.cs.dal.ca/Software/NetworkDiversity>

Program Name: *rSPR, version 1.2.0*

Author: Chris Whidden *et al.* (Beiko lab)

Description: software for computing the rooted SPR distance, a measure of lateral genetic transfer, for two phylogenetic trees

<http://kiwi.cs.dal.ca/Software/RSPR>

Program Name: *PICRUSt, version 1.0* (officially released Sept. 3, 2013)

Author: Morgan Langille (Beiko lab)

Description: bioinformatics software package designed to predict metagenome functional content from marker gene surveys and full genomes. Described in: M.G.I. Langille *et al.* (2013) Predictive functional profiling of microbial communities using 16S rRNA marker gene sequences. *Nat. Biotechnol.* 31, 814–821.

<http://picrust.github.io/>

Program Name: *SPR Supertrees*, version 1.2.0

Author: Chris Whidden *et al.* (Beiko lab)

Description: software for computing supertrees with minimal SPR distances from a collection of gene trees

<http://kiwi.cs.dal.ca/Software/SPRSupertrees>

Program Name: *IslandViewer 2*

Author: Morgan Langille (Beiko lab)

Description: a computational tool that integrates three different genomic island prediction methods: IslandPick, IslandPath-DIMOB, and SIGI-HMM

<http://www.pathogenomics.sfu.ca/islandviewer/query.php>

Program name: *NSGTR-BH*

Author: Liwen Zou (Susko lab)

Description: the program allows one to fit the NSGTR-BH substitution models

<http://www.mathstat.dal.ca/~tsusko>

Program Name: *QmmRAxML*, version 2.0

Author: Huaichun Wang (Susko lab)

Description: software to fit class-frequency mixture models

<http://www.mathstat.dal.ca/~hcwang/QmmRAxML/>

Program name: *pr4design*, *pr4addbranch*, *pr4deltaxa* and *pr4list*

Author: Ed Susko

Description: software to determine the probability of correctly resolving a split for a given tree, substitution process and sequence length

<http://www.mathstat.dal.ca/~tsusko>

## SECTION 3 – FINANCIAL INFORMATION

### 3.1 DOES THE C/I HAVE A SEPARATE OVERALL OPERATING AND ADMINISTRATIVE BUDGET? Yes.

#### FUNDING SOURCES:

- I. Tula Foundation (2007-2015)
- II. (new) CGEB Trainee Fellowships & support for CGEB administration
- III. Dalhousie University - Faculties of Medicine, Science, Computer Science, and VP-Academic & Provost (2007-2019)

#### Annual Operating/Administration Funds in Reporting Year:

##### I. TULA FOUNDATION

A. *Administration/Seminar Series/Student Travel* (\$50,000 per annum): this includes \$25,000 for CGEB administration, \$15,000 for seminar series speakers, and \$10,000 for trainees travel to meetings. This support commenced in July 2007, with an 8-year commitment from Tula (i.e. 2007-2015). Aggregate over 8 years: \$400,000

B. *Research Traineeships (for Postdocs & PhD students)*: these are 5-year ‘slots’ awarded to each CGEB faculty for postdocs or PhD students, plus research expense allowance. Listed below are current slots that are still active (6 others have completed their 5-year installments from Tula).

Archibald lab: \$64,000/year (April 2011 – 2016)

Blouin lab: 2<sup>nd</sup> slot \$27,500 (Sept. 2010 – 2015)

Beiko lab: 2<sup>nd</sup> slot \$27,500 (May 2010 – 2015)

Slamovits lab: \$64,000/year (Dec. 2011 – 2016)

##### II. (NEW) CGEB TRAINEE FELLOWSHIPS AND SUPPORT FOR CGEB ADMINISTRATION

CGEB member Dr. W. Ford Doolittle has pledged to support a new CGEB Trainee Fellowship program and CGEB Administration from funds awarded to him as part of the NSERC Herzberg Gold Medal. This program will provide majority support for stipends for 2-3 graduate students/year and 1 postdoctoral fellow for the five years of his award (2014-2019). These fellowships will be awarded on a competitive basis to applicants from the CGEB community (Members and Associates). The details of the criteria and procedures are outlined in Appendix A. The awards are:

- \$35,000 p.a. for 2 years for postdoctoral fellowships
- \$15,000 for 2 years for M.Sc. and up to 5 years for Ph.D. student stipends

The remaining stipend of the trainee is to be contributed by the trainee supervisor from grants awarded to them. The first round of these awards has been made. Three M.Sc. studentships have been awarded in the first round: Ms. Eyre Nomi (Comp. Sci.), Mr. Tyer Brunet (Comp.Sci.), Ms. Yun Cai (Math/Stats), and one postdoctoral fellowship (Dr. Dayana Salas-Leiva, Biochem.).

