2016 Curriculum Vitae

NAME: Angela Douglas
DEPARTMENT/UNIT: Entomology
TITLE: Daljit S. and Elaine Sarkaria Professor of Insect Physiology and Toxicology
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BACKGROUND

EDUCATION

Year	Degree	Institution
1981	Ph.D.	University of Aberdeen
1978	B.A.	University of Oxford

ACADEMIC RANKS (year achieved)

Personal Chair: 2003
Reader: 1999
Senior Lecturer: 1996

PRIMARY DEPARTMENTAL/Unit PROGRAM AREA

Entomology, 80% research and 20% teaching

AREAS OF EXPERTISE (key words)

Insect physiology
Nutritional physiology
Insect-microbial interactions
Symbiosis

PROFESSIONAL EXPERIENCE

Year	Experience
1985-1986	Postdoctoral Fellow at University of East Anglia, UK
1981-1985	Postdoctoral Fellow at University of Oxford, UK

HONORS AND AWARDS

2015	2015 Entomological Society of America Recognition award in Insect Physiology, Biochemistry and Toxicology
2014	College of Agriculture and Life Sciences Award for Outstanding Accomplishments in Research
2013	Sir Frederick McMaster Fellowship (CSIRO, Australia)
2013-2016	Visiting Professor at Northwest A&F University, China
2012	Al Downe Memorial Lecture, Queen's University, Canada
2011	Elected Fellow of Entomological Society of America Founders Memorial Lecture of Entomological Society of America
2009	Invited Lecture to the Darwin Celebration organized by the Society for Experimental Biology in collaboration with the Biochemical Society, British Ecological Society and UK Higher Education Academy Centre for Bioscience (Glasgow, UK)
2005-2008	BBSRC Research Fellowship
1999	Royal Society sponsored Collaborative Research Visitor to Tsukuba Institute, Japan
1986-1996	Royal Society University Research Fellowship

GRANT SUPPORT IN US (FROM AUG 2008: prior grant support in UK available on request)

Raguso RA (PI), Douglas AE and Loeb G 10/01/2015-09/30/2018
NIFA-HATCH $84,000
Identification of fruit fly volatiles for improved management of the invasive spotted wing *Drosophila*

Colvin JC (PI) and 13 sub-grantees including Douglas AE 11/01/2014-10/31/2018
Bill and Melinda Gates Foundation $10,500,000 ($528,766 to Douglas)
African cassava whitefly: outbreak causes and sustainable solutions

Douglas AE (PI) 10/01/2014-09/30/2016
AFRI-NIFA $480,000
Identification of Molecular Targets to Disrupt the Bacterial Symbiosis in Aphid Pests

Douglas AE (PI), Jaenike J and Loeb G (1/1/13-12/31/17)
NSF BIO 1241099 $1,968,342
Animal-microbial interactions as an engine of phylogenetic and functional diversity: insights from interactions between drosophilids and their resident microbiota

Jander G (PI), Douglas AE (03/01/2012-02/28/2015)
AFRI-NIFA NYW-2011-04650 $452,000
Osmoregulatory collapse to control phloem-feeding insect pests

Douglas AE (PI), Lazarro BP and Clark AG (2011-2014)
NIH (NIGMS) 1R01GM095372 $1,617,247
The protein nutrition of the symbiotic system between Drosophila and its gut microbiota

Douglas AE (PI), Jander G and van Wijk K(2009-2011)
NSF IOS-0919765 $450,000
Metabolic coupling in an obligate insect-bacterial symbiosis

Behmer S (PI), Douglas AE and Grebenok R (2010-2012)
USDA-AFRI $449,190
Control of sap-feeding insect pests by plant sterols

Douglas AE (PI) (2010-2012)
HATCH $30,000
Metabolic biomarkers for honey bee colony health and morbidity

Douglas AE (PI), Clark A and Coffroth M-A (2009)
Conversations in the Disciplines conference grant $4,814
Cooperation: self interest and mutual interest

ACADEMIC RESPONSIBILITIES

COMMITTEE ASSIGNMENTS
At Cornell

- **Department:**

2013-2014 Member of Entomology Awards Committee (Chair from 2015)

2011-2013 Member of Graduate Admissions Committee (Field of Microbiology)

