

Bryony C. Bonning, Ph.D.

Professor of Entomology
Davies, Fischer and Eckes Eminent Scholar Chair
Director, NSF I/UCRC Center for Arthropod Management Technologies

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Research, Teaching and Administration Programs

Research: Bonning conducts fundamental and applied research on insect physiology and insect pathology with the goal of developing novel, environmentally benign alternatives to chemical insecticides for management of insect pests and insect transmitted disease. Research has included insect virus discovery, the genetic optimization of insect viruses for pest management, plant virus transmission blocking strategies and insecticidal toxins derived from *Bacillus thuringiensis*.

Administration: As inaugural director of the NSF Industry / University Cooperative Research Center, the Center for Arthropod Management Technologies (CAMTech; established August 2013), Bonning oversees the operation of the center, the mission of which is to streamline the efforts of industry, government and academia toward development of technologies for effective management of arthropod and nematode pests. Fundamental research within the center is aligned with the needs of industry to expedite the delivery of new tools for pest management.

Education:

1985 to 1988 Department of Entomology, London School of Hygiene and Tropical Medicine, University of London, UK Ph.D thesis (January 1989): Acetylcholinesterase and insecticide resistance in mosquitoes. Supervisor: Dr. Janet Hemingway, NAS. Sponsored by Sumitomo Chemical Co., Japan

1982 to 1985 Van Mildert College, University of Durham, UK. B.Sc. Hons. in Zoology (2i). Specialization in Entomology and Neurobiology. Research project: Efficacy of Juvenile Hormone Analogues for Control of *Callosobruchus maculatus* and *Locusta migratoria*.

Professional Experience:

2013 to present Director, NSF I/UCRC, Center for Arthropod Management Technologies
2017 to present Davies, Fischer and Eckes Eminent Scholar Chair and Professor,
Department of Entomology and Nematology, University of Florida

2017 to present Affiliate Professor, Department of Entomology, Iowa State University

2005 to 2017 Professor, Department of Entomology, Iowa State University

2000 to 2005 Associate Professor, Department of Entomology, Iowa State University

1994 to 2000 Assistant Professor, Department of Entomology, Iowa State University

1990 to 1994 Postdoctoral Research Associate. Departments of Entomology and Environmental Toxicology, University of California, Davis, USA. Genetic engineering and optimization of baculovirus insecticides. Laboratory of Dr. Bruce D. Hammock, NAS.

1989 to 1990 Visiting member of Wolfson College, University of Oxford, UK.

1989 to 1990 Higher Scientific Officer, NERC Institute of Virology and Environmental Microbiology, Oxford, UK. Genetic engineering of baculovirus insecticides. Laboratory of Dr. Robert D. Possee.

1987 to 1988 Field work on detection and monitoring of insecticide resistance mechanisms in

mosquitoes, funded by the Overseas Development Administration. (Four months) Anti-Malaria Campaign, Colombo, Sri Lanka.

- 1986 Institut National de la Recherche Agronomique, Antibes, France
Purification and characterization of acetylcholinesterase in mosquitoes and houseflies with Drs. J.B. Bergé and D. Fournier. (Two months)
- 1984 Regional monitoring and field trials for biological or chemical control of arthropod and nematode pests. (Two months). Department of Entomology, Ministry of Agriculture, Fisheries and Food, Agricultural Development and Advisory Service, Shardlow, Derbyshire, UK.

Honors and Awards

- 2016 ISU Outstanding Achievement in Research Award
- 2016 ISU College of Agriculture and Life Sciences Outstanding Achievement in Research Award
- 2015 Rossmann Manatt Faculty Development Award, ISU for an exceptional level of creativity and productivity in scholarship, teaching and research
- 2013 Fellow of the Entomological Society of America
- 2013 Nan-Yao Su Award for Innovation and Creativity in Entomology
- 2011 Iowa Technology Association, Iowa Women of Innovation Award for Research Innovation and Leadership
- 2010 Fellow of the American Association for the Advancement of Science
- 2008 One of twelve honorees "Women Impacting Iowa State University 2008", awarded by Carrie Chapman Catt Center for Women and Politics
- 2007 Entomology Graduate Student Organization Recognition Award for commitment and dedication to the department and its members
- 2004 Iowa State University Bailey Research Career Development Award
- 1994 to present

Member of numerous USDA and NSF grant review panels

Invited speaker (82 presentations) including Patton Lecture in Insect Physiology at Cornell University and Ted Hopkins Distinguished Colloquium Speaker at Kansas State University, plenary lecture at the International Symposium on Molecular Insect Science, symposium talks at the annual meetings of the Entomological Society of America, Society for Invertebrate Pathology, and American Chemical Society.

Professional Memberships

- American Association for the Advancement of Science
- American Society for Microbiology
- American Society for Virology
- Entomological Society of America

Committees Served & Offices Held:

- Student contest judge
- Symposium organizer

Member, International Congress of Entomology organizing committee, section convenor and co-organized two symposia (2016)

Iowa State University Osborn Research Club

Committees Served & Offices Held:

- 2007 to 2010 Steering Committee

Royal Entomological Society of London (1985 to 2005)

Society for Invertebrate Pathology

Committees Served & Offices Held:

1995	Established the Virus Division
1995 to 1997	Member at Large for Virus Division
2002 to 2011	Awards and Student Contest Committee
2006 to 2008	Council Trustee
2006 to 2008	Chair Elect, Virus Division
2008 to 2010	Chair, Virus Division
2007 to 2008	Program Chair, 41 st Annual meeting of the Society for Invertebrate Pathology, held in Warwick, UK, August 2008
2004 to 2005	Program Chair, 38 th Annual meeting of the Society for Invertebrate Pathology, Anchorage, Alaska, August 2005
2010 to present	Publications Committee

International Committee on Taxonomy of Viruses

Committees Served & Offices Held:

2002 to 2011	Baculovirus Study Group
2009 to 2011	Dicistrovirus Study Group; Iflavirus Study Group

RESEARCH***Publications***

A total of 140 publications (92 refereed journal articles, 23 refereed reviews, 25 book chapters)

Refereed Journal Articles in reverse chronological order; * indicates mentee

92. Kemmerer, M., **Bonning, B.C.** Transcytosis of Junonia coenia densovirus VP4 across the gut epithelium of *Spodoptera frugiperda* (Lepidoptera: Noctuidae). *Insect Science* (in press)
91. Lomate, P.R., **Bonning, B.C.** 2018. Proteases and nucleases involved in the biphasic digestion process of the brown marmorated stink bug, *Halyomorpha halys* (Hemiptera: Pentatomidae). *Arch Insect Biochem Physiol* (in press) doi: 10.1002/arch.21459
90. Liu, S., Chen, Y., Sappington, T.W., **Bonning, B.C.** 2017. Genome Sequence of a Small RNA Virus, *Diabrotica virgifera virgifera* virus 2, a Novel Virus of the Western Corn Rootworm, *Diabrotica virgifera virgifera* LeConte. *Genome Announcements* 5(20). pii: e00365-17. doi: 10.1128/genomeA.00365-17.
89. Liu, S., Chen, Y., Sappington, T.W., **Bonning, B.C.** 2017. Genome Sequence of a Novel Positive Sense, Single-Stranded RNA Virus Isolated from Western Corn Rootworm, *Diabrotica virgifera virgifera* LeConte. *Genome Announcements* 5(20). pii: e00366-17. doi: 10.1128/genomeA.00366-17
88. Adema, C.M. et al. (Bonning, B.C. 19th of 117 authors) 2017. Whole genome analysis of a schistosomiasis-transmitting freshwater snail. *Nature Communications* 8:15451. doi: 10.1038/ncomms15451.
87. Feng, Y., Krueger, E.N. Liu*, S., Dorman, K., **Bonning, B.C.**, Miller, W.A. 2017. Discovery of known and novel viral genomes in soybean aphid by deep sequencing. *Phytobiomes* 1(1): 36-45 <https://doi.org/10.1094/PBIOMES-11-16-0013-R>
86. Liu, S., Chen, Y., Sappington, T.W., **Bonning, B.C.** 2017. Genome sequence of the first coleopteran iflavirus isolated from western corn rootworm, *Diabrotica virgifera virgifera* LeConte. *Genome Announcements* 5(6) e01530-16. doi: 10.1128/genomeA.01530-16
85. Doumayrou*, J., Sheber, M., **Bonning, B.C.**, Miller, W.A. 2017. Quantification of Pea enation mosaic virus 1 and 2 during infection of *Pisum sativum* by one step real-time RT-PCR. *J Virol. Methods* 240: 63-68. doi: 10.1016/j.jviromet.2016.11.013