Dr. Doolittle has also pledged \$32,000 p.a. towards supporting the CGEB administrator salary from 2015-2019.

The total support for CGEB from Doolittle’s Herzberg monies is currently \$112,000 p.a. but will vary according to the number of fellowships given each year.

### III. DALHOUSIE UNIVERSITY

The Faculties of Medicine, Science, and Computer Science, and Office of the VP-Academic & Provost initially collectively committed funding for Years 1-7 (i.e. 2008-2015) to at least match the funds from the Tula Foundation for CGEB administration. In 2014 these commitments were extended for four more years (i.e. April 2015-April 2019), to coincide with Dr. Ford Doolittle's Herzberg Award funding contribution toward CGEB trainees and administration (see II above).

#### Financial Commitments from Dalhousie to CGEB:

<b>Fiscal Year: April - March</b>	<b>Faculty of Medicine</b>	<b>VP, Academic &amp; Provost</b>	<b>Faculty of Science</b>	<b>Faculty of Comp. Science</b>	<b>TOTAL</b>
Year 1: 2008-2009	\$15,000	\$10,000	N/A	N/A	<b>\$25,000</b>
Year 2: 2009-2010	\$15,000	\$10,000	\$1,000	\$1,000	<b>\$27,000</b>
Year 3: 2010-2011	\$10,000	\$10,000	\$6,000	\$3,000	<b>\$29,000</b>
Year 4: 2011-2012	\$10,000	\$10,000	\$7,000	\$4,000	<b>\$31,000</b>
Year 5: 2012-2013	\$10,000	\$10,000	\$8,000	\$5,000	<b>\$33,000</b>
Year 6: 2013-2014	\$10,000	\$10,000	\$8,000	\$5,000	<b>\$33,000</b>
Year 7: 2014-2015	\$10,000	\$10,000	\$8,000	\$5,000	<b>\$33,000</b>
Year 8: 2015-2016	\$10,000	\$10,000	\$8,000	\$5,000	<b>\$33,000</b>
Year 9: 2016-2017	\$10,000	\$10,000	\$8,000	\$5,000	<b>\$33,000</b>
Year 10: 2017-2018	\$10,000	\$10,000	\$8,000	\$5,000	<b>\$33,000</b>
Year 11: 2018-2019	\$10,000	\$10,000	\$8,000	\$5,000	<b>\$33,000</b>

### IV. OTHER – CGEB NEW OPPORTUNITIES FUND

Another source of funds available to finance specific CGEB activities is the *CGEB New Opportunities Fund*. This is a 'special purpose account' (6-8292) that was originally opened to receive transfers of revenue that was previously generated by CGEB members' activities (i.e. scientific meetings). The current balance in this account is \$37,666. The purpose of this fund is to provide additional partial funding or 'seed' monies for CGEB activities, the costs of which either exceed existing allocated funds (e.g. the Trainee Travel to Meeting fund, the Seminar Series fund), or one-time events/activities/opportunities that fall within the CGEB mandate (*see Section 1.2 – F. for meeting events sponsored in 2013-14*). To date these funds have also been used for costs associated with recruitment of potential trainees to CGEB labs (e.g. interview travel costs), occasional public lecture sponsorship, as well as the initial CGEB website design.

### 3.2 RESEARCH GRANTS/AWARDS DIRECTLY RELATED TO THE MISSION STATEMENT AWARDED TO THE ACADEMIC AND RESEARCH POPULATION WITHIN THE C/I NOT LISTED ABOVE

#### 3.2.1 Current External Research Grants and other Funding

Collectively, CGEB faculty received (including ongoing awards) **\$2,290,000** from external research grants and other awards during this reporting period. Grants involving more than one CGEB faculty were only counted once (i.e. for the primary P.I.) to obtain the above total.