2011-2012 Chair of Search Committee: tenure-track appointment in Insect Immunology

2010-2013 Member of Departmental Strategy Committee

2009-2013 Member of Departmental Executive Committee

2008-2011 Member of Graduate Admissions Committee (Field of Entomology)

- **University:**

2016-2019 Faculty Committee on Program Review

2014-2015 Member of Search Committee for Director of Baker Institute

2012-2016 Member of Cornell University Press Science Faculty Board

2012-2016 Member of Life Sciences Advisory Committee (chair from August 2013)

2011-2013 Member of Local Action Committee

- **External**

2014 External reviewer of Department of Entomology, Iowa State University
2014-18 Member of Steering Committee and Conference Committee of NSF Research Coordination Network on Insect Genetic Technologies

RESEARCH RESPONSIBILITIES

Current Postdoctoral Associates (list names)

Karen Adair (from Jan 2016)
Nana Ankrah (from Aug 2015)
Alyssa Bost (from May 2014)
Bessem Chouaia (from September 2014)
Seung Ho Chung (from October 2014)
Junbo Luan (from August 2013)
Yuan Luo (from October 2014)

Past Postdoctoral Associates (list names and dates)

2013-2015 Jia-Hsin Huang
2013-2014 Soeren Franzenburg
2012-2015 Xiangfeng Jing
2012-2014 Adam Dobson
2011-2014 Peter Newell
2011-2014 John Chaston
2011-2013 Sophie Bouvaine
2010-2011 George Lin
2009-2010 John Ramsey
2008-2012 Sandy MacDonald
2006-2008 Bruce Weber
2008-2009 Eylem Gunduz
2004-2006 Kelly Pescod
1999-2003 Cindy Birkle
1998-2002, 1994-1997 Tom Wilkinson

Other Recent Relevant Research Activities, Accomplishments

Conference/workshop organizer

2017-19 Co-organizer of Gordon Congerence on Ecological and Evolutionary Genetics

2016 Co-organizer of plenary session Metabolism of Host-Bacterial Interactions, Annual Meeting of American Society of Microbiology
Co-organizer of workshop on transgenic technologies at Annual meeting of Arthropod Genomics (with Kristin Michel)

2016 Co-Convener for a section on *Insect Immunity* at International Congress of Entomology (ICE) 2016 Orlando, Florida, USA

2015-16 Convenor of Biology without Borders Lecture Series at Cornell University

2014 Co-organizer of Hemiptera Day (with Georg Jander and Michelle Cilia) (December 3rd)
Co-organizer of Program Symposium The Future of Insect Genomics at Annual Meeting of Entomological Society of America (with Kristin Michel and David O'Brochta) (November 16-19)
Co-organizer of Nanoempires in New York: Microbes in Health and Disease (with Sabine Ehrt (Weill Cornell Medical College) (November 6)
Co-organizer of 5th Beneficial Microbes Conference, American Society for Microbiology (with Rob Knight) (September 27-30)
Organizing Committee Member of 7th International Symposium on Molecular Insect Science, Amsterdam (July 13-16)
Host of week visit of PCCW A.D.White Professor at Large, Professor Margaret McFall Ngai

Recent Invited conference presentations

2016 Annual Meeting of the Microbiology Society, UK: Insights from within: current understanding of microbial interactions with insects.
Nutritional Homeostasis Workshop, Bonn, Germany
MetaOrganisms, Kiel, Germany

2015 Annual Symposium of the Gates Cassava Whitefly Project, London, UK
Entomological Society of America Annual Meeting, PBT Section Symposium: Water and Ion Homeostasis-Role of Aquaporins and Other Channel Proteins Minneapolis, MN
Keystone Symposium on The Arthropod Vector: The Controller of Transmission, Taos, New Mexico
Frontiers in Host Microbe Interactions, MBA Woods Hole
Gordon Conference on Ecological and Evolutionary Genomics, Biddeford, MA
German Society for Microbiology Annual Meeting, Marburg, Germany
6th Congress of European Microbiologists, Maastricht, Netherlands

Gordon Conference on Animal-Microbe Symbioses, Waterville Valley, NH
Development and Symbiosis Conference, University of Minnesota, Minneapolis