84. Liu*, S., Vijayendran*, D., Chen*, Y., **Bonning, B.C.** 2016. Aphis glycines virus 2, a novel insect virus with a unique genome structure. *Viruses* 8:315; doi:10.3390/v8110315
83. Doumayrou*, J., Sheber, M., **Bonning, B.C.**, Miller, W.A. 2016. Role of Pea enation mosaic virus coat protein in the host plant and aphid vector. *Viruses* 8(11): 312; doi:10.3390/v8110312
82. Lomate*, P.R., **Bonning, B.C.** 2016. Distinct properties of digestive proteases and nucleases in the gut, salivary gland and saliva of southern green stink bug, *Nezara viridula*. *Scientific Reports* 6:27587. doi: 10.1038/srep27587.
81. Rausch*, M.A., Chougule, N.P., Deist*, B.R. **Bonning, B.C.** 2016. Modification of Cry4Aa toward improved toxin processing in the gut of the pea aphid, *Acyrtosiphon pisum*. *PlosOne* 11(5): e0155466. doi:10.1371/journal.one.0155466
80. Dolezal*, A.G., Carrillo-Tripp*, J., Miller, W.A., **Bonning, B.C.**, Toth, A. L. 2016. Intensively cultivated landscape and Varroa mite infestation are associated with reduced honey bee nutritional state. *PlosOne* 11(4): e0153531. doi 10.1371/journal.pone.0153531
79. Carrillo-Tripp*, J., Dolezal*, A.G., Goblirsch, M.J., Miller, W.A., **Bonning, B.C.** 2016. In vivo and in vitro infection dynamics of honey bee viruses. *Scientific Reports* 6:22265. doi: 10.1038/srep22265
78. Dolezal*, A.G., Carrillo-Tripp*, J., Miller, W.A., **Bonning, B.C.**, Toth, A. L. 2016. Pollen contaminated with field-relevant levels of cyhalothrin affects honey bee survival, nutritional physiology, and pollen consumption behavior. *J. Econ. Entomol.* 109(1):41-8
77. Tang, S.L., Linz*, L.B., **Bonning, B.C.**, Pohl, N.L.B. 2015. Automated solution-phase synthesis of insect glycans to probe the binding affinity of pea enation mosaic virus. *J. Organic Chem.* 80: 10482-9
76. Linz*, L.B., Liu*, S., Chougule*, N.P., **Bonning, B.C.** 2015. *In vitro* evidence supports membrane alanine aminopeptidase N as a receptor for a plant virus in the pea aphid vector. *J. Virol.* 89 (22) 11203-12. doi: 10.1128/JVI.01479-15 (Cover, vol. 90, no. 3, 2016)
75. Chen, Y.*, Liu, S.*, **Bonning, B.C.** 2015. Genome sequence of a novel iflavivirus from the leafhopper, *Graminella nigrifons*. *Genome Announcements* 3: e00323-15.
74. Liu*, S., D. Vijayendran*, J. Carrillo-Tripp*, W.A. Miller, **B.C. Bonning.** 2014 Analysis of new Aphid lethal paralysis virus isolates suggests evolution of two ALPV species. *J. Gen. Virol.* 95: 2809-19. doi: 10.1099/vir.o.069765-0.
73. Carrillo-Tripp*, J., E.N. Krueger, R.L. Harrison*, A.L. Toth, W.A. Miller, **B.C. Bonning.** 2014. *Lymantria dispar* iflavivirus 1 (LdIV1), a new model to study iflaviral persistence in lepidopterans. *J. Gen. Virol.* 95: 2285-96
72. Miller, W.A., J. Carrillo-Tripp*, **B.C. Bonning**, A.G. Dolezal, A.L. Toth 2014. Conclusive evidence of replication of a plant virus in honeybees is lacking. *mBio* DOI:10.1128/mBio.00985-14
71. **Bonning, B.C.**, Pal*, N., Liu*, S., Wang, Z., Sivakumar*, S., King, G.F., Miller, W.A. 2014. Toxin delivery by the coat protein of an aphid-vectored plant virus provides plant resistance to aphids. *Nature Biotech* 32: 102-105 DOI 10.1038/nbt.2753 (Cover)
70. Chougule*, N.P., Li*, H., Liu*, S., Narva, K.E., Meade, T., **Bonning, B.C.** 2013. Retargeting of *Bt* toxins against hemipteran insect pests. *PNAS* 110(21): 8465-70

69. Pal*, N., Yamamoto, T., King, G.F., Waive, C., **Bonning, B.C.** 2013. Aphicidal efficacy of scorpion- and spider-derived neurotoxins. *Toxicon* 70: 114-122
68. Liu*, S., Chougule*, N.P., Vijayendran*, D., **Bonning, B.C.** 2012 Deep sequencing of the transcriptomes of soybean aphid and associated endosymbionts. *PlosOne* 7(9): e45161
67. Giri*, L., Feiss, M.G., **Bonning, B.C.**, Murhammer, D.W. 2012. Production of baculovirus defective interfering particles during serial passage is delayed by removing transposon target sites in *fp25k*. *J. Gen. Virol.* 93: 389-399.
66. Li*, H., Chougule*, N.P., **Bonning, B.C.** 2011. Interaction of the *Bacillus thuringiensis* delta endotoxins Cry1Ac and Cry3Aa with the gut of the pea aphid, *Acyrtosiphon pisum* (Harris). *J. Invertebr Pathology* 107: 69-78.
65. Sparks*, W.O., Rohlfig*, A., **Bonning, B.C.** 2011. A peptide with similarity to baculovirus ODV-E66 binds the gut epithelium of *Heliothis virescens* and impedes infection with *Autographa californica* multiple nucleopolyhedrovirus. *J. Gen. Virol.* 92:1051-1060.
64. Sparks*, W.O., Harrison*, R.L., **Bonning, B.C.** 2011. *Autographa californica* multiple nucleopolyhedrovirus ODV-E56 is a *per os* infectivity factor, but is not essential for binding and fusion of occlusion-derived virus to the host midgut. *Virology* 409:69-76. (Cover)
63. Giri*, L., Li*, H., Sandgren*, D., Feiss, M.G., Roller, R., **Bonning, B.C.**, Murhammer, D.W. 2010. Removal of transposon target sites from the AcMNPV *fp25k* gene delays, but does not prevent, accumulation of the few polyhedra phenotype. *J. Gen. Virol.* 91:3053-64.
62. Liu*, S., Sivakumar*, S., Sparks*, W.O., Miller, W.A., **Bonning, B.C.** 2010. A peptide that binds the pea aphid gut impedes entry of Pea enation mosaic virus into the aphid hemocoel. *Virology* 401 (1): 107-16.
61. Harrison*, R.L., Sparks*, W.O., **Bonning, B.C.** 2010. The *Autographa californica* multiple nucleopolyhedrovirus ODV-E56 envelope protein is required for oral infectivity and can be functionally substituted by the *Rachiplusia* ou multiple nucleopolyhedrovirus ODV-E56. *J. Gen Virol.* 91(5): 1173-82.
60. Schmidt*, N.R., Haywood*, J.M., **Bonning, B.C.** 2009. Toward the physiological basis for increased *Agrotis ipsilon* multiple nucleopolyhedrovirus infection following feeding of *Agrotis ipsilon* larvae on transgenic corn expressing Cry1Fa2. *J. Invertebr. Pathol.* 102(2): 141-8.
59. Liu*, S., Sivakumar*, S., Wang, Z., **Bonning, B.C.**, Miller, W.A. 2009. The readthrough domain of Pea enation mosaic virus is not essential for virus stability in the hemolymph of the pea aphid, *Acyrtosiphon pisum*. *Arch. Virol.* 154 (3): 469-479.
58. Sun, X., Wu, D., Sun, X., Jin, L., Ma, Y., **Bonning, B.C.**, Peng, H., Hu, Z. 2009. Impact of *Helicoverpa armigera* nucleopolyhedroviruses expressing a cathepsin L-like protease on target and nontarget insect species on cotton. *Biol. Control* 49 (1): 77-83.
57. Sivakumar*, S., Wang, Z., Harrison*, R.L., Liu*, S., Miller, W.A. and **Bonning, B.C.** 2009. Baculovirus-expressed virus-like particles of *Pea enation mosaic virus* vary in size and encapsidate baculovirus mRNAs. *Virus Res.* 139:54-63.
56. Li*, H., Tang*, H., Sivakumar*, S., Philip, J., Harrison*, R.L. Gatehouse, J.A. and **Bonning, B.C.** 2008. Insecticidal activity of a basement membrane-degrading protease against *Heliothis virescens* (Fabricius) and *Acyrtosiphon pisum* (Harris). *Journal of Insect Physiology* 54(5): 777-789.

55. Boyapalle*, S., Beckett, R.J., Pal*, N., Miller, W.A. and **Bonning, B.C.** 2008. Infectious genomic RNA of *Rhopalosiphum padi* virus transcribed in vitro from a full-length cDNA clone. *Virology* 375(2): 401-411.
Author correction: Virology 2014. 158:452-3
54. Liu* Z, Li* X, Prasifka JR, Jurenka R, **Bonning BC.** 2008. Overexpression of *Drosophila* juvenile hormone esterase binding protein results in anti-JH effects and reduced pheromone abundance. *Gen. Comp. Endocrinol.* 156: 164-172.
53. Tang*, H., Li*, H., Lei*, S., Harrison*, R.L. and **Bonning, B.C.** 2007. Tissue specificity of a baculovirus-expressed, basement membrane-degrading protease in larvae of *Heliothis virescens*. *Tissue and Cell* 39: 431-443
52. Li*, H., Buschman, L.L., Huang, F., Zhu, K.Y., **Bonning, B.C.** and Oppert, B. 2007. Dipel-selected *Ostrinia nubilalis* larvae are not resistant to transgenic corn expressing *Bacillus thuringiensis* Cry1Ab. *Journal of Economic Entomology* 100: 1862-1870.
51. Pal*, N., Boyapalle*, S., Beckett, R., Miller, W.A. and **Bonning, B.C.** 2007. A baculovirus-expressed dicistrovirus that is infectious to aphids. *J Virol.* 81 (17):9339-45
Author Correction: J Virol. 2014. 88(6): 3610
50. Liu*, Z., Pal*, N., **Bonning, B.C.** 2007. Potential ligands of DmP29, a putative juvenile hormone esterase binding protein of *Drosophila melanogaster*. *Insect Biochem Molec. Biol.* 37: 838-846
49. Philip, J., Fitches, E., Harrison*, R. L., **Bonning, B.C.** and Gatehouse, J.A. 2007. Characterisation of functional and insecticidal properties of a recombinant cathepsin L-like proteinase from flesh fly (*Sarcophaga peregrina*), which plays a role in differentiation of imaginal discs. *Insect Biochem. Molec. Biol.* 37(6): 589-600.
48. Li*, H., Tang*, H., Harrison*, R.L. and **Bonning, B.C.** 2007. Impact of a basement membrane-degrading protease on dissemination and secondary infection of *Autographa californica* multiple nucleopolyhedrovirus in *Heliothis virescens* L. *J. Gen Virol.* 88: 1109-1119.
47. Liu*, Z., Ho*, L., **Bonning, B.C.** 2007. Localization of a *Drosophila melanogaster* homolog of the putative juvenile hormone esterase binding protein of *Manduca sexta*. *Insect Biochem. Molec. Biol.* 37(2): 155-163
46. Boyapalle*, S., Pal, N., Miller, W.A., **Bonning, B.C.** 2007. A glassy-winged sharpshooter cell line supports replication of *Rhopalosiphum padi* virus (Dicistroviridae). *J. Invertebr. Pathol.* 94(2): 130-139.
45. Prater, C.A., Redmond, C.T., Barney, W., **Bonning, B.C.** and Potter, D.A. 2006. Microbial control of the black cutworm (Lepidoptera: Noctuidae) in turfgrass using a naturally occurring baculovirus. *J. Econ. Entomol.* 99(4): 1129-37
44. Liu*, S., **Bonning, B.C.**, Miller, W.A. 2006. A simple wax-embedding method for isolation of aphid hemolymph for detection of luteoviruses in the hemocoel. *J. Virol. Methods* 132 (1-2): 174-180
43. Nusawardani*, T., Ruberson, J.R., Obrycki, J.J. and **Bonning, B.C.** 2005. Effects of a protease-expressing recombinant baculovirus insecticide on the parasitoid *Cotesia marginiventris* (Cresson). *Biological Control* 35(1):46-54.
42. Harrison*, R.L. and **Bonning, B.C.** 2004. Application of maximum likelihood models to selection pressure analysis of group I nucleopolyhedrovirus genes. *J. Gen. Virol.* 85: 197-210

