

Robert Wingate Lee

Curriculum Vitae, Feb. 2011

Personal Data

Date and Place of Birth: June 11, 1942, Boston, Massachusetts

Present Address and position: Adjunct Professor
Department of Biology
1459 Oxford Street
Dalhousie University
Halifax, Nova Scotia B3H 4R2
CANADA

Education

- 1971, Ph.D., Cell Biology and Genetics, State University of New York at Stony Brook.
Dr. Raymond F. Jones, Supervisor. Dissertation: Studies on nitrosoguanidine mutagenesis in *Chlamydomonas*.
- 1966, M.A., Botany, University of Massachusetts, Amherst. Dr. Robert T. Wilce, Supervisor.
Dissertation: An ecological study of the Mould Bay, Northwest Territories, marine algae.
- 1964, B.S., Botany, University of Massachusetts, Amherst.

Fellowships

National Institutes of Health (USA) Postdoctoral Fellowship, 1972-73;
Duke University Hargitt Postdoctoral Fellowship, 1971-72;
National Institutes of Health (USA) Predoctoral Fellowship, 1968-70

Professional Experience

- 2007-2012 Adjunct Professor, Department of Biology, Dalhousie University
- 1992-2007 Professor, Department of Biology, Dalhousie University
- 1986-1987 Visiting Scientist, Departement de Biochimie, Universite Laval
- 1979-1980 Visiting Scientist, Laboratoire de Biologie Moleculaire Vegetale, Universite de Paris-XI, Orsay, France.
- 1978-1992 Associate Professor, Department of Biology, Dalhousie University
- 1973-1978 Assistant Professor, Department of Biology, Dalhousie University
- 1971-1973 Postdoctoral Fellow in the laboratory of Nicholas Gillham and John Boynton, Departments of Zoology and Botany, Duke University, Durham, North Carolina

Referred publications from the Lee laboratory

(Individuals working in the Lee lab at the time the work was done are indicated in bold).

Smith, D.R. and Lee, R.W. (2011) Nucleotide diversity of the colorless green alga *Polytomella parva* (Chlorophyceae, Chlorophyta): high for the mitochondrial telomeres, surprisingly low everywhere else. *J. Euk. Microbiol.* (in press).

Hua, J., Smith, D.R., Borza T., and Lee R.W. (2011) Similar relative mutation rates in the three genetic compartments of *Mesostigma* and *Chlamydomonas*. *Protist.* (in press).

Smith D.R., Crosby, K., and Lee RW (2011) Plastids and gene transfer: Correlation between nuclear plastid DNA abundance and plastid number supports the limited transfer window hypothesis. *Genome Biol. Evol.* 3: 365-371. (A commentary by Nick Lane *Genome Biol Evol.* 2011; 3:372-374 accompanies this article.)

Smith, D.R., Hua, J., and Lee, R.W. (2010) Evolution of linear mitochondrial DNA in three known lineages of *Polytomella*. *Curr. Genet.* 56:427-438.

Smith, D.R. and Lee, R.W. (2010) Low nucleotide diversity for the expanded organelle and nuclear genomes of *Volvox carteri* supports the mutational-hazard hypothesis. *Mol. Biol. Evol.* 27:2244-2256.

Smith, D.R., Lee, R.W., Cushman, J.C., Magnuson, J.K., Tran, D. and Polle, J.E.W. (2010) The *Dunaliella salina* organelle genomes: large sequences, inflated with intronic and intergenic DNA. *BMC Plant Biology* 10:83.

Smith D.R. (2009) Unparalleled GC content in the plastid DNA of *Selaginella*. *Plant Mol. Biol.* 71:627-639. This work was conducted in the laboratory of R.W. Lee and supported by his NSERC grant.

Borza, T., Redmond, E.K., Laflamme, M. and Lee R.W. (2009) Mitochondrial DNA in the *Oogamochlamys*-clade (Chlorophyceae): high GC content and unique genome architecture for green algae. *J. Phycol.* 45:1323-1334.

Smith, D.R. and Lee, R.W. (2009) Nucleotide diversity of the *Chlamydomonas reinhardtii* plastid genome: addressing the mutational-hazard hypothesis. *BMC Evol. Biology* 9:120.

Smith D.R. and Lee R.W. (2009) The mitochondrial and plastid genomes of *Volvox carteri*: bloated molecules rich in repetitive DNA. *BMC Genomics* 10:132.