International Joint Meeting of the German Society for Cell Biology (DGZ) and the German Society for Developmental Biology (GfE) at Heidelberg, Germany. Symposium "Lateral gene transfer & Evolution of symbiosis" organized by Thomas Bosch

Public workshop on "Microbial Etiology in States of Health and Disease" organized by David Relman, James Hughes and Lonnie King, at The Forum on Microbial Threats organized by The Institute of Medicine of the National Academies (Washington DC)

Gordon Research Conference on Plant-Herbivore Interactions (The Changing Face of Plant-Herbivore Studies), Ventura, California

Recent Invited Research Seminars

2016 School of Integrated Plant Science, Cornell University
Stickland Memorial Lecture at University of Alberta, Edmonton
Department of Entomology, North Carolina State University: Mike Duke Memorial Lecture, graduate student invitation
Bayer Crop Science, Monheim, Germany

2015 Department of Entomology/Department of Microbiology University of Georgia
Kansas State University
University of Pennsylvania
Population Biology, Ecology and Evolution Graduate Program, Emory University
Evolution Group, Cornell University
Department of Microbiology, Cornell University

2012 Department of Molecular Biology & Genetics, Cornell
Program in Infection and Pathobiology, Cornell University
University of California at Riverside, USA
Pennsylvania State University, USA
Iowa State University, USA
Ohio State University, USA
Department of Plant Pathology, Cornell University
Al Downe Memorial Lecture, Queen's University, Kingston, Ontario

Recent Outreach activities

2015-17 Workshop on bacterial genomes (2 x one week) for local higher education institutions, in collaboration with Corning Community College and Mansfield University, Pennsylvania

2013 "Chats in the Stacks" book talk about The Insects: Structure and Function 5e (edited by S.J. Simpson and A.E. Douglas
Insectapalooza: Department of Entomology Open Day. Organizer of laboratory exhibit for general public

2012 2 x Discussion session on animal-microbial interactions Cornell Institute for Biology Teachers
Insectapalooza: Department of Entomology Open Day. Organizer of laboratory exhibit for general public

TEACHING AND ADVISING RESPONSIBILITIES (*current is required; past is optional)*
Responsibilities at Cornell University (2008-present) are provided. Previous responsibilities available on request

- **Courses Taught (course number and name)**

2016 ARTH 4151: Topics in Media Art: one lecture and lab visit for students
Graduate course BIOMG7810: Problems in Genetics and Development: one session

2015 Graduate course BIOMG7810: Problems in Genetics and Development: one session
Graduate course ENTOM7670: Professional Development in Entomology: one session
Insect Physiology: (4830): 20 lectures and linked labs/projects

2014 Chemical Ecology (3690): 3 lectures
Graduate course BIOMG7810: Problems in Genetics and Development: one session

2013 Insect Physiology (4830): 20 lectures and linked labs/projects
Insect Physiology at UC Davis, skype discussion for one session in collaboration with Dr Walter Leal, Department of Entomology, University of California, Davis
Graduate course BIOMG7810: Problems in Genetics and Development: one session

2012 PLPA4480/BioMi4480 Symbiotic Associations: Evolution and Ecology (one lecture)
ENTOM 7670 Current Topics in Entomology: one session
BIOMG7810 Problems in Genetics and Development: one session

2011 Insect Physiology (4830): 20 lectures and linked labs/projects
Chemical Ecology (3690): 3 lectures
ENTOM 7670 Current Topics in Entomology: one session

2010 Symbiotic Associations: Evolution and Ecology (PLPA4480/BIOMI4480): one lecture
ENTOM 7670 Current Topics in Entomology: 1 lecture

2009 Insect Physiology (4830) class: 18 lectures and linked labs/projects
ENTOM 7670 Current Topics in Entomology: 1 lecture

2008 2008 Invertebrate Pathology (4630): 1 lecture
ENTOM 7670 Current Topics in Entomology 1 lecture

Cornell Undergraduate Students Mentored in Independent Research (list names)

2012-2015 Dan Kim
2014-2015 Nathan Winans
2011-2012 Michael Garvey

Current Student Organizations for Which You Served as Faculty Advisor (list organizations)