41. Harrison*, R.L. and **Bonning, B.C.** 2003. Comparative analysis of the genomes of *Rachiplusia ou* and *Autographa californica* multiple nucleopolyhedroviruses. *J. Gen. Virol.* 84: 1827 - 1842.
40. Boughton*, A.J., Obrycki, J.J, **Bonning, B.C.** 2003. Effects of a protease-expressing recombinant baculovirus on nontarget insect predators of *Heliothis virescens*. *Biological Control* 28(1):101-110.
39. Boughton*, A.J., Lewis, L.C. and **Bonning, B.C.** 2001. Potential of *Agrotis ipsilon* nucleopolyhedrovirus for suppression of the black cutworm (Lepidoptera: Noctuidae) and effect of an optical brightener on virus efficacy. *J. Econ. Entomol.* 94(5):1045-52.
38. Harrison*, R.L. and **Bonning, B.C.** 2001. Use of proteases to improve the insecticidal activity of baculoviruses. *Biological Control* 20: 199-209.
37. Shanmugavelu*, M., Larysa Porubleva, Parag Chitnis, and **Bonning, B.C.** 2001. Ligand blot analysis of juvenile hormone esterase binding proteins in *Manduca sexta* L. *Insect Biochem. Molec. Biol.* 31(1): 51-56.
36. van Meer, M.M., **Bonning, B.C.**, Ward, V.K., Vlaskovits, J.M. and Hammock, B.D. 2000. Recombinant, catalytically inactive juvenile hormone esterase enhances efficacy of baculovirus insecticides. *Biological Control.* 19(2): 191-199.
35. Shiotsuki, T., **Bonning, B.C.**, Hirai, M., Kikuchi, K., Hammock, B.D. 2000. Characterization and affinity purification of juvenile hormone esterase from *Bombyx mori*. *Biosci. Biotechnol. Biochem.* 64(8): 1681-1687.
34. Shanmugavelu*, M., Baytan, A., Chesnut, J.D. and **Bonning, B.C.** 2000. A novel protein that binds juvenile hormone esterase in fat body and pericardial cells of the tobacco hornworm *Manduca sexta* L. *Journal of Biological Chemistry* 275(3): 1802-1806.
33. Harrison*, R.L. and **Bonning, B.C.** 2000. Use of scorpion neurotoxins to improve the insecticidal activity of *Rachiplusia ou* multicapsid nucleopolyhedrovirus. *Biological Control.* 17(2): 191-201.
32. Edgar, K., Noriega, F.G., **Bonning, B.C.** and Wells, M.A. 2000. Recombinant juvenile hormone esterase, an effective tool to modify juvenile-hormone dependent gene expression in mosquitoes. *Insect Molecular Biology.* 9(1): 27-31.
31. Brockhouse*, A.C., Horner, H.T., Booth, T.F. and **Bonning, B.C.** 1999. Pericardial cell ultrastructure in the tobacco hornworm *Manduca sexta* L. (Lepidoptera: Sphingidae) *International Journal of Insect Morphology and Embryology* 28(4): 261-271.
30. Boughton*, A.J., Harrison*, R.L., Lewis, L.C. and **Bonning, B.C.** 1999. Characterization of a nucleopolyhedrovirus form the black cutworm *Agrotis ipsilon* (Lepidoptera: Noctuidae). *J. Invertebr. Pathol.* 74: 289-294. (Cover)
29. Harrison*, R.L. and **Bonning, B.C.** 1999. The nucleopolyhedroviruses of *Rachiplusia ou* and *Anagrapha falcifera* are isolates of the same virus. *J. Gen. Virol.* 80 (10): 2793-2798.
28. **Bonning, B.C.**, Possee, R.D. and Hammock, B.D. 1999. Insecticidal efficacy of a recombinant baculovirus expressing JHE-KK, a modified juvenile hormone esterase. *J. Invertebr. Pathol.* 73: 234-236.
27. **Bonning, B.C.**, Ward, V.K., van Meer, M.M., Booth, T.F. and Hammock, B.D. 1997. Disruption of lysosomal targeting is associated with insecticidal potency of juvenile hormone esterase. *Proceedings of the National Academy of Sciences USA* 94 (12):6007-6012.

26. Ignoffo, C.M., Garcia, C., **Bonning, B.C.**, Herman, R. and Hammock, B.D. 1997. Simulated sunlight-UV sensitivity of engineered juvenile hormone esterase and scorpion toxin recombinants of the nuclear polyhedrosis virus of *Autographa californica*. Journal of the Kansas Entomological Society 70(2):149-152.
25. Hoover, K., Schultz, C.M., Lane, S.S., **Bonning, B.C.**, Hammock, B.D. and Duffey, S.S. 1997. Effects of diet age and streptomycin on virulence of *Autographa californica* nucleopolyhedrovirus against the tobacco budworm. Journal of Invertebrate Pathology 69:46-50.
24. **Bonning, B.C.**, Loher, W. and Hammock, B.D. 1997. Recombinant juvenile hormone esterase as a biochemical anti-juvenile hormone agent: Effects on ovarian development in *Acheta domesticus*. Archives of Insect Biochemistry and Physiology 34 (3): 359-368.
23. **Bonning, B.C.**, Booth, T.F. and Hammock, B.D. 1997. Mechanistic studies of the degradation of juvenile hormone esterase in *Manduca sexta*. Archives of Insect Biochemistry and Physiology 34(3): 275-286.
22. Hoover, K., Herrmann, R., Moskowitz, H., **Bonning, B.C.**, Duffey, S.S. and Hammock, B.D. 1996. The potential of recombinant baculoviruses as enhanced biopesticides. Pesticide Outlook 7(3): 21-27.
21. Charles, J-P., Wojtasek, H., Lentz, A.J., Thomas, B.A., **Bonning, B.C.**, Palli, S.R., Parker, A.G., Dorman, G. Hammock, B.D., Prestwich, G.D. and Riddiford, L.M. 1996. Purification and reassessment of ligand binding of the recombinant, putative juvenile hormone receptor of the tobacco hornworm, *Manduca sexta*. Archives of Insect Biochem. Physiol. 31 (4): 371-393.
20. Touhara, K., **Bonning, B.C.**, Hammock, B.D., Prestwich, G.D. 1995. Action of juvenile hormone (JH) esterase on the JH-JH binding protein complex. An *in vitro* model of JHE metabolism in a caterpillar. Insect Biochemistry and Molecular Biology 26 (6): 727-734.
19. Hoover, K., Schultz, C.M., Lane, S.S., **Bonning, B.C.**, Duffey, S.S., McCutchen, B.F., Hammock, B.D. 1995. Reduction in damage to cotton plants by a recombinant baculovirus that knocks moribund larvae of *Heliothis virescens* off the plant. Biological Control 5: 419-426.
18. **Bonning, B.C.**, Hoover, K., Duffey, S., Hammock, B.D. 1995. Production of polyhedra of the *Autographa californica* nuclear polyhedrosis virus using the Sf21 and Tn5B1-4 cell lines and comparison with host-derived polyhedra by bioassay. Journal of Invertebrate Pathology 66: 224-230.
17. **Bonning, B.C.**, Hoover, K., Booth, T.F., Duffey, S., Hammock, B.D. 1995. Development of a recombinant baculovirus expressing a modified juvenile hormone esterase with potential for insect control. Archives of Insect Biochemistry and Physiology 30 (2/3): 177-194.
16. **Bonning, B.C.** and Hammock, B.D. 1995. Use of juvenile hormone esterase as a novel reporter enzyme in the baculovirus expression system. Journal of Virological Methods 51: 103-114.
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Refereed Review Papers

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22. **Bonning, B.C.**, Palli, S.R. 2016. CAMTech: Bridging the gap between industry needs and federal and academic research for arthropod management. *Entomology Today* [Sept. 15, 2016](#)
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7. Liu*, S., Li*, H., Sivakumar*, S. and **Bonning, B.C.** 2006. Virus-derived genes for insect resistant transgenic plants. In. *Insect Viruses: Biotechnological Applications. Advances in Virus Research*, vol. 68: 427-457.

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Book Chapters

25. Deist, B.R.* and **Bonning, B.C.** 2016. Biotechnological approaches to aphid management. Chapter 12 In: *Biology and Ecology of Aphids*, (H. Schmidtbert and A. Vilcinskas, editors). CRC Press.
24. Popham, H.J.R., Ellerseick, M.R., Li*, H. and **Bonning, B.C.** 2016. Evaluation of the insecticidal efficacy of wild type and recombinant baculoviruses. In: *Baculovirus and Insect Cell Expression Protocols Third Edition* (D. Murhammer, Ed.), Humana Press, Totowa, New Jersey. Chapter 21, pages 407-444.
Methods Mol Biol. 2016;1350:407-44. doi: 10.1007/978-1-4939-3043-2_21
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4. Possee, R.D., **Bonning, B.C.**, Merryweather, A.T. 1991. Expression of proteins with insecticidal activities using baculovirus vectors. In: "Progress in Recombinant DNA Technologies and Applications" (A. Prokop, ed.), Annals of the New York Academy of Sciences, USA 646: 234-239.
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- Hammock, B.D., Szekacs, A., Hanzlik, T., Maeda, S., Philpott, M., **Bonning, B.**, Possee, R. 1990. Use of transition state theory in the design of chemical and molecular agents for insect control. In: "Recent Advances in the Chemistry of Insect Control II" pp. 256-277, (L. Crombie, ed). Royal Society of Chemistry.
 - Bonning, B.C.** 1990. Insensitive acetylcholinesterase in insecticide resistant mosquitoes. "Pesticides and Alternatives", Excerpta Medica International Congress Series, Elsevier, pp 433-437.

Technology Transfer

Patents

- U.S. Patent Application No. 7,547,677. Issued June 16, 2009. "Plant Virus Transmission Inhibitor and Methods". S. Liu, W.A. Miller and **B.C. Bonning**
- U.S. Patent No. 7,312,080. Issued December 25, 2007. Plant Resistance to Insect Pests Mediated by Viral Proteins. W.A. Miller and **B.C. Bonning**.
- U.S. Patent No. 6,673,340. Issued October 8, 2003. Basement membrane-degrading proteases as insect toxins and methods for use of same. **B. C. Bonning** and R. L. Harrison.
- U.S. Patent No. 5,643,776. Issued July 1, 1997 "Insect Diagnostic and Control Compositions". B.D. Hammock, T. Hanzlik, L.G. Harshman, V.K. Ward, **B.C. Bonning**.
- U.S. Patent No. 5,674,747. Issued October 7, 1997 "Viral vector coding for juvenile hormone esterase". B.D. Hammock, T. N. Hanzlik, L.G. Harshman, **B.C. Bonning**, V.K. Ward.

A total of 17 patent disclosures were submitted by Bonning to the Iowa State University Research Foundation from 1999 - 2017.