Smith D.R. and Lee, R.W. (2008) Nucleotide diversity in the mitochondrial and nuclear compartments of *Chlamydomonas reinhardtii*: investigating the origins of genome architecture. *BMC Evol. Biol.* 8:156.

Smith D.R. and Lee, R.W. (2008) Mitochondrial genome of the colorless green alga *Polytomella capuana*: a linear molecule with an unprecedented GC content. *Mol. Biol. Evol.* 25:487-496.

- Koziol, A.G., **Borza, T.**, Ishida, K.-I., Keeling, P., Lee, R.W. and D.G. Durnford (2007) Tracing the evolution of the light-harvesting antennae in chlorophyll *a/b*-containing organisms. *Plant Physiol.*143:1-15.
- Popescu, C.E** and Lee, R.W. (2007) Mitochondrial genome sequence evolution in *Chlamydomonas*. *Genetics* 175:819-826.
- Nedelcu, A.M.¹, **Borza, T.**¹, and Lee, R.W. (2006) A plant-specific multigene family in the unicellular *Mesostigma* argues for its close relationship to Streptophyta. *Mol. Biol. Evol.* 23:1011-1015. ¹These authors contributed equally to this work.
- Popescu, C.E., Borza, T.,** Bielawski, J.P. and Lee, R.W. (2006) Evolutionary rates and expression level in *Chlamydomonas*. *Genetics* 172:1567-1576.
- Mallet, M.A.** and Lee, R.W. (2006) Identification of three distinct *Polytomella* lineages based on mitochondrial DNA features. *J. Euk. Microbiol.* 53: 79-84.
- Keeling, P.J., Burger, G., Durnford, D.G., Lang, B.F., Lee, R.W., Pearlman, R.E., Roger, A. J. and Gray, M.W. (2005) The tree of eukaryotes. *Trends Ecol. Evol.* 20: 670-676.
- Borza, T., Popescu, C.E.** and Lee, RW. (2005) Multiple metabolic roles for the nonphotosynthetic plastid of the green alga *Prototheca wickerhamii*. *Euk. Cell* 4:253-261.
- Laflamme, M.** and Lee, R.W. (2003) Mitochondrial genome conformation among CW-group chlorophycean algae. *J. Phycol.* 39: 213-220.
- Fan, J.,** Schnare, M.N. and Lee, R.W. (2003) Characterization of fragmented mitochondrial ribosomal RNAs of the colorless green alga *Polytomella parva*. *Nucleic Acids Res.* 31: 769-778.
- Fan, J.** and Lee, R.W. (2002) Mitochondrial genome of the colorless green alga *Polytomella parva*: Two linear DNA molecules with homologous inverted repeat termini. *Mol. Biol. Evol.* 19:999-1007.
- Nedelcu, A.M.** and Lee, R.W., Lemieux, C., Gray, M.W. and Burger, G. (2000) The complete mitochondrial DNA sequence of *Scenedesmus obliquus* reflects an intermediate stage in the evolution of the green algal mitochondrial genome. *Genome Res.* 10:819-831.
- Nedelcu, A.M.** and Lee, R.W. (1998) Modes and tempos of mitochondrial and chloroplast genome evolution in *Chlamydomonas*: a comparative analysis. In: Rochaix, J.-D., M. Goldschmidt-Clermont and M. Merchant (Eds.), *The Molecular Biology of Chlamydomonas: chloroplasts and mitochondria*, pp. 63-91, Kluwer Academic Publishers, The Netherlands.
- Nedelcu, A.M.** and Lee, R.W. (1998) A degenerate group II intron in the intronless mitochondrial genome of *Chlamydomonas reinhardtii*: Evolutionary implications. *Mol. Biol. Evol.* 15:918-922.
- Nedelcu, A.M.** and Lee, R.W. (1998) Short repetitive sequences in green algal mitochondrial genomes: Potential roles in mitochondrial genome evolution. *Mol. Biol. Evol.* 15:690-701