2011- 2013 Faculty Advisor for the Graduate Women in Science

Undergraduate Advisees (list names)

2015- Ari Grele
2014- Elias Diakolios
2010-2014 Stephen Pecylak
2010-2012 Enrico Bonatti
2009-2013 Dylan Beal

GRADUATE FIELD MEMBERSHIPS

Entomology
Microbiology
Genetics, Genomics and Development
Nutrition

GRADUATE STUDENTS

- **Total Completed (names and dates)**

A Wong 2013
C Russell 2013
E van Fleet 2011
E Ridley 2011
S Bouvaine 2010
R Vega 2010
R Madison 2008
CLMJ Francois 2007
SH Taylor 2006

GRADUATE MINORS

- **Current (names and expected date and field of degree)**

Christina Akoh (Cornell) Nutritional Sciences 2016

- **Recently completed**

Prasit Deewatthanawong (Cornell) Entomology 2012

Morgan Mouchka (Cornell) Ecology & Evolutionary Biology 2013
Angus Chandler (Department of Evolution and Ecology at UC Davis) 2013
Geraldine Ryan (School of Environmental Sciences, University of Guelph) 2014
Virginia Howick (Cornell) Entomology 2015
Rebecca Duncan (Biological Sciences, University of Florida) 2016

OTHER CURRENT PROFESSIONAL ACTIVITIES

(*current is required; past is optional)*

PROFESSIONAL SOCIETIES

Royal Entomological Society
International Symbiosis Society
Entomological Society of America
American Society for Microbiology

PROFESSIONAL HONORARIES

Fellow of the Royal Entomological Society
Fellow of the Entomological Society of America

EDITORIAL BOARDS

Guest Editor for volume on Microbial Symbionts in Current Opinion in Insect Science 2014
Applied and Environmental Microbiology Jan 2014- Dec 2016
Journal of Chemical Ecology Jan 2014-Dec 2018
Annual Reviews of Entomology Nov 2013-Oct 16
Journal of Insect Physiology
Physiological Entomology

RECENT RESEARCH AND EXTENSION GRANT REVIEW PANELS

2015 NIH Panel member for NIMH RFA on Gut-Microbiome-Brain Interactions and Mental Health, held on 11 March 2015
AFRI Competitive Grant Program A1111 Plant Associated Insects and Nematodes held on 15-18 September 2015
2013 National Institute of General Medical Sciences [NIGMS] Review Panel for Dynamics of Host-Associated Microbial Communities June 18th
2011 National Institute of General Medical Sciences [NIGMS] Review Panel for Dynamics of Host-Associated Microbial Communities June 27-28
2010 Integrative Organismal Systems Proposal Review Panel for the Physiological and Structural Systems Cluster 31 March-2 April
Insect Pollinators Initiative Panel, BBSRC (UK) 24-25 May

Refereed Publications

(past 10 years)

- For publications after June 2016, please refer to website at http://www.angeladouglaslab.com/publications.html)

217. Luan JB, Shan H-W, Isermann P, Huang J-H, Lammerding J, Liu S-S and Douglas AE in press. Cellular and molecular remodeling of a host cell for vertical transmission of bacterial symbionts. *Proceedings of the Royal Society of London B*, in press.

216. Overend G, Luo Y, Henderson L, Douglas AE and Dow JAT. in press. Molecular mechanism and functional significance of acid generation in the Drosophila midgut. *Scientific Reports* 6, 27242.

215. Douglas AE and Werren JH, 2016. Holes in the hologenome: why host-microbial symbioses are not holobionts *mBio* 7, e02099-15.

214. Koyle ME, Veloz M, Judd A, Wong A C-N, Newell PD, Douglas AE and Chaston JM. 2016. Rearing the fruit fly *Drosophila melanogaster* under axenic and gnotobiotic conditions. J*ournal of Visualized Experiments,* in press.

213 Jing XF, White TA, Luan J, Jiao C, Fei Z and Douglas AE, 2016. Evolutionary conservation of candidate osmoregulation genes in plant phloem-sap feeding insects. *Insect Molecular Biology* 25, 251-8.