##### John Archibald

- 2014-2019 **NSERC Discovery Grant**—“*Endosymbiosis and genome evolution in eukaryotic microbes*” \$85,000/year
- 2012-2017 **Canadian Institute for Advanced Research, Program in Integrated Microbial Biodiversity**—research allowance for Program Fellows: \$24,000/year
- 2011-2016 **Canadian Institutes of Health Research – Operating Grant: *Endosymbiosis, parasitism, and genome evolution***: \$115,000/year
- 2009-2014 **NSERC Discovery Grant – *Genome and proteome evolution in nucleomorph-containing algae***: \$34,000/year
- 2011-2016 **Tula Foundation - CGEB Postdoctoral Research Fellowship** (funding for postdoctoral fellowship, plus research allowance): \$64,000/year

##### Robert Beiko

- 2014 **EW Group GmbH – Research Contract: *Rapid identification of insertion sites for retroid elements in complex genomes***: \$32,000
- 2014 **NRC-IRAP: *Comparative genomics to identify genes and pathways controlling reproductive longevity of mammals***: \$80,928
- 2014-2019 **NSERC – CREATE: *Training in big text data (TRIBE)***: \$1,350,000 over 5 years (co-applicant with P.I. - S. Matwin)
- 2014-2017 **NSERC – Strategic Project Grant: *Genomics approaches to the management of mixed stock fisheries in Canada***: \$593,000 over 3 years (co-applicant with P.I.s - P. Bentzen & I. Bradbury; 20% to R. Beiko)
- 2013-2016 **Genome Canada – 2012 Competition in Bioinformatics and Computational Biology: *A federated bioinformatics platform for public health microbial genomics***: (with Fiona Brinkman, P.I.; 8 co-applicants including R. Beiko: \$500,000/year; 4% to R. Beiko)
- 2013-2015 **Nova Scotia Health Research Foundation – Scotia Support Grant, Medical Category: *Scotia support for pilot project to assess the gut microbiomes of patients in assisted living facility***: \$22,500/year; R. Beiko, P.I. with J. Bielawski, co-P.I.
- 2013-2014 **Nova Scotia Health Research Foundation – Discovery/Innovative Grant, Medical Category: *A pilot project to assess the gut microbes of patients in an assisted care facility***: \$15,000/year; R. Beiko, P.I. with J. Bielawski, co-P.I.
- 2013-2015 **NRC-IRAP: *Development of a genetic marker panel to predict fertility and longevity traits in Holstein dairy cattle (and related projects)***: \$165,000 (approx.)
- 2013-2014 **Nova Scotia Health Research Foundation – Discovery/Innovative Grant: *The role of the complement system in post-colitis colonization and recovery from injury***: \$15,000/year (co-applicant with A. Stadnyk + 2 others)

- 2012-2017 **Canada Research Chair – Tier II (CIHR) in Bioinformatics:** \$100,000/year  
 2012-2017 **NSERC - Discovery Grant:** *Untangling the complex geographic and evolutionary patterns of microbes:* \$33,000/year  
 2011-2014 **Genome Canada, Large-Scale Applied Research Project:** *Biomonitoring 2.0: A high-throughput genomics approach for comprehensive biological assessment of environmental change* (co-applicant with P.I. - M. Hajibabaei, Guelph; 1 million/year; 6% to R. Beiko)  
 2010-2015 **Tula Foundation** – funding for PhD student traineeship and research allowance: \$27,500/year

### Joseph Bielawski

- 2009-2014 **NSERC – Discovery Grant:** *Evolutionary analysis of protein diversification: model improvement, assessment and application to real data:* \$29,000/year

### Christian Blouin

- 2010-2015 **NSERC – Discovery Grant:** *Exploring the landscape of phylogenies:* \$24,000/year  
 2009-2014 **CFI (Infrastructure Operating Funds):** *A high performance computational platform for bioinformatics:* \$12,000/year  
 2010-2015 **Tula Foundation** – CGEB funding for PhD student traineeship and research allowance: \$27,500/year