- Nedelcu, A.M.** (1998) Contrasting mitochondrial genome organizations and sequence affiliations among green algae: Potential factors, mechanisms, and evolutionary scenarios. *J. Phycol.* 34:16-28.
- Denovan-Wright, E.M., Nedelcu, A.M.** and Lee, R.W. (1998) Complete sequence of the mitochondrial DNA of *Chlamydomonas eugametos*. *Plant Mol. Biol.* 36:285-295.
- Nedelcu, A.M.** (1997) Fragmented and scrambled mitochondrial ribosomal RNA coding regions among green algae: a model for their origin and evolution. *Mol. Biol. Evol.* 14:506-517.
- Bussi eres, J., Lemieux, C., Lee, R.W., Turmel, M. (1996) Optional mobile genetic elements in the chloroplast DNAs of *Chlamydomonas eugametos* and *C. moewusii*: unidirectional gene conversions in high-viability crosses. *Curr. Genet.* 30:356-365.
- Denovan-Wright, E.M., Sankoff, D. Spencer, D.F.** and Lee, R.W. (1996) Evolution of fragmented ribosomal RNA genes in *Chlamydomonas*. *J. Mol. Evol.* 42:382-391.
- Nedelcu, A. M., Spencer, D.F., Denovan-Wright, E.M.** and Lee, R.W. (1996) Discontinuous mitochondrial and chloroplast large subunit ribosomal RNAs among green algae: phylogenetic implications. *J. Phycol.* 32:103-111.
- Denovan-Wright, E.M.** and Lee, R.W. (1995) Evidence that the fragmented ribosomal RNAs of *Chlamydomonas* mitochondria are associated with ribosomes. *FEBS Letters* 370:222-226.
- Denovan-Wright, E.M.** and Lee, R.W. (1994) Comparative structure and genomic organization of the discontinuous mitochondrial ribosomal RNA genes of *Chlamydomonas eugametos* and *Chlamydomonas reinhardtii*. *J. Mol. Biol.* 241:298-311.
- Denovan-Wright, E.M.** and Lee, R.W. (1993) *Chlamydomonas eugametos* mitochondrial genome. In Genetic Maps, 6th Edition, Book 2, Bacteria, Algae and Protozoa, S.J. O'Brien Ed., Cold Spring Harbor Press.
- Denovan-Wright, E.M.** and Lee, R.W. (1992) Comparative analysis of the mitochondrial genomes of *Chlamydomonas eugametos* and *Chlamydomonas moewusii*. *Curr. Genet.* 21:197-202.
- Lee, R.W., Dumas, C. Lemieux, C. and Turmel, M. (1991) Cloning and characterization of the mitochondrial genome of *Chlamydomonas moewusii*. *Mol. Gen. Genetics* 231:53-58.
- Lee, R.W. and **Lemieux, C.** (1990) Loss of hybrid lethality during backcross programs involving *Chlamydomonas eugametos* and *Chlamydomonas moewusii* (Chlorophyceae). *J. Phycol.* 26:376-380.
- Lee, R.W., **B. Langille, C. Lemieux** and Boer, P.H. (1980) Inheritance of mitochondrial and chloroplast genome markers in backcrosses of *Chlamydomonas eugametos* X *Chlamydomonas moewusii* hybrids. *Curr. Genet.* 17:73-76.
- Lemieux, C.** and Lee, R.W. (1987) Non-reciprocal recombination between alleles of the chloroplast 23S rRNA gene in interspecific *Chlamydomonas* crosses. *Proc. Natl. Acad. Sci. USA* 84:4166-4170.
- Lee, R.W. and **Lemieux, C.** (1986) Biparental inheritance of non-Mendelian gene markers in *Chlamydomonas moewusii*. *Genetics* 113:589-600.