212. Chaston JM, Dobson AJ, Newell PD and Douglas AE 2016. Host genetic control of the microbiota mediates *Drosophila* nutritional phenotype. *Applied and Environmental Microbiology* 82, 671-9. Journal Spotlight

211. Luan J, Chen W, DK, Simmons AM, Wintermantel WM, Ling K-S, Fei Z, Liu S-S and Douglas AE 2015. Metabolic coevolution in the bacterial symbiosis of whiteflies and related plant sap-feeding insects. *Genome Biology and Evolution* 15, 2635-47.

210. Huang J-H and Douglas AE 2015. Consumption of dietary sugar by gut bacteria determines *Drosophila* lipid content. *Biology Letters* 11, 20150469.

209. Wong C-N*, Luo Y*, Jing X, Franzenburg S, Bost A and Douglas AE 2015. The host as driver of the microbiota in the gut and external environment of *Drosophila melanogaster*. *Applied and Environmental Microbiology* 81, 6232-6240. [*Joint first authors].

208. Tzin V, Yang X, Jing X, Zhang K, Jander G and Douglas AE 2015. RNA interference against gut osmoregulatory genes in phloem-feeding insects. *Journal of Insect Physiology* 79, 105-112.

207. Lin XL, Pan QJ, Tian HG, Douglas AE and Liu TX 2015. Bacteria abundance and diversity of different life stages of *Plutella xylostella* (Lepidoptera: Plutellidae) revealed by bacteria culture-dependent and PCR-DGGE methods. *Insect Science* 22, 375-85.

206. Huang JH*, Jing X* and Douglas AE 2015. The multi-tasking gut epithelium of insects. *Insect Biochemistry and Molecular Biology* 67, 15-20. [*Joint first authors]

205. Jing X, White TA and Douglas AE 2015. The molecular correlates of organ loss: the case of insect Malpighian tubules. *Biology Letters* 11, 20150154.

204. Douglas AE 2015. Symbiotic mutualisms: special issues. In *Mutualism*, ed. J. Bronstein, pp.20-34. Oxford University Press.

203. Dobson AJ*, Chaston JM*, Newell PD, Donahue L, Hermann SL, Sannino DR, Westmiller S, Wong C-N, Clark AG, Lazzaro BP and Douglas AE 2015. Host genetic determinants of microbiota-dependent nutrition revealed by genome-wide analysis of *Drosophila melanogaster*. *Nature Communications* 6, 6312. [*Joint first authors]

202. Douglas AE 2015. The multi-organismal insect: diversity and function of resident microorganisms**.** *Annual Review of Entomology* 60, 17-34.

201. Raguso R, Agrawal AA, Douglas AE, Jander G, Kessler A, Poveda K and Thaler JS 2015. The raison d'etre of chemical ecology. *Ecology* 96, 617-630.

200. Newell PD, Chaston JM, Yang Y, Winans NJ, Sannino DR, Wong C-N, Dobson AJ, Kagle J and Douglas AE 2014. In vivo function and comparative genomic analyses of the Drosophila gut microbiota identify candidate symbiosis factors. *Frontiers in Microbiology* 5, 576.

199. Chaston JM*, Newell PD* and Douglas AE 2014. Metagenome-wide association of microbial determinants of host phenotype in *Drosophila melanogaster*. *MBio* 5, e01631-14. [*Joint first authors]

198. Douglas AE 2014. Molecular Dissection of Nutrient Exchange at the Insect-Microbial Interface. *Current Opinion in Insect Science* 4, 23-28.

197. Russell CW, Poliakov A, Haribal M, Jander G, van Wijk K and Douglas AE 2014. Matching the supply of bacterial nutrients to the nutritional demand of the animal host. *Proceedings of the Royal Society* B, 281, 20141163.

196. Douglas AE 2014. The molecular basis of bacterial-insect symbiosis. *Journal of Molecular Biology* 426, 3830-7.

195. Wong C-N*, Dobson AJ* and Douglas AE 2014. Gut microbiota dictates the metabolic response of *Drosophila* to diet. *Journal of Experimental Biology* 217, 1894-1901[*Joint first authors]

194. Jing X, Wong C-N, Chaston JM, McKenzie CL, Colvin J and Douglas AE 2014. The bacterial communities in plant phloem sap feeding insects. *Molecular Ecology* 23, 1433-1444.