### W. Ford Doolittle

- 2014-2019 **NSERC – Gerhard Herzberg Canada Gold Medal for Science and Engineering:** \$1,000,000 over 5 years  
 2014-2016 **Dalhousie – Strategic Research Initiatives Fund (SRIF):** *An integrated resource for metagenomics and microbiomics in Atlantic Canada:* \$100,000/year  
 P.I. – W. F. Doolittle, with 10 others (including A.J. Roger, J. Bielawski, and M. Langille)  
 2010-2013 **Canadian Institutes of Health Research - Emerging Team Grant: Canadian Microbiome Initiative:** *Modeling and mapping microbial diversity and function with marker genes, genomes and metagenomes:* \$223,000/year  
 P.I. – W.F. Doolittle, with co-PIs: J. Bielawski, R. Beiko & M. Ereshefsky  
 [3 yr. grant with 1½ year extension to March 31, 2015 to use unspent funds]

### Morgan Langille

- 2014 Start-up funds from Department of Pharmacology, Dalhousie: \$100,000  
 2013 **NSHRF Innovation Grant** ('Associate' applicant with Andrew Stadnyk, P.I. & others): *The role of the complement system in post-colitis colonization and recovery from injury:* \$15,000

### Andrew Roger

- 2014 **Medical Research Development Office, Dalhousie University** – Bridge funding support: \$40,000

- 2013-2014 **CIHR Operating Grant-Priority Announcement: Regional Partnership Program Nova Scotia** – Bridge funding support: \$82,686
- 2011-2016 **NSERC Discovery Grant** – *Phylogenomic approaches to ancient relationships amongst eukaryotes*: \$54,000/year
- 2011-2014 **NSERC Discovery Grant – Accelerator Supplement** (3 years; \$40,000/year)
- 2010-2017 **Canada Research Chair – Tier I (CIHR) in Comparative Genomics and Evolutionary Bioinformatics**: \$200,000/year (includes 7-yr. salary award, 20% of which is research allowance)
- 2008-2013 **Canadian Institutes of Health Research, Operating Grant** – *Major transitions in eukaryotic cell evolution*: \$719,381 over 5 years (A. Roger, P.I., with co-applicant A. Simpson)
- 2013-2018 **Canadian Institute for Advanced Research - Program in Integrated Microbial Biodiversity**— research allowance for program fellows: \$24,000/year
- 2007-2015 **Tula Foundation** – CGEB administration, seminar series and student travel funds: \$50,000/year

### Alastair Simpson

- 2014-2019 **NSERC Discovery Grant: Linking microscopy-based identities to molecular identities for problem- or problematic protozoa: \$27,000/year**
- 2009-2014 **NSERC Discovery Grant: Microbial eukaryote diversity and evolution in extraordinary environments**: \$34,000/year
- 2008-2013 **Tula Foundation - CGEB Postdoctoral Research Fellowship** (funding for postdoctoral fellowship plus research allowance): \$64,000/year
- 2008-2013 **CIHR Operating Grant** (co-applicant with A.J. Roger, P.I.: \$143,876/year – *not counted in above total*)
- 2012-2017 **Canadian Institute for Advanced Research - Program in Integrated Microbial Biodiversity** - research allowance for program fellows: \$24,000/year

### Claudio Slamovits

- 2014 **NSERC Engage: Improving algal biomass production through genomics. Research in partnership with SabrTech Inc.:** \$25,000
- 2012-2017 **CFI-NSRIT – Leaders Operating Fund**: \$5,000/year (support for infrastructure maintenance)
- 2011-2016 **Tula Foundation – CGEB Postdoctoral Research Fellowship** (funding for postdoctoral fellowship plus research allowance): \$64,000/year
- 2010-2015 **NSERC Discovery Grant: Genomes of alveolate protists: structure, function and evolution**: \$33,000/year
- 2012-2017 **Canadian Institute for Advanced Research - Program in Integrated Microbial Biodiversity**— research allowance for program members: \$24,000/year

### Ed Susko

- 2008-2013 **NSERC – Discovery Grant: Statistical evolutionary bioinformatics**: \$21,000/year
- 2013-2018 **NSERC – Discovery Grant: Statistical methods for molecular evolution**: \$22,000/year
- 2008-2013 **Tula Foundation – CGEB Postdoctoral Research Fellowship** (funding for postdoctoral fellowship plus research allowance): \$49,000/year

### **3.2.2 Honours, Awards, Distinctions Received (or Currently Held) by CGEB Faculty**

Here we have listed new awards received in 2013-2014, as well as ongoing salaried fellowships and scholarships, and lifetime fellowships and honorary memberships.