- Turmel, M., G. Bellemare, R.W. Lee and Lemieux, C. (1986) A linear DNA molecule of 5.9 kilobase-pairs is highly homologous to the chloroplast DNA in the green alga *Chlamydomonas moewusii*. *Plant Mol. Biol.* 6:313-319.
- Vandermeulen, J.H. and Lee, R.W. (1986) Lack of mutagenic activity of crude and refined oil in the unicellular alga *Chlamydomonas reinhardtii*. *Bull. Env. Cont. Toxicol.* 36:250-253.
- Lemieux, C., M. Turmel**, R.W. Lee and Bellemare, G. (1985) A 21 kilobase-pair deletion/addition difference in the inverted repeat sequence of *Chlamydomonas eugametos* and *C. moewusii* chloroplast DNA. *Plant Mol. Biol.* 5:77-84.
- Boer, P.H., L. Bonen, R.W. Lee and Gray, M.W. (1985) Genes for respiratory chain proteins and ribosomal RNAs are present on a 16 kbp DNA species from *Chlamydomonas reinhardtii* mitochondria. *Proc. Natl. Acad. Sci. USA* 82:3340-3344.
- Lemieux, C., M. Turmel**, V. Seligy and Lee, R.W. (1985) The large subunit of ribulose-1,5-bisphosphate carboxylase-oxygenase is encoded in the inverted repeat sequence of the *Chlamydomonas eugametos* chloroplast genome. *Curr. Genet.* 9:139-145.
- Lemieux, C., M. Turmel**, V. Seligy and Lee, R.W. (1984) A genetical approach to the physical mapping of chloroplast genes in *Chlamydomonas*. *Can. J. Biochem. Cell Biol.* 62:225-229.
- Lemieux, C., M. Turmel**, V. Seligy and Lee, R.W. (1984) Chloroplast DNA recombination in interspecific hybrids of *Chlamydomonas*: Linkage between a nonMendelian locus for streptomycin resistance and restriction fragments coding for 16S rRNA. *Proc. Natl. Acad. Sci. USA* 81:1164-1168.
- Lemieux, C., M. Turmel** and Lee, R.W. (1982) Physical evidence for recombination of chloroplast DNA in hybrid progeny of *Chlamydomonas eugametos* and *C. moewusii*. Rosowski, J.R., Parker, B.C. (eds.), Selected Papers in Phycology II. Allen Press.
- Lemieux, C., M. Turmel** and Lee, R.W. (1981) Physical evidence for recombination of chloroplast DNA in hybrid progeny of *Chlamydomonas eugametos* and *C. moewusii*. *Curr. Genet.* 3:97-103
- Turmel, M, C. Lemieux** and Lee, R.W. (1981) Dispersive labelling of *Chlamydomonas* chloroplast DNA in ¹⁵N-¹⁴N density transfer experiments. *Curr. Genet.* 4:91-97.
- Lemieux, C., M. Turmel** and Lee, R.W. (1980) Characterization of chloroplast DNA in *Chlamydomonas eugametos* and *C. moewusii* and its inheritance in hybrid progeny. *Curr. Genet.* 2:139-147.
- Turmel, M., C. Lemieux** and R.W. Lee (1980) Net synthesis of chloroplast DNA throughout the synchronized cell-cycle of *Chlamydomonas*. *Curr. Genet.* 2:229-232.
- Lee, R.W. and **Haughn, G.W.** (1980) Induction and segregation of chloroplast mutations in vegetative cell cultures of *Chlamydomonas reinhardtii*. *Genetics* 96:79-94.
- Lee, R.W. and **Sapp, J.A.** (1978) Nuclear mutation increases streptomycin and spectinomycin sensitivity in *Chlamydomonas*. *Genetics* 88:643-650.
- Whiteway, M.S.** and Lee, R.W. (1977) Chloroplast DNA content increases with nuclear ploidy in *Chlamydomonas*. *Mol. Gen. Genetics* 157:11-15.

Lee, R.W. and Jones, R.F. (1976) Lethal and mutagenic effects of nitrosoguanidine on synchronized *Chlamydomonas*. *Mol. Gen. Genetics* 147:283-289.

Hawks, B.G. and Lee, R.W. (1976) Methyl methanesulfonate mutagenesis of synchronized *Chlamydomonas*. *Mutation Res.* 37:222-228.

Gillham, N.W., J.E. Boynton and Lee, R.W. (1974) Segregation and recombination of non-Mendelian genes in *Chlamydomonas*. *Genetics* 78:439-457.

Lee, R.W. and Jones, R.F. (1973) Induction of Mendelian and non-Mendelian streptomycin resistant mutants during the synchronous cell cycle of *Chlamydomonas reinhardtii*. *Mol. Gen. Genet.* 121: 99-108.

Lee, R.W., N.W. Gillham, K.P. Van Winkle and Boynton, J.E. (1973) Preferential recovery of uniparental streptomycin resistant mutants from diploid *Chlamydomonas reinhardtii*. *Molec. Gen. Genetics* 121:109-116.

Yentsch, C.S. and Lee, R.W. (1966) A study of photosynthetic light reactions and a new interpretation of sun and shade phytoplankton. *J. of Marine Res.* 24:319-337.

Wilce, R.T. and Lee, R.W. (1964) *Lomentaria clavellosa* in North America. *Botanica Marina* VI: 251-258.

Appointments

Associate in the Evolutionary Biology Program of the Canadian Institute for Advanced Research, ten year term, 1988 - 1997.

Member of the editorial board of the journal CURRENT GENETICS, 1985 - 2001.

Genetics Society of Canada, Eastern Director and Chair of membership committee, 1996-99.

NSERC Research Grants Selection Committee, Molecular and Developmental Genetics, 1998 - 2001.

Current Research Funding

Natural Sciences and Engineering Research Council of Canada, continuous Discovery Grant funding since 1973. Current grant period through 2012.