193. Douglas AE, 2014. Symbiosis as a general principle in eukaryotic evolution. In Origin and Evolution of Eukaryotes (eds Patrick Keeling and Eugene Koonin). *Cold Spring Harbor Perspectives in Biology* 6, a016113.

192. Bouvaine S, Faure M-L, Grebenok RJ, Behmer ST and Douglas AE 2014. A dietary test of putative deleterious sterols for the aphid *Myzus persicae. PLoS One* 9, e86256.

191. Newell PD and Douglas AE 2014. Among-species interactions determine the impact of gut microbiota on nutrient allocation in *Drosophila melanogaster*. *Applied and Environmental Microbiology* 80, 788-796. Journal Spotlight

190. Douglas AE and Dobson AD 2013. Animal communication mediated by microbes: fact or fantasy? *Journal of Chemical Ecology* 39, 1149.

189. Scott JG, Michel K, Bartholomay L, Siegfried B, Hunter WB, Smagghe G, Zhu KY and Douglas AE 2013. Towards the elements of successful RNAi. *Journal of Insect Physiology* 59, 1212-1221.

188. Russell, CW, Bouvaine S, Newell PD and Douglas AE 2013. Shared metabolic pathways in a coevolved insect-bacterial symbiosis. *Applied and Environmental Microbiology* 79, 6117-23.

187. Douglas AE 2013. Microbial brokers of insect-plant interactions revisited. *Journal of Chemical Ecology* 39, 952-61.

186. MacDonald SJ, Thomas GH and Douglas AE 2013. Nitrogen recycling by metabolic pathways shared between and animal and its symbiotic bacteria. *The Biochemist* 35, August.

185. Wong C-N*, Chaston JM* and Douglas AE 2013. The inconstant gut microbiota of *Drosophila* species revealed by 16S rRNA gene analysis. *The ISME Journal* 7, 1922-32. [*joint first authors]

184. Ridley EV, Wong C-N and Douglas AE 2013. Microbe-dependent and non-specific effects of procedures to eliminate the resident microbiota

from *Drosophila melanogaster*. *Applied and Environmental Microbiology* 79, 3209-14.

183. McFall-Ngai M, Hadfield, MG, Bosch TCG, Carey HV, Domazet-Loso T, Douglas AE, Dubilier N, Eberl G, Fukami T, Gilbert SF, Hentschel U, King N, Kjelleberg S, Knoll AH, Kremer N, Mazmanian SK, Metfalf JL, Nealson K, Pierce NE, Rawls JF, Reid A, Ruby EG, Rumpho M, Sanders J, Tautz D, Wernegreen JJ 2013. Animals in a bacterial world: a new imperative for the life sciences. *Proceedings of the National Academy of Sciences USA* 110, 3229-36.

182. Karasov WH and Douglas AE 2013. Gastrointestinal Physiology. In *Comprehensive Physiology*, pp. 741-783. John Wiley & Sons, and American Physiological Society.

181. Simpson SJ and Douglas AE 2012. *The Insects – Structure and Function*. Cambridge University Press.

180. Bouvaine S, Behmer ST, Lin GG, Faure M-L, Grebenok RJ and Douglas AE 2012. The physiology of sterol nutrition in the pea aphid *Acyrthosiphon pisum*. *Journal of Insect Physiology* 58, 1383-9.

179. Aronstein KA, Saldivar E, Vega R, Westmiller S and Douglas AE 2012. How *Varroa* parasitism affects the immunological and nutritional status of the honey bee, *Apis mellifera*. *Insects* 3, 601-615.

178. Douglas AE 2012. "Can't live without you": essential animal-bacterial relationships. Microbe 7, 273-277.

177. Ridley EV, Wong C-N, Westmiller S and Douglas AE 2012. Impact of the resident microbiota on the nutritional phenotype of *Drosophila melanogaster*. PLoS One, 7, e36765.

176. Macdonald SJ, Lin GG, Russell CW, Thomas GH and Douglas AE 2012. The central role of the host cell in symbiotic nitrogen metabolism. *Proceedings of the Royal Society* B 279, 2965-2973.