#### John Archibald

- Seymour H. Hutner Young Investigator Prize, International Society of Protistologists (2014)
- Fellow, Canadian Institute for Advanced Research - Integrated Microbial Biodiversity Program (2012-2017)
- New Investigator Award, Canadian Institutes of Health Research (5-yr. salary; 2008-2013)

#### Robert Beiko

- Canada Research Chair (Tier II) in Bioinformatics (2006 – present; CRC renewed in 2011)

#### Christian Blouin

- Srini Award for Excellence in Teaching, Faculty of Computer Science, Dalhousie University (December 2013)

#### W. Ford Doolittle

- Received NSERC Gerhard Herzberg Canada Gold Medal for Science and Engineering (2013)
- Elected Member, The Norwegian Academy (2009-present)
- Institute Fellow, Canadian Institute for Advanced Research (2008-present)
- Member, U.S. National Academy of Sciences (2002-present)
- Fellow, American Academy of Microbiology (1999-present)
- Fellow, Royal Society of Canada (1991-present)
- Fellow, American Association for the Advancement of Science (1985-present)

#### Michael Gray

- Fellow, American Academy of Microbiology (2013-present)
- Fellow, Royal Society of Canada (1996-present)

#### Andrew Roger

- President, International Society for Evolutionary Protistology (2013-2014); President-Elect (2010-2012)
- Fellow, American Academy of Microbiology (2013-present)
- Fellow, Royal Society of Canada (2012-present)
- Fellow, Canadian Institute for Advanced Research - Integrated Microbial Biodiversity Program (2012-2017)
- Canada Research Chair (Tier I) in Comparative Genomics and Evolutionary Bioinformatics (2010-2017)

#### Alastair Simpson

- Fellow, Canadian Institute for Advanced Research - Integrated Microbial Biodiversity Program (2012-2017)

#### Claudio Slamovits

- Scholar, Canadian Institute for Advanced Research - Integrated Microbial Biodiversity Program (2012-2017)



## **APPENDIX A: CGEB TRAINEE FELLOWSHIPS**

### **Application Instructions and Administrative Procedures**

1. CGEB allocated Herzberg monies, to fund postdoc and graduate students working with CGEB members, are available.
2. CGEB fellowships will generally be awarded to fund the 'majority' of the stipend. PI will have to supplement the remainder of the salary (a case can be made for funding the whole stipend by the PI if other monies are not available).
  - \$35,000 p.a. for 2 years for postdoc (potentially renewable – PI has to make the case)
  - \$15,000 p.a. for 2-3 years for Masters and up to 5 years for Ph.D.
  - on average we could support 1 postdoc and 2 graduate students per year
3. CGEB fellowship/scholarship applications – consisting of CV, short supervisor's statement and copies of any recommendations supervisor has received – will be reviewed by the CGEB Steering committee (Roger, Doolittle and Gray). Submit applications to wandad@dal.ca. Applications will be considered as they arrive. Decisions to award/not award will be made based on the following criteria.
  - demonstrated excellence in academic and research performance in a field relevant to CGEB core scientific goals
  - applications that involve collaborative supervision of the trainee between more than one CGEB member or associate will be given priority
  - applications from active participants in CGEB group meetings will be given priority: our intent is to strengthen collaborations
4. Conditions of the award:
  - student/postdoc must attend all joint CGEB meetings and participate by presenting their work according to the rotating schedule
  - supervisor(s) are greatly encouraged to attend these meetings and participate as well
  - student/postdoc must apply for all competitive graduate or postdoctoral scholarships they are eligible for in the first year or two of their tenure (e.g. NSERC, CIHR, NSHRF etc). If scholarship is awarded, the CGEB scholarship can be re-allocated.
  - the PI whose trainee receives the award is greatly encouraged to engage in collaborations with other CGEB labs