Bryony C. Bonning, Ph.D.

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

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Research, Teaching and Administration