175. Chaston J and Douglas AE 2012. Making the most of Omics for symbiosis research. *Biological Bulletin* 22, 21-29.

174. Wallace IS, Shakesby AJ, Hwang JH, Choi WG, Martinkova N, Douglas AE and Roberts DM 2012. *Acyrthosiphon pisum* AQP2: a multifunctional insect aquaglyceroporin. *Biochimica et Biophysica Acta – Biomembranes* 1818, 627-635.

173. Taylor, SH, Parker WE and Douglas AE 2012. Patterns in aphid honeydew production and parallel diurnal shifts in phloem sap composition. *Entomologia Experimentalis et Applicata* 142, 121-129.

172. Douglas AE 2011. Is the regulation of insulin signaling multi-organismal? *Science Signaling* 4, pe46.

171. Douglas AE 2011. Lessons from studying insect symbioses. *Cell Host Microbe* 10, 359-367.

170. Wong CN, Ng P and Douglas AE 2011. Low diversity bacterial community in the gut of the fruitfly *Drosophila melanogaster*. *Environmental Microbiology* 13, 1889-1900.

169. Vellozo AF, Véron AS, Baa-Puyoulet P, Huerta-Cepas J, Cottret L, Febvay G, Calevro F, Rahbé Y, Douglas AE, Gabaldón T, Sagot MF, Charles and Colella S 2011. CycADS: an annotation database system to ease the development and update of BioCyc databases. *Database* (Oxford) Apr 7, bar008

168. Poliakov A, Russell CW, Ponnala L, Hoops HJ, Sun Q, Douglas AE, van Wijk KJ 2011 Large-scale label-free quantitative proteomics of the pea aphid-*Buchnera* symbiosis. *Molecular and Cellular Proteomics* 10, M10.007039

167. Macdonald SJ, Thomas GH, Douglas AE.2011. Genetic and metabolic determinants of nutritional phenotype in an insect-bacterial symbiosis. *Molecular Ecology* 20, 2073-2084.

166. Bouvaine S, Boonham N, Douglas AE 2011. Interactions between a luteovirus and the GroEL chaperonin protein of the symbiotic bacterium *Buchnera aphidicola*. Journal of General Virology 92, 1467-74.

165. Behmer ST, Grebenok RJ and Douglas AE 2011. Plant sterols and host plant suitability for a phloem-feeding insect. *Functional Ecology* 25, 484-491.

164. Douglas AE, Bouvaine S and Russell R 2011. How the insect immune system interacts with an obligate symbiotic bacterium. *Proceedings of the Royal Society* B 278, 333-8

163. Douglas AE 2010. *The Symbiotic Habit.* Princeton University Press.

162. The International Aphid Genomics Consortium 2010. Genome sequence of the pea aphid *Acyrthosiphon pisum*. *PLoS Biology* 8, e1000313.

161. Wilson ACC, Ashton PD, Calevro F, Charles H, Colella S, Febvay G, Jander G, Kushlan P, Macdonald SA, Schwartz J, Thomas GH and Douglas AE 2010. Genomic insight into the amino acid relations of the pea aphid *Acyrthosiphon pisum* with its symbiotic bacterium *Buchnera aphidicola. Insect Molecular Biology* 19, S2, 249-258

160. Ramsey JS, MacDonald SJ, Jander G, Nakabachi A, Thomas GH and Douglas AE 2010. Genomic evidence for complementary purine metabolism in the pea aphid *Acyrthosiphon pisum* and its symbiotic bacterium *Buchnera aphidicola*. Insect Molecular Biology 19, S2, 241-248

159. Price DRG, Tibbles K, Shigenobu S, Smertenko A, Russell CW, Douglas AE, Fitches E, Gatehouse AMR and Gatehouse JA 2010. Sugar transporters of the major facilitator superfamily in aphids; from gene prediction to functional characterization. *Insect Molecular Biology* 19, S2, 97-112.

158. Wang Y, Carolan JC, Hao, F-H, Nicholson, J, Wilkinson TL and Douglas AE 2010. Integrated metabonomic-proteomic analysis of an insect-bacterial symbiotic system. *Journal of Proteome Research* 9, 1257-1267

157. Hazell SP, Neve BP, Groutides C, Douglas AE, Blackburn TM and Bale JS 2010. Hyperthermic aphids: insights into behaviour and mortality. *Journal of Insect Physiology* 56, 123-131.