- "Insect toxin delivery mediated by a densovirus coat protein". B.C. Bonning, M. Kemmerer. International application No. PCT/IB2017/055903 submitted October 20, 2017.
- "Insecticidal toxins for plant resistance to Hemiptera". B.C. Bonning, N.P. Chougule, M.T. Fernandez-Luna, M. Blackburn, D. Hall.

Grants Awarded (1995-present)

Principal investigator (PI) or Co-PI on more than \$9 million for research (excluding the \$20 million USDA CAP grant received in 2011). Listed below are collaborating colleagues at ISU and other institutions.

Name	Position	Department / Affiliation
Beattie, Gwyn	Professor	Iowa State University
Blackburn, Michael	Research Entomologist	USDA, ARS
Booth, Timothy	Director	Public Health Agency of Canada
Borneman, James	Professor	University of California, Riverside
Chougule, Nanasahab	Assistant Scientist	Iowa State University
Dawson, William O.	Eminent Scholar	University of Florida
Falk, Bryce	Professor	University of California, Davis
Feiss, Michael	Professor	University of Iowa
Gassmann, Aaron	Associate Professor	Iowa State University
Gatehouse, John A.	Professor	Durham University , UK
Grafton-Cardwell, Elizabeth	Cooperative Extension Specialist	University of California, Riverside
Hall, David	Research Leader	USDA, ARS
Harrison, Robert L.	Assistant Scientist	Iowa State University
Hodgson, Erin	Associate Professor	Iowa State University
Jetter, Karen	Associate Project Economist	University of California, Davis

Name	Position	Department / Affiliation
Keesling, James	Professor	University of Florida
Leandro, Leonora	Professor	Iowa State University
Liu, Sijun	Associate Scientist	Iowa State University
Miller, W. Allen	Professor	Iowa State University
Lewis, Leslie C.	Research Leader; ISU Collaborator	USDA, ARS
MacIntosh, Gustavo	Professor	Iowa State University
Murhammer, David	Professor	University of Iowa
Obrycki, John	Professor	ISU
Orbovic, Vladimir	Scientific Lab Manager	University of Florida
O'Neal, Matthew	Associate Professor	Iowa State University
Palli, S. Reddy	Professor, Co-Director	University of Kentucky
Roper, Caroline	Assistant Professor	University of California, Riverside
Sappington, Tom W.	Research Entomologist; ISU Collaborator	USDA, ARS
Scott, M. Paul	Research Geneticist	USDA ARS
Setamou, Mamoudou	Associate Professor	Texas A&M University
Stelinski, Lukasz	Associate Professor	University of Florida
Toth, Amy	Assistant Professor	Iowa State University
Wright-Morton, Lois	Professor	Iowa State University

Abbreviations for Funding Agencies:

BCS	Bayer CropSciences
BRCDA	ISU Bailey Research Career Development Award
BRAP	USDA Biotechnology Risk Assessment Program
CAMTech	NSF Center for Arthropod Management Technologies
CATD	Center for Advanced Technology and Development
CATP/CRDF	Citrus Advanced Technology Program, Citrus Research and Development Foundation
CDFA	California Department of Food and Ag -Pierce's Disease Control Program
CIAG	ISU Center for Integrated Animal Genomics
CPBR	Consortium for Plant Biotechnology Research
CRKP	Corn Rootworm Knowledge Program, Monsanto Company
CT	Roy J. Carver Charitable Trust
DAS	Dow AgroSciences LLC
EPA	U.S. Environmental Protection Agency
GIVF	Grow Iowa Values Fund
IMBA	Illinois Missouri Biotechnology Alliance
ISA	Iowa Soybean Association
ISU	Iowa State University
ISURF	ISU Research Foundation
I/UCRC	NSF Industry / University Cooperative Research Centers program
NATO	North Atlantic Treaty Organization
NCBP	USDA North Central Biotechnical Program
NCSR	North Central Soybean Research Program
NRI	USDA National Research Initiative
NSF	National Science Foundation
PSI	ISU Plant Sciences Institute
RIG	ISU Research Initiation Grant
USDA	United States Department of Agriculture

Funded Research Contracts in chronological order; shaded projects are linked

Project Title	Agency	PI	Co-PI	Period	Amount
Development of a recombinant baculovirus for control of the European corn borer.	ISU	Bonning		1995-6	\$12,000
Heat shock cognate proteins and degradation of juvenile hormone esterase.	NATO	Bonning	Booth	1995-2000	\$30,000
Development of recombinant baculovirus insecticides for control of corn insect pests	IMBA	Bonning		1996-1998	\$141,262
Heat shock cognate proteins involved in lysosomal degradation of juvenile hormone esterase.	ISU RIG	Bonning		1996-7	\$20,000
A novel approach for introducing aphid resistance into plants.	CT	Miller	Bonning	1997-8	\$20,000
Development of improved recombinant baculovirus pesticides	ISU RIG	Bonning		1997-8	\$11,000
The basement membrane as a barrier to baculovirus dissemination in the host.	USDA	Harrison (Postdoc Fellowship)	Bonning	1997-9	\$90,000
Plant resistance to aphids.	USDA NCBP	Miller	Bonning	1998-2000	\$94,875
A new insect virus for control of the black cutworm.	ISURF	Bonning	Lewis	1999-2000	\$12,464
A new insect virus for control of the black cutworm.	CATD	Bonning	Lewis	1999-2000	\$12,464
Project Title	Agency	PI	Co-PI	Period	Amount
Risk assessment of recombinant baculovirus insecticides.	ISU RIG	Bonning	Obrycki	1999-2000	\$10,184
Plant resistance to aphids.	Aventis & Syngenta	Miller	Bonning	1999-2002	\$393,868
Unrestricted gift	Aventis & Syngenta	Bonning		2000	\$10,000
Risk assessment of a recombinant baculovirus expressing a protease	USDA BRAP	Bonning	Obrycki	2000-2003	\$190,000
Function of juvenile hormone esterase binding protein in insects.	NSF	Bonning		2001-2004	\$355,900
Plant resistance to aphids mediated by an insect virus.	CT	Bonning	Miller	2001-2002	\$25,000
Novel insect toxins for transgenic plants.	ISURF	Bonning		2002-2003	\$25,000

Blocking aphid transmission of plant viruses.	CT	Bonning	Miller	2003-2004	\$25,000
Basement membranes, baculovirus dissemination and the insect immune response.	USDA NRI	Harrison	Bonning	2003-2006	\$205,000
Cost-effective production of baculovirus insecticides.	US EPA	Murhammer	Bonning, Feiss	2003-2006	\$470,000 (\$150k to BB)
Broad spectrum plant resistance to insect pests mediated by a protease	ISU BRCDA	Bonning		2004-2006	\$150,000
Aphid resistance in plants mediated by luteovirus structural proteins and an intrahemocoelic toxin.	USDA NRI	Bonning	Miller	2004-2007	\$250,000
Plant resistance to insect pests mediated by a protease.	CPBR	Bonning	Gatehouse	2006-2008	\$222,500
Plant resistance to insect pests mediated by a protease.	DAS	Bonning	Gatehouse	2006-2008	\$15,000
Plant resistance to both aphids and plant virus transmission	ISU PSI	Bonning	Miller	2006-2008	\$60,000
Aphid Crop Interactions	ISU PSI	Miller	Bonning, MacIntosh	2007-2008	\$130,000
Aphid Crop Interactions	ISA	Miller	Bonning, MacIntosh	2007-2008	\$30,000
Plant resistance to aphids mediated by a virus.	CPBR	Bonning	Miller	2008-2010	\$120,000
Toward the soybean aphid genome	ISU CIAG	Bonning	Liu	2008-2009	\$25,000
Project Title	Agency	PI	Co-PI	Period	Amount
Aphid-luteovirus interaction: Aphid receptors, luteovirus receptor binding domains and blocking luteovirus transmission	USDA NRI	Bonning	Liu	2008-2011	\$400,000
Plant resistance to aphids mediated by a Bt toxin.	CPBR	Bonning		2009-2011	\$158,302
Plant resistance to aphids mediated by a Bt toxin.	DAS	Bonning		2009-2011	\$116,468
Transgenic plant resistance to invertebrate pests.	GIVF	Bonning	Miller	2009-2011	\$107,680
Transgenic plant resistance to invertebrate pests.	DuPont Pioneer	Bonning	Miller	2009-2011	\$100,000
Deep sequencing for analysis of soybean aphid sRNA and virus discovery.	CIAG	Bonning	Liu	2010-2011	\$27,000

Virus-Insect- Interactions Initiative Phase I award.	ISU PSI	Miller	Bonning	2010-2011	\$40,000
Virus-Insect- Interactions Initiative Phase II award, year 1.	ISU PSI	Bonning	Miller	2011-2012	\$250,000
Virus-Insect- Interactions Initiative Phase II award, year 2.	ISU PSI	Bonning	Miller	2012-2013	\$250,000
Virus-Insect- Interactions Initiative Phase II award, year 3.	ISU PSI	Bonning	Miller	2013-2014	\$250,000
Corn Systems Coordinated Agricultural Project	USDA NIFA	Wright-Morton	29 incl. Bonning	2011-2016	\$20 million (\$75 k to Ent)
Approaching Crops as Ecosystems, Phase I award.	ISU PSI	Beattie, Sappington	Bonning, Gassmann, Leandro, Scott	2011-2012	\$40,000
Development and use of recombinant <i>Homalodisca coagulata</i> Virus-1 for controlling <i>Homalodisca vitripennis</i> , the glassy-winged sharpshooter.	CDFA	Falk	Bonning, Miller	2011-2013	\$425,000 (\$165,000 to ISU)
Exploiting viruses to control the soybean aphid	ISU	Miller	Bonning	2011-2012	\$145,083
Interactions between honey bee nutrition and viral infection: An integrative approach to colony collapse disorder	USDA NIFA	Toth	Bonning, Miller	2011-2014	\$400,000
A Bt toxin for soybean aphid resistance	USDA NIFA	Bonning	Chougule	2012-2017	\$435,000
Project Title	Agency	PI	Co-PI	Period	Amount
Collaborative Research: Planning grant: I/UCRC for Arthropod Management Technologies	NSF I/UCRC	Bonning	Palli	2012-2013	\$14,500
Capsoid mediated delivery of silencing RNAs for pest control	CPBR/ Monsanto match	Bonning	Miller	2012-2013	\$115,000
Toxin engineering for aphid resistant transgenic plants.	ISA	Bonning	Chougule	2012-2014	\$72,000
Soybean aphid management, resistance, and outreach in the North Central Region.	NCSRP	Hodgson	Bonning, O'Neal	2012-2014	\$250,000 (\$75,000 to BB)
Corn rootworm viruses and RNA interference	CRKP	Bonning	Sappington Liu	2013-2016	\$450,000
Bt toxins for resistance to the Asian citrus psyllid.	CATD, CRDF	Bonning	Chougule, Hall,	2013-2017	\$500,000