Selected Presentations (Since 2008 only)

(Individuals working in the Lee lab at the time work was done are indicated in bold).

D.R. Smith and R.W. Lee. 14th International conference on the cell and molecular biology of *Chlamydomonas* (Chlamy 2010). Wheaton College, Norton, Massachusetts, USA. Poster presentation: "Low nucleotide diversity for the expanded organelle and nuclear genomes of *Volvox carteri* supports the mutational-hazard hypothesis." June 2010.

D.R. Smith Canadian Society for Ecology and Evolution (CSEE), Quebec City, Canada.
Poster presentation: "Unparalleled GC content in the organelle DNA of *Selaginella*

Lee, R.W. and **D.R. Smith**. Nucleotide diversity in the mitochondrial and nuclear genomes of *Chlamydomonas reinhardtii*: investigating the origins of genome architecture. Mitochondria, ribosomes & cells: a symposium in honour of Mike Gray. Dalhousie University, Halifax, N.S., July 2008.

Smith, D.R. and R.W. Lee. Evolution of genome compactness in *Chlamydomonas*. Joint Meeting of the International Society of Protistologists and the International Society for Evolutionary Protistology, Halifax July 2008 (platform session)

Smith, D.R. and R.W. Lee The mitochondrial and chloroplast genomes of *Volvox carteri*: molecules rich in noncoding DNA that share a common repeat element with the nuclear compartment. Meeting of the International Society of Protistologists and the International Society for Evolutionary Protistology, Halifax July 2008 (poster)

Smith, D.R. Nucleotide diversity in the mitochondrial and nuclear compartments of *Chlamydomonas reinhardtii*: investigating the origins of genome architecture. Molecular Biology and Evolution Meeting, Barcelona, Spain. June 2008 (platform presentation).

Lee, R.W. Mutation rates, effective genetic population sizes, and genome architectures in *Chlamydomonas*. Department of Biology, Dalhousie University. March 2008.

Postdoctoral, Graduate & Undergraduate Students & Technicians Supervised

I. Postdoctoral Fellows

Jimeng Hua (2009-current)
Aurora M. Nedelcu (1997-98)
Eileen Denovan-Wright (1994-95)
Tudor Borza (2003-2007) July 1, 2003 to June 30, 2006, Protist Est Program

II. Graduate Students

David Smith, Ph.D student (2005-2010) Killam Scholar, Canada Graduate Scholar
Popescu, Ph.D. (2006)
Mark Laflamme, Ph.D. (2003)
Jinshui Fan, Ph.D. (2003)
Pamela Jarman, MSc (2001)
Aurora Nedelcu, Ph.D. (1997) Killam Scholar
Eileen Denovan-Wright, Ph.D. (1994) Killam Scholar
John Fenety, M.Sc.(1993)
Albert Cormier, M.Sc.(1993)
Monique Turmel, Ph.D. (1982) Killam Scholar
Claude Lemieux, Ph.D. (1981)
Bruce Hawks, M.Sc. (1975)

III. Honours B.Sc. Theses

Kabir Bhanot (2009)
Ryan Holloway (2008)
Sean Farmer (2007)
Paul Chafe (2006)
Martin Mallet (2005)
Erin Redmond (2005)
Brian Simons (2003)
Faron Friars (2001)
Pamela Jarman (1999)
Kelly Pendergast (1999)
Tamara Western (1992)
Selva Rajaraman (1984)
Peter Johnston (1983)
Jheri Wade (1983)
John Hardie (1979)
George Haughn (1978)
Sally Sharpe (1978)
Melanie Dobson (1977)
Malcolm Whiteway (1977)
Jan Sapp (1976)
Marc York (1975)

III. Undergraduate (non- Honours) Summer Students

Ahalya Rajeswaran	2006
Fredrik Thoren	1989
Ralph Bastarache	1989
Susan Laufer	1988
Leanne Byers	1988
Trevor Locke	1985
Katherine Gregg	1984
David Russell	1981
Mary Ann Carlos	1976

V. Special Topics Students (research projects)

Trudi Walsh	BIOL 4800R	1994-95
Gabriel DiMattia	BIOL 4800R	1981-82
Harvey Domsolai	BIOL 4806A, 4807B	1990-91

VI. Technicians

Alan Bland	2007
Grace Fen Yin	1992-93
Andrea Losier	1990-91
Eileen Denovan	1989-90
Carole Dumas	1986-87
Bonnie Langille	1983-86
Diane Nichol	1980-83
Caroline Reid	1973-74