156. Hawkes CV, Douglas AE and Fitter AH 2010. Origin, local experience and the relative impact of biotic interactions on native and introduced *Senecio* species. *Biological Invasions* 12, 113-124.

155. Douglas AE 2009. Mutualism and Commensalism: endosymbionts and intracellular parasites. In *Encyclopedia of Microbiology* (3rd edition) (eds Martin Alexander, Barry R. Bloom, David A. Hopwood, Roger Hull, Barbara H. Iglewski , Allen I. Laskin, Stephen G. Oliver, Moselio Schaechter, William C. Summers, Joshua Lederberg), pp. 128-141. Academic Press.

154. Bermingham J, Rabatel A, Calevro F, Viñuelas J, Febvay G, Charles H, Douglas AE and Wilkinson TL 2009. Impact of host developmental age on the transcriptome of the symbiotic bacterium *Buchnera aphidicola* in the pea aphid *Acyrthosiphon pisum*. *Applied and Environmental Microbiology* 75, 7294-7

153. Douglas AE 2009. Honeydew. In Encyclopedia of Insects (eds Resh VH and Cardé RT), p. 461-463. Academic Press.

152. Carolan, JC, Fitzroy CF, Douglas AE and Wilkinson TL 2009. The proteome of pea aphid saliva characterized by LC/MS-MS. *Proteomics* 9, 2457-2467.

151. Thomas GH, Zucker J, Macdonald AJ, Sorokin A, Goryanin I and Douglas AE 2009. A fragile metabolic network adapted for cooperation in the symbiotic bacterium *Buchnera aphidicola*. *BMC Systems Biology* 3, 24.

150. Gündüz, EA and Douglas AE 2009. Symbiotic bacteria enable insect to utilise a nutritionally-inadequate diet. *Proceedings of the Royal Society* B 276, 987-991.

149. Douglas AE 2009. The microbial dimension in insect nutritional ecology. *Functional Ecology* 23, 38-47.

148. Shakesby AJ, Wallace IS, Isaacs HV, Pritchard J, Roberts DM and Douglas AE 2009. A water-specific aquaporin involved in aphid osmoregulation. *Insect Biochemistry and Molecular Biology* 39, 1-10.

147. Douglas AE 2008. Conflict, cheats and persistence of symbioses. *New Phytologist* 177, 849-858.

146. Fitches E, Wiles D, Douglas AE, Hinchcliffe G, Audsley N and Gatehouse JA, 2008. The insecticidal activity of recombinant garlic lectins towards aphids. *Insect Biochemistry and Molecular Biology* 38, 905-915.

145. Chandler SM, Wilkinson TL and Douglas AE 2008. Impact of plant nutrients on the relationship between a herbivorous insect and its symbiotic bacteria. *Proceedings of the Royal Society* B 275, 565-570.

144. Venn, AA, Loram JE, Trapido-Rosenthal HG, Joyce DA and Douglas AE 2008. The importance of time and place: patterns in abundance of *Symbiodinium* clades A and B in the tropical sea anemone. *Biological Bulletin* 215, 243-252.

143. Venn AA, Loram JE and Douglas AE 2008. Photosynthetic symbioses in animals. *Journal of Experimental* Botany 59, 1069-1080.

142. Pescod KV, Quick WP & Douglas AE 2007. Aphid responses to plants with genetically manipulated phloem nutrient levels. *Physiological Ent*omology 32, 253-258.

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PROFESSIONAL OVERVIEW AND OBJECTIVES

I am interested in the interactions between animals and beneficial microorganisms. My research focuses on: (1) *Drosophila*-gut microbe interactions: the taxonomic and functional diversity of the gut microbiota, and the host and microbial genes that define the impact of the microorganisms on host phenotype, especially nutritional function. Our purpose is to use this association, as a general model system for animal-gut microbe interactions. (2) Obligate intracellular symbioses, especially in plant sap-feeding insects: metabolite exchange between the host cell and intracellular bacteria, and the immune functions of the host that regulate bacterial abundance. We are motivated by the fundamental problem of how the bacteria have become integrated into the insect system, and by the potential of key symbiosis genes as targets for insect pest management.