			Blackburn		
Collaborative Research: I/UCRC: Center for Arthropod Management Technologies (CAMTech)	NSF I/UCRC	Bonning	Palli	2013-2018	\$482,500
Mechanisms of transcytosis across the insect gut	CAMTech	Bonning		2013-2015	\$110,000
Stink bug digestive enzymes	CAMTech	Bonning	Chougule	2013-2015	\$130,000
Stink bug viruses and RNA interference.	DAS	Bonning		2014-2017	\$450,000
Modification of a Bt toxin for stink bug management	BCS	Bonning		2015-2018	\$500,000
Toxin engineering for novel lepidopteran gut target sites	BCS	Bonning		2015-2018	\$385,000
Toxin engineering to counter resistance	Monsanto	Bonning		2016-2018	\$260,000
Bt-based strategies for management of <i>Diaphorina citri</i> and citrus greening	USDA SCRI	Bonning,	Blackburn Dawson Borneman Roper Orbovic Keesling Jetter Grafton-Cardwell Stelinski Setamou	2017-2020	\$2,496,099

Invited Presentations – National (67 since 1994)

- 2018 Symposium talk, 11th Annual Arthropod Genomics Symposium (6-8-18). The insect virome.
- 2017 University of Florida, Genetics and Genomics Program (10-11-17). Invertebrate virus discovery and applications for management of snail-vector disease.
- 2017 University of Florida, Department of Plant Pathology (10-3-17). Plant virus-aphid vector molecular interactions and associated technologies.
- 2016 Valent BioSciences Corporation, Osage, Ia (6-14-16) Modified Bt toxins for suppression of hemipteran pests.
- 2016 Ted Hopkins Distinguished Colloquium Speaker, Department of Entomology, Kansas State University (4-4-16) Pea aphids and plant viruses: Molecular interactions and innovation
- 2016 Iowa State University Department of Entomology. (2-8-16) CALS Rossmann Manatt Lecture: From plant virus-aphid vector molecular interactions to transgenic plant resistance to aphids
- 2016 Iowa State University, Department of Biomedical Sciences (1-14-16) Invertebrate virus discovery and applications for management of agricultural insect pests and for snail-vector human disease.

- 2015 Nan-Yao Su Symposium talk, Entomological Society of America, Minneapolis, MN (11-15-15) Synergy between plant virus and Bt toxin research results in novel transgenes for plant resistance to aphids.
- 2015 Symposium talk, Entomological Society of America, Cell culture symposium: Replication of viruses of the honey bee (*Apis mellifera*) in cell culture
- 2015 Bayer CropScience, RTP, NC (4-7-15) Insect gut binding peptides for enhancement of Bt toxin efficacy.
- 2015 Monsanto Company, St. Louis, MO. Insect gut binding peptides for enhancement of Bt toxin efficacy (2/18/15).
- 2015 University of Georgia, Athens. Department of Entomology (4-6-15). Novel transgenes for plant resistance to aphids from plant virus-aphid vector molecular interactions.
- 2014 Robert L. Patton Lecture in Insect Physiology, Department of Entomology, Cornell University (12-3-14) Plant virus-aphid vector molecular interactions and associated technologies.
- 2014 Symposium talk, Entomological Society of America, Portland, OR (11-17-14). Transformative technologies from knowledge of plant virus – aphid vector interaction.
- 2013 Symposium talk, Entomological Society of America, Austin, TX (11-12-13). Aphid – plant – symbiont – virus interactions.
- 2013 Symposium talk, American Chemical Society, Indianapolis, IN, (9-10-13) Toxins for transgenic resistance to hemipteran pests.
- 2013 Symposium talk, North Central Branch American Phytopathological Society, Manhattan KS, (6-13-13). Transformative technologies from knowledge of plant virus – aphid vector interaction.
- 2013 Bayer CropScience, RTP, NC (5-1-13). Thinking outside of the insect pest control tool box.
- 2013 Monsanto Company, St. Louis, MO. (4-25-13). Thinking outside of the insect pest control tool box.
- 2013 Iowa State University, Department of Plant Pathology and Microbiology “The Center for Arthropod Management Technologies”.
- 2013 Iowa State University, Genetics Program “Small RNA clues for mechanisms of anti-viral defense in aphids”.
- 2012 Iowa State University, Toxicology program “Novel toxin delivery strategies for management of pestiferous aphids”.
- 2012 Iowa State University Department of Plant Pathology and Microbiology “Pea enation mosaic virus-pea aphid interactions and associated technologies”.
- 2012 University of California, Davis (4-18-12). Novel toxin delivery strategies for management of pestiferous aphids. On-line at <http://seminars.uctv.tv/Seminar.aspx?sid=23898>
- 2012 University of Kentucky (3-23-12). How analysis of Pea enation mosaic virus – pea aphid interactions resulted in two novel aphid control technologies.
- 2010 NCERA 200 Soybean Virus Symposium (11-9-10). Aphid-luteovirus interaction and blocking luteovirus transmission.
- 2010 Pioneer Hi-Bred International, a DuPont Company (3-17-10). Transgenic plant resistance to invertebrate pests.
- 2009 Dow AgroSciences, Indianapolis (12-16-09). Plant resistance to aphids.
- 2009 Iowa State University Interdepartmental Program in Genetics “The Dicistroviruses: Advances and Applications”.
- 2008 Iowa State University, Genetics, Cell and Developmental Biology “Of juvenile hormone, mitochondria, pheromones and hyperactive flies”.

- 2008 Pioneer Hi-Bred International, a DuPont Company (10-13-08). Toward aphid control technologies.
- 2008 University of Kentucky (9-12-08). Of juvenile hormone, mitochondria, pheromones and hyperactive flies.
- 2006 Dow AgroSciences, Indianapolis (12-13-06). Delivery of intrahemocoelic toxins to aphids from plants.
- 2006 Ohio State University, Department of Entomology (4-18-06). Of Baculoviruses, Basement Membranes, and the Insect Immune Response.
- 2006 University of California Riverside, Department of Entomology (3-13-06). Of Baculoviruses, Basement Membranes, and the Insect Immune Response.
- 2006 Iowa State University, Genetics Program “Functional Analysis of a Putative Juvenile Hormone Esterase Binding Protein in *Drosophila melanogaster*”.
- 2006 Iowa State University Osborn Research Club “Of baculoviruses, basement membranes, and dead bugs”.
- 2006 Iowa State University, Department of Entomology “Of baculoviruses, basement membranes and the insect immune response”.
- 2005 Iowa State University, Plant Sciences Institute, Center for Plant Responses to Environmental Stresses “Toward Virus-Mediated Plant Resistance to Aphids”.
- 2005 Pennsylvania State University. Department of Entomology. (10-28-05) A novel recombinant baculovirus insecticide: Risk assessment and mechanism of action.
- 2005 University of Illinois at Urbana-Champaign. Department of Entomology. (9-19-05). “Of Baculoviruses, Basement Membranes and Dead Bugs”
- 2004 Kansas State University, Department of Entomology “Basement Membranes and Recombinant Baculovirus Insecticides”.
- 2004 University of Nebraska, Lincoln. “Basement Membranes and Recombinant Baculovirus Insecticides”.
- 2004 University of Missouri – Columbia “Insecticidal activity and risk assessment of a recombinant baculovirus expressing a basement membrane-degrading protease”.
- 2004 University of Kentucky, Department of Entomology “Basement Membranes and Recombinant Baculovirus Insecticides”.
- 2004 Ohio State University, Department of Entomology “Insecticidal activity and risk assessment of a recombinant baculovirus expressing a basement membrane-degrading protease”.
- 2003 Iowa State University, Department of Entomology “Basement Membranes and Recombinant Baculovirus Insecticides”.
- 2003 Iowa State University, Interdepartmental Program in Genetics “Analysis of molecular adaptation of nucleopolyhedrovirus genes”.
- 2003 Iowa State University, Plant Sciences Institute, Center for Plant Responses to Environmental Stresses “Virus-based strategies for management of aphid vectors and plant disease”.
- 2002 Iowa State University, Departments of Veterinary Pathology, and Veterinary Microbiology and Preventative Medicine “Insecticidal activity and risk assessment of a recombinant baculovirus expressing a basement membrane degrading protease”.
- 2001 Iowa State University, Interdepartmental Program in Toxicology “The basal laminar: A novel target for recombinant baculovirus insecticides”.
- 2001 Iowa State University, Department of Plant Pathology “The basal laminar: A novel target for recombinant baculovirus insecticides”.
- 2001 Iowa State University, Department of Microbiology “A novel baculovirus insecticide that

- expresses a toxic protease”.
- 2000 Iowa State University, Interdepartmental Program in Genetics “Juvenile hormone esterase binding proteins in insects and their significance”.
- 1998 Iowa State University, Department of Entomology “Altered fate of juvenile hormone esterase: elucidating the mechanism of insecticidal action”.
- 1998 Iowa State University, Molecular Cellular and Development Biology. “Disruption of lysosomal targeting is associated with insecticidal potency of juvenile hormone esterase”.
- 1998 Michigan State University, Department of Entomology “Disruption of lysosomal targeting is associated with insecticidal potency of juvenile hormone esterase”.
- 1997 University of Iowa. Department of Biological Sciences. “Lysosome targeting and protein degradation as a target for insect pest control”.
- 1996 Iowa State University. Microbiology, Immunology and Preventative Medicine. “Baculoviruses, Bugs and Biotechnology”.
- 1996 Iowa State University. Interdepartmental Genetics Program. “Baculoviruses engineered to be deadly”.
- 1996 NCR-125 conference: Biological Control in the Midwest, Iowa State University. “Biotech applications for corn insect pest control”.
- 1995 Iowa State University. Department of Zoology and Genetics “Baculoviruses, juvenile hormone esterase and insect control”.
- 1994 University of Illinois. Department of Entomology, “Development of quick-kill recombinant baculoviruses which express modified juvenile hormone esterase”.
- 1994 University of Wisconsin-Madison. Department of Entomology “Baculovirus expression of juvenile hormone esterase for insect control”.
- 1994 University of California, Davis. Department of Microbiology
- 1993 University of California, Riverside. Department of Entomology
- 1991 University of California, Davis. Department of Entomology

Invited Presentations – International (25)

- 2018 Insect gut-binding peptides for enhancement of Bt toxin efficacy. Invited talk. Society for Invertebrate Pathology, Gold Coast, Australia (August, scheduled)
- 2018 The insect virome. Invited speaker, 11th annual Arthropod Genomics Symposium, Illinois (June, scheduled)
- 2016 International Congress of Entomology. Invited talk in Symposium on Novel Biopesticides. Novel transgenes for plant resistance to aphids from plant virus-aphid vector molecular interactions.
- 2016 Pasteur Institute, Paris, France 7-1-16. Pea aphids and plant viruses: Molecular interactions and innovation.
- 2014 John Innes Center, Norwich, UK 7-29-14. Transformative Technologies from Knowledge of Plant Virus – Aphid Vector Interaction.
- 2014 Syngenta / DevGen, Ghent, Belgium 7-11-14. Transformative Technologies from Knowledge of Plant Virus – Aphid Vector Interaction.
- 2014 Syngenta, Jealott’s Hill, UK. 7-10-14. Transformative Technologies from Knowledge of Plant Virus – Aphid Vector Interaction.
- 2013 A novel pea aphid antiviral defense strategy. Symposium talk. Annual meeting of the Society for Invertebrate Pathology, Pittsburgh, PA August 11-15.

- 2012 Pea enation mosaic virus-pea aphid gut interactions and associated technologies. Second International Insect Midgut Conference, Guangzhou, China
- 2012 Institute of Virology, Wuhan, P.R. China, 9-28-12. “Analysis of Pea enation mosaic virus-pea aphid interactions and resulting aphid control technologies.”
- 2012 The Food and Environment Research Agency, York, UK “Novel toxin delivery strategies for management of pestiferous aphids”
- 2011 Plenary lecture: Novel toxin delivery strategy for management of pestiferous aphids. Sixth International Symposium on Molecular Insect Science. Amsterdam, The Netherlands, October 2-5
- 2011 Agricultural University, Wageningen, The Netherlands “Pea enation mosaic virus – pea aphid interactions and associated technologies”
- 2010 University of Bath, UK. “Virus-based strategies for management of aphids and aphid-vectoring disease”
- 2009 Dicistroviruses: Advances and Applications. Symposium talk, Society for Invertebrate Pathology, Park City, Utah, USA
- 2007 University of Durham, UK; Department of Biological Sciences “Plant lectin delivery of intrahemocoelic toxins”
- 2004 Wuhan Institute of Virology, China. “Basement Membranes and Recombinant Baculovirus Insecticides”
- 2004 Wuhan Institute of Virology, China. “Analysis of molecular adaptation of nucleopolyhedrovirus genes”
- 2004 University of Durham, UK; Department of Biological Sciences “Insecticidal activity and risk assessment of a recombinant baculovirus expressing a basement membrane-degrading protease”
- 2004 Recombinant Baculovirus Insecticides: State of the Art. Invited paper. International Plant Protection Congress, Beijing, China
- 2003 Analysis of molecular adaptation of nucleopolyhedrovirus genes. Invited paper. Society for Invertebrate Pathology, Burlington, VT
- 1998 Target Genes in Reproduction and Development: Juvenile hormone esterase. B.C. Bonning. Plenary lecture at Keystone Symposium “Toward the genetic manipulation of insects”. Taos, NM
- 1990 University of Oxford. Entomological Society, UK
- 1989 Royal Entomological Society of London, UK
- 1989 Pasteur Institute, Paris, France

Oral Presentations at International Conferences - Contributed (19)

- 2016 Infection dynamics of honey bee viruses in AmE-711 cells. Society for Invertebrate Pathology, Tours, France
- 2014 Soybean aphid viruses exploit contrasting transmission strategies. Society for Invertebrate Pathology, Mainz, Germany.
- 2011 Aphid small RNAs. Sixth International Symposium on Molecular Insect Science. Amsterdam, The Netherlands, October 2-5.
- 2010 A peptide that binds the gut epithelium of *Heliothis virescens* has similarity to ODV-E66 and impedes infection with wild type baculovirus. Society for Invertebrate Pathology, Trabzon, Turkey.
- 2008 Toward aphid resistant transgenic plants. Society for Invertebrate Pathology, University of Warwick, UK.
- 2005 A cell culture system and infectious clone for the study of *Rhopalosiphum padi* virus

- (Dicistroviridae). Society for Invertebrate Pathology, Anchorage, Alaska.
- 2005 Baculovirus expression of *Rhopalosiphum padi* virus (Dicistroviridae). Society for Invertebrate Pathology, Anchorage, Alaska.
- 2004 Analysis of molecular adaptation of nucleopolyhedrovirus genes. International Plant Protection Congress, Beijing, China.
- 2002 The sequence of the *Rachiplusia ou* multi-nucleocapsid nucleopolyhedrovirus genome. XXXV Annual Meeting of the Society for Invertebrate Pathology, Iguassu Falls, Brazil.
- 1998 Genetic engineering of *Rachiplusia ou* multicapsid nucleopolyhedrovirus. B.C. Bonning. "Science in Transition" Joint annual meeting of Entomological Society of America and American Phytopathological Society, Las Vegas, NV.
- 1998 Binding proteins involved in transport of endocytosed juvenile hormone esterase in the tobacco hornworm, *Manduca sexta* L. B.C. Bonning. 10th Growth Factor and Signal Transduction Conference, Ames, IA on "Endocytosis and Intracellular Trafficking".
- 1996 Heat shock cognate proteins and degradation of juvenile hormone esterase in *Manduca sexta* (Lepidoptera: Sphingidae). B.C. Bonning. XX International Congress of Entomology, Florence, Italy.
- 1995 Reduced binding of a heat shock protein associated with protein degradation and enhanced insecticidal efficacy of JHE expressed in a baculovirus vector. B.C. Bonning, B.D. Hammock. Society for Invertebrate Pathology 28th Annual Meeting, Ithaca, New York.
- 1994 Superior expression of intracellular and extracellular proteins from the basic protein promoter of *Autographa californica* nuclear polyhedrosis virus compared to p10 and polyhedrin promoters. B.C. Bonning, P.W. Roelvink, J.M. Vlak, R.D. Possee, B.D. Hammock. American Society for Virology 13th Annual Meeting, Madison, Wisconsin.
- 1993 Baculovirus Workshop Co-ordinator. Second International Symposium on Molecular Insect Science, Flagstaff, Arizona, USA. Publication: Bonning, B.C. Use of recombinant baculoviruses for insect control. In "Conference Report on Workshops Held at Second International Symposium on Molecular Insect Science" Archives of Insect Biochemistry and Physiology 27:317-324.
- 1993 Insect control by use of recombinant baculoviruses expressing modified juvenile hormone esterase. B.C. Bonning, V.K. Ward, M.M.M. Van Meer, R.D. Possee, B.D. Hammock. Second International Symposium on Molecular Insect Science, Flagstaff, Arizona, USA.
- 1993 Baculovirus expression of juvenile hormone esterase for insect control. B.C. Bonning, V.K. Ward, M.M.M. Van Meer, R.D. Possee, B.D. Hammock. American Society for Virology 12th Annual Meeting Davis, CA.
- 1992 Juvenile hormone esterase - an insecticidal agent. B.C. Bonning, M.M.M. Van Meer, R. Ichinose, V.K. Ward, B.D. Hammock. American Chemical Society "Natural and Derived Pest Management Agents", Snowbird, Utah, USA.
- 1989 Insensitive acetylcholinesterase in insecticide resistant *Culex pipiens*: Implications for field control. B.C. Bonning and J. Hemingway. International Symposium "Pesticides and Alternatives", Crete, Greece.

TEACHING

Teaching Responsibilities (ISU)

Ent410/510 Insect-Virus Interactions: A Molecular Perspective. 2 Cr. Alt. F. Molecular aspects of insect-virus interactions of agricultural, medical and veterinary relevance. Emphasis on understanding basic concepts and techniques in molecular biology as

applied to the study of virus-insect interactions, through reading of the current literature. This course (taught 5 times) was pivotal in the decision of six undergraduate students to pursue careers in research.

Ent590A Insect Pathology and Biological Control. 1 Cr. Alt. F. Review of contemporary topics in insect pathology and biological control based on the primary literature.

Ent590G Molecular Entomology. 2 Cr. Alt. F. Geared toward students with minimal experience in molecular biology. Goals of the course are to increase awareness of cutting edge molecular research in Entomology and to familiarize students with basic concepts and commonly used molecular techniques. Class assignments have resulted in publication of molecular entomology review papers. e.g. Vijayendran, D., Airs, P.M., Dolezal, K., Bonning, B.C. 2013. Arthropod viruses and small RNA. *J. Invertebr. Pathol.* 114: 186-95

Teaching Responsibilities (UF)

ENY6934 Insect-Pathogen Interactions 1 Cr. Occ. F. Molecular aspects of insect-pathogen interactions of agricultural, medical and veterinary relevance with an emphasis on viruses and bacteria. Emphasis on understanding basic concepts and techniques in molecular biology as applied to the study of pathogen-insect interactions, through reading of the current literature.

Mentoring of Students, Postdoctoral Researchers and Other Scientists

* Research Excellence Awards recognize the top 10% of graduating doctoral students at Iowa State University.

Name	Degree, Major	Thesis Title or Area of Training	Support	Period	Current Position
Deist, Benjamin	MS, Microbiology	Engineering Cry4Aa for toxicity against the soybean aphid, <i>Aphis glycines</i> Matsumura	USDA	2012-2015	Applications Scientist, Advanced Analytical
Jin, Hailing	MS, Genetics	Polyhedral envelope protein mutants of <i>Rachiplusia</i> ou multi-nucleocapsid nucleopolyhedrovirus	RA	1999-2002	Director, Microarray Facility, ISU
Kemmerer, Mariah	MS, Microbiology	Transcytosis across the lepidopteran gut epithelium	CAMTech	2014 - 2017	Biological Scientist, UF
Li, Shunji	MS Entomology	Honey bee viruses	USDA	2015 to 2017	PhD student, North Dakota Univ.
Nusawardani, Tyasning	MS, Entomology	Effects of a protease-expressing recombinant baculovirus insecticide on the parasitoid <i>Cotesia marginiventris</i> (Cresson)	BRAP	2002-2005	PhD, Univ Kentucky; Postdoc, ISU
Rausch, Michael	MS, Microbiology	Modification of the Bt toxin Cry4Aa for improved toxin processing in the gut of the pea aphid	ISA	2012-2014	Evogene Ltd.
Regelin, Zachary (co-advisee)	MS, Genetics	Translation and replication of <i>Rhopalosiphum padi</i> virus RNA in a plant cellular environment	PSI	2009-2010	Research Scientist, Monsanto

Name	Degree, Major	Thesis Title or Area of Training	Support	Period	Current Position
Sandgren, David	MS, Genetics	Removal of transposon target sites from the <i>Autographa californica</i> multiple nucleopolyhedrovirus fp25k gene	EPA	2004-2005	Industry
Schmidt, Nina	MS, Microbiology	Physiological impact of a <i>Bacillus thuringiensis</i> toxin on the black cutworm that enhances baculovirus pathogenicity	RA	2006-2009	DuPont Pioneer
Tang, Hailin	MS, Toxicology	Tissue specificity of a baculovirus expressed, basement membrane-degrading protease in larvae of <i>Heliothis virescens</i>	USDA	2004-2008	Software developer, FDA
Boughton,* Anthony	PhD, Entomology	Wildtype and recombinant baculovirus for management of insect pests	RA	1995-2001	Entomologist-Identifier, USDA APHIS
Boyapalle,* Sandhya	PhD, Microbiology	A cell culture system and production of an infectious clone of Rhopalosiphum padi virus (Dicistroviridae)	CPBR / ISA	2001-2005	Senior Scientist, University of South Florida
Li, Shunji	MS Entomology	Insect-virus interactions	RA	2015 - 2017	
Linz*, Lucas	PhD, Microbiology	Molecular interactions between Pea enation mosaic virus and its pea aphid vector	USDA, PSI	2009-2013	Douglas Scientific, Alexandria, MN
Liu, Zhiyan	PhD, Genetics	Subcellular location and function of a putative juvenile hormone esterase binding protein in <i>D. melanogaster</i>	NSF	2001-2007	Postdoc, Harvard Medical School
Sparks, Wendy	PhD, Genetics	Interaction of the baculovirus occlusion-derived virus envelope proteins ODV-E56 and ODV-E66 with the midgut brush border microvilli of <i>Heliothis virescens</i> (Fabricius)	RA	2005-2010	USDA ARS, MD
Vijayendran*, Diveena	PhD, Genetics	Aphid small RNAs and viruses	RA	2010-2014	Postdoc, Harvard Medical School
Boughton, Anthony	Postdoc	Risk assessment of recombinant baculovirus insecticides	BRAP	2001-2002	Postdoc., USDA-ARS, FL.
Canton, Emiliano	Postdoc	Host plant impact on stink bug digestive enzymes	CAMTech	2017-present	
Cao, Chun	Postdoc	Juvenile hormone esterase binding proteins in <i>Manduca sexta</i> .	NSF	2001-2003	Bioforce Nanosciences Inc.

Name	Degree, Major	Thesis Title or Area of Training	Support	Period	Current Position
Carrillo-Tripp, Jimena (co-advisee)	Postdoc	Viruses of aphids and bees	PSI, USDA	2009-2015	DuPont Pioneer
Chen, Yuting	Postdoc	Viruses of stink bugs	DAS	2014 - 2017	Postdoc, NC State Univ.
Choi, Man Yeon	Postdoc	Plant virus delivery systems	PSI	1999	Research Entomologist, USDA ARS, Fl.
Chougule, Nanasaheb P.	Postdoc / Assist. Scientist	Modification of Bt toxins to target hemipteran pests	CPBR, ISA, DAS CRDF	2009-2013	Bayer CropSciences, NC
Fan, Qiuling (co-advisee)	Postdoc	Dicistrovirus molecular biology	PSI	2009	PRC
Fernandez-Luna, Maria Teresa	Postdoc	Bt toxin engineering to target Asian citrus psyllid	CRDF	2013 - 2016	Lecturer, Baylor University
Flores-Escobar, Biviana	Postdoc	Toxin engineering to target stink bugs	BCS	2014 to present	
Georgievska, Liljana	Postdoc	Plant virus coat protein delivery of neurotoxins	PSI	2008-2010	Industry
Guo, Ya	Postdoc	Honey bee viruses	Endowment	2018 to present	
Harrison, Robert L.	Postdoc / Assist. Scientist	Recombinant baculovirus insecticides	IMBA USDA	1996 - 2003	Project Director, USDA ARS
Kroemer, Jeremy	Postdoc	Glassy winged sharpshooter dicistrovirus; Capsoid delivery of silencing RNAs	CDFA / Monsanto Company	2011-2013	Monsanto Company
Kumar, Pavan	Postdoc	Bt toxin engineering to target Asian citrus psyllid	USDA SCRI	2017 - present	
Kuwar, Suyog	Postdoc	Toxin modification to overcome resistance	Monsanto	2016 to present	
Li, Huarong	Postdoc	Recombinant baculovirus insecticides; Bt interaction with the hemipteran gut	USDA	2004-2008	Dow AgroSciences
Liu, Sijun	Assist / Assoc Scientist	Plant virus – aphid interactions; insect virus discovery	USDA, industry	2004 to present	
Lomate, Purushottam	Postdoc	Digestive enzymes of stink bugs	CAMTech	2014 to 2016	Snr. Scientist, Ajeet Seeds, India
Pal, Narinder	Postdoc / Assist Scientist	Juvenile hormone esterase binding proteins in <i>Manduca sexta</i> ; Plant virus coat protein delivery of neurotoxins	NSF; GIVF / DuPont Pioneer	2004-2006; 2009-2012	USDA ARS
Paramasivan, Vijaya	Assist Scientist	Capsoid delivery of silencing RNAs	Monsanto Company	2012-2013	Assistant Scientist ISU
Mishra, Ruchir	Postdoc	Toxin engineering for novel target sites	BCS	2016 to present	

Name	Degree, Major	Thesis Title or Area of Training	Support	Period	Current Position
Shanmugavelu, Madasamy	Postdoc	Identification of juvenile hormone esterase binding proteins in <i>Manduca sexta</i>	NSF	1997-1999	Staff Scientist, Catalyst Biosciences
Sinha, Divya	Postdoc	Transcytosis across the lepidopteran gut epithelium	CAMTech	2013-2014	Postdoc, University of Wisconsin, Madison
Swaminathan, Sivakumar	Postdoc	Baculovirus expression of plant virus VLPs; Use of plant virus coat proteins for delivery of neurotoxins	USDA; Aventis & Syngenta	2005-2007	Research Associate ISU
Yang, Sheng	Postdoc	Toxin engineering for novel target sites	BCS	2015 - 2016	Postdoc, ISU
Brockhouse, Abbey	Res Scientist	Structure and function of <i>Manduca sexta</i> pericardial cells.	ISU	1995-1997	Res Associate, Univ. Prince Edward Is, Canada
Grosic, Sehiza	Res Scientist	Toxin engineering to target stink bugs	BCS	2015 - 2017	
Kemmerer, Mariah	Biological Scientist	Toxin delivery across the lepidopteran gut	UF	2017 - present	

Visiting Scientists

David Ben Yakir, Israel; Umut Toprak, Canada; Lopa Giri, University of Iowa; Ismael E. Badillo-Vargas, Kansas State University.

Service on Other Student Committees (UF)

Student	Degree	Program	Major Advisor	Dates
Lauren A. Cirino	PhD	Entomology	Christine Miller	2017 to 2018
Tse-Yu Chen	PhD	Entomology	Chelsea Smartt	2018 to pres.
Kellee Britt	PhD	Plant Pathology	Ozgun Batuman	2018 to pres.

Service on Other Student Committees (ISU)

Student	Degree	Program	Major Advisor	Dates
Gerardo Marquez	PhD	Entomology	Elliot Krafur	1995 to 2001
Monina Bartoces	MS	Entomology	Wayne Rowley	1995 to 1995
Lada Rasochova	PhD	Plant Pathology	W. Allen Miller	1995 to 1999
Brad Coates	MS	Entomology	Les Lewis	1997 to 2001
Gennediy Koev	PhD	Plant Pathology	W. Allen Miller	1997 to 1999
Rhuizong Shen	PhD	Plant Pathology	W. Allen Miller	2000 to 2004
Emily Gartrell	MS	Entomology	Russ Jurenka	2002 to 2004
Shao-Yi Huang	PhD	Genetics	Jack Girton and Kristen Johansen	2002 to 2004
Nina Richtman	MS	Entomology	Jon Tollefson	2004 to 2006
Matthew Peterson	PhD	Entomology	Greg Courtney	2004 to 2008
Gretchen Paluch	PhD	Entomol /Toxicol	Joel Coats	2006 to 2009
Grishma Parikh	PhD	MCDB	Lyric Bartholomay	2007 to 2011

Misha Rajaram	PhD	BCB	Karin Dorman	2007 to 2010
Aaron Gross	MS	Toxicology	Joel Coats	2008 to 2010
Jon Oliver	PhD	Entomology	Lyric Bartholomay	2008 to 2011
Michael McCarville	MS	Entomology	Matt O'Neal	2009 to 2011
Sarah Eagen	PhD	Genetics	M. Nilsen-Hamilton	2010 to 2011
Shambhavi Shubham	PhD	MCDB	M. Nilsen-Hamilton	2010 to 2016
Aaron Gross	PhD	Toxicology	Joel Coats	2011 to 2014
Jing Sun	PhD	Entomology	Tom Sappington	2011 to 2012
Stephanie Morriss	PhD	BBMB	Gustavo MacIntosh	2011 to 2012
Elizabeth Asque	PhD	Genetics	Michael Kimber	2012 to 2015
Paul Airs	MS	Entomology	Lyric Bartholomay	2012 to 2015
Adam Varenhorst	PhD	Entomology	Matt O'Neal	2012 to 2015
Melissa Irizarry	MS	Plant Pathology	Daren Mueller, Steve Whitham	2013 to 2016
Stacey Barnes	PhD	Genetics	Thomas Baum	2013 to 2016
Lisa Fraser	PhD	MSDB	Michael Kimber	2013 to 2016
Courtney Vogel	PhD	BBMB	Dipali Sashital	2014 to 2016
Ying Feng	MS	BCB	W. Allen Miller	2014 to 2015
Edmund Norris	PhD	Toxicology	Joel Coats, Lyric Bartholomay	2014 to 2016
Amy Geffre	PhD	EEB	Amy Toth	2015-present
Bliss Kernodle	PhD	Plant Pathology	Steve Whitham	2015 to 2016
Rebekah Reynolds	PhD	Entomology	Ryan Smith	2016 to 2016
Xiaoyi Dou	PhD	Entomology	Russell Jurenka	2016 to 2016

BCB, Bioinformatics & Computational Biology

EEB, Ecology & Evolutionary Biology

MCDB, Molecular, Cellular & Developmental Biology

University of Iowa

Patty Rose	PhD	Chemical Engineering	David Murhammer	2002 to 2005
Lopa Giri	PhD	Chemical Engineering	David Murhammer	2005 to 2009

Other

2004	External dissertation examiner for Erica Crone, CSIRO, Australia <i>Esterases of <i>Drosophila melanogaster</i></i>
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Undergraduates/Summer students

1995-1996	David Thompson, undergraduate research internship
1996	Sarah Jorgenson, high school student, Howard Hughes Medical Institute Research Assistantship in the Biological Sciences (RABS)
1996	Charles Knight, undergraduate research internship
1997	Jeffrey Veccelio, undergraduate Psychology/Pre-med, research for credit
1998	Diane Schroeder, Honors Student in Genetics; Howard Hughes RABS program
2000	Michael Hensel, Microbiology major, undergraduate research internship
2002	Karen Parian, University of Nevada, Reno, Agriculture Minority Internship Progr
2003	Linda Ho, Iowa State University, Program for Women in Science and Engineering, and undergraduate research for credit
2003	Rachel McGinley, undergraduate research internship
2004	Erica Cromer, pre-vet undergraduate research internship
2005	Lindsey Ehrlar, Iowa State University, Program for Women in Science and Engineering
2006	Amy Rohlfig, University of Iowa, Program for Women in Science and Engineering

2007	Clint Moody, Iowa State University undergraduate honors program. Research internship.
2007	Shannon Ashmore, Program for Women in Science and Engineering
2008	Jessicka Haywood, Program for Women in Science and Engineering, and undergraduate research for credit
2008-2009	Evelyn Chen, Junior at Ames High School, intern “Partnerships for Science Education”
2009	Arun Sethuraman, Erin Boggess, Bioinformatics & Computational Biology
2012	Claire Dupuis, Middle School student (8 th grade).
2017	Abigail G. Prohofskey, Entomology undergraduate
2017	Luke Prescott, Entomology undergraduate

SERVICE

University of Florida

University, College and Departmental Committees Served

2017 to present IFAS Honors and Awards Committee

Center and Interdepartmental Affiliations, University of Florida

2017 to present UF Genetics Institute

2017 to present UF Emerging Pathogens Institute

Iowa State University

Enhancement of research infrastructure at Iowa State University has provided a primary focus for Bonning’s service activities, along with alignment of research conducted within academia with the needs of industry, at both the fundamental and applied levels. Toward this end, Bonning established an NSF Industry/University Cooperative Research Center to address fundamental questions in insect physiology that are key for delivery of effective pest control measures.

Enhancement of Research Infrastructure

1995 to 2012	ISU Virology Journal Club Coordinator: Participating labs W. Allen Miller (Plant Pathology), Susan Carpenter (Animal Science), Steve Whitham (Plant Pathology), Dan Voytas (Zoology and Genetics), Brad Blitvich and Cathy Miller (VMPPM).
2000 to 2006	“Fly by Night” Coordinator: Monthly meetings with six participating labs that use <i>Drosophila</i> as a model organism.
2004, 2008	Organizer, Biennial All-Iowa Virology Symposium, Ames, IA. This meeting serves to enhance links between virologists within the state.
2007, 2009, 2011, 2013	Organizer, Iowa State University Hemiptera Research Symposium. To enhance interaction between nine ISU labs conducting research on Hemiptera
2011 to 2014	Director, Virus-Insect Interactions Initiative: The interdisciplinary VII team included 27 faculty members from 15 departments and was charged with conducting fundamental research to address challenges associated with plant protection against viruses and insect pests.
2013 to 2014	Coordinator, Interdisciplinary Interface Seminar Series, to increase awareness among biologists of the potential for on-campus, cross-disciplinary interaction and research collaboration between biologists and engineers.
2013 to present	Director, NSF Industry / University Cooperative Research Center, the Center for Arthropod Management Technologies. This center serves to

streamline the efforts of industry, government and academe toward pest management solutions.

Center and Interdepartmental Affiliations, Iowa State University

- 2013 to present Director, NSF Industry / University Cooperative Research Center, the Center for Arthropod Management Technologies
- 2011 to 2014 Lead, Plant Sciences Institute Virus-Insect Interactions Initiative
- 2008 to 2017 Iowa Center for Advanced Neurotoxicology
- 2007 to 2010 Co-director, Plant Sciences Institute, Crop Protection Initiative
- 2002 to 2014 Center for Plant Responses to Environmental Stresses, Plant Sciences Institute
- 2003 to present Interdepartment Microbiology Program Faculty
- Committees Served & Offices Held:
- 2003 to 2005 Admissions Committee
- 2005 to 2008 Supervisory Committee
- 2001 to 2017 Interdepartmental Program in Toxicology
- 1998 to 2017 Molecular, Cellular and Developmental Biology Program Faculty
- Committees Served & Offices Held:
- 2000 to 2003 Recruitment Committee
- 1994 to 2017 Interdepartmental Genetics Program Faculty
- Committees Served & Offices Held:
- 1997 to 1999 Admissions committee
- 1999 to 2000 Workshop committee for GENET591 (1 Cr) The Science and Politics of Agricultural Genetically Modified Organisms. Conference held 3/2000.
- 2000 to 2006 Supervisory Committee
- Workshop committee for GENET591 (1 Cr)
- 2001 to 2002 Genetics of Behavior, held April 2002
- 2003 to 2004 Genomic Tools and Analysis, held April 2004
- 2009 to 2010 Emerging Model Systems, held April 2010

University, College and Departmental Committees Served

- 1995 to 2013 Entomology Seminars and Lectures Committee
Chair 1997 - 2013
- 1995 to 1999 Entomology Faculty/Staff Awards Nominations Committee
- 1996 to 1999 Entomology Instruction and Student Affairs Committee
- 1997 to 1998 ISU Conference committee for 10th Annual Growth Factor and Signal Transduction Conference on Endocytosis and Intracellular Trafficking
- 1999 to 2017 Entomology Student Awards and Scholarships Committee
Chair 1999 - present
- 1998 to 2007 Department of Entomology Newsletter committee
- 2000 to 2017 Entomology Alumni Newsletter committee
Chair 2000 – 2012
- 2004 Chair, Medical Entomology Search Committee, Dept. of Entomology
- 2004 to 2017 Entomology Diversity committee
- 2005 to 2007 College of Agriculture Promotion & Tenure Committee
- 2005 to 2008 Iowa State University Biotechnology Council
- 2005 to 2011 Entomology Budget Advisory committee
- 2006 College of Agriculture and Life Sciences Budget Advisory Committee
- 2007 to 2010 Iowa State University Osborn Research Club Steering Committee
- 2007 to 2017 Entomology Promotion and Tenure Committee
- 2005 to 2011 Entomology Curriculum Committee
- 2014 Chair, Vector Entomology Search Committee, Dept. of Entomology

2015 to 2016 Entomology & NREM Executive Committee
NREM, Natural Resource Ecology & Management

Professional and Government Organizations

Society for Invertebrate Pathology
 1995 to present See page 3 for details

International Committee on Taxonomy of Viruses
 2002 to 2011 See page 3 for details

International Congress of Entomology (ICE)
 2014 to 2016 ICE 2016 Scientific Committee: Biological Control and Insect Pathology
 Symposium Organizer: *Virus-Insect Interactions*
 Symposium Organizer: *Public- Private Partnerships for Development of
 Next Generation Pest Management Methods* (CAMTech symposium)

Editorial Board

2007 to 2013 Editorial Board, Journal of Invertebrate Pathology
 2010 to 2012 Associate Editor, Journal of Invertebrate Pathology
 2013 to present Editorial Board, Current Opinion in Insect Science

Editor

2006 Bonning, B.C. Ed. (2006). Insect Viruses: Biotechnological Applications. *Adv. Virus Res.*
 Vol. 68. 532 pp. Academic Press.
 2009 Bonning, B.C. Ed. (2009) Honey Bee Disease. Supplementary Issue of Journal of
 Invertebrate Pathology. January 2010.
 2011 Bonning, B.C. Ed. (2011) Insect Viruses in Medicine. Special Issue of Journal of
 Invertebrate Pathology. February 2011.
 2015 Bonning, B.C. Ed. (2015) Virus-Insect Interactions. Special Issue of Current Opinion in
 Insect Science.
 2018 Genersch, E., Jensen, A.B., and Bonning, B.C. Eds. 2018. Bee disease. Special Issue of
 Current Opinion in Insect Science.

Ad hoc Reviewer for multiple journals including:

Archives of Insect Biochemistry and Physiology, Biochemical Systematics and Ecology,
 Biocontrol, Biological Control, Biotechnology and Bioengineering, Comparative Biochemistry
 and Physiology, Environmental Entomology, Insect Biochemistry and Molecular Biology, Insect
 Science and Its Application, Journal of Economic Entomology, Journal of General Virology,
 Journal of Invertebrate Pathology, Journal of Virology, Molecular Biotechnology, Molecular and
 Cellular Endocrinology, Nature Biotechnology, New Phytologist, PlosOne, Plos Pathogens,
 Proceedings of the National Academy of Sciences USA, Scientific Reports, Tissue and Cell

Book Reviews

1995 Methods in Molecular Biology™ 39 “Baculovirus Expression Protocols” (C.D.
 Richardson, Ed.) Annals of the Entomological Society of America 88(6): 894
 1998 Methods in Biotechnology™ 5: “Biopesticides: Use and Delivery”. F.R. Hall and J.J.
 Menn Eds. Humana Press. Quarterly Review of Biology
 2004 “Pesticides: Problems, Improvements and Alternatives”. F. Den Hond, P. Groenewegen,
 and N. M. Van Straalen (editors). Quarterly Review of Biology 79(1): 102-103

Ad hoc Reviewer for funding agencies including:

- United States Department of Agriculture National Research Initiative
 Entomology/Nematology
 Biologically Based Pest Management

- Biotechnology Risk Assessment Programs
- National Science Foundation
 - Integrative Animal Biology Program
 - Ecological and Evolutionary Physiology
- University of Maryland Industrial Partnerships/Technology Advancement Program.
- US-Israel BARD Grants Program
- Natural Environment Research Council, UK

Grant Review Panels

- USDA National Research Initiative, Entomology/Nematology
- National Science Foundation, Integrative Animal Biology
- National Science Foundation, Industry / University Cooperative Research Center

Other

Review team member, Comprehensive Program Review, Department of Entomology, Purdue University, October 27-30, 2014

Key Professional Development Activities

Training opportunities that facilitated Bonning's establishment and service as inaugural Director of the NSF I/UCRC, the Center for Arthropod Management Technologies. Bonning's leadership has consistently been closely aligned with research through the programs of the Plant Sciences Institute and through enhancement of research infrastructure at Iowa State University.

2012 **Iowa State University Emerging Leaders Academy.** Year long, university-wide program with monthly sessions established to enhance leadership development with emphasis placed on development of depth of leadership skills. Covers leadership research, theory and practice and a semester-long mentoring experience with a current Iowa State leader.

2014-15 **LEAD21: Leadership for the 21st Century.** Year long leadership development tool for those in land grant universities' colleges of agricultural, environmental, and human sciences and the USDA/NIFA. Goals of the program are to:

- Enhance application of skills and knowledge learned in four core leadership development areas (change, conflict, communication, and collaboration)
- Develop a peer leadership network in order to enhance personal leadership practice, collaboration, and diversity of perspective
- Develop and implement an individual leadership development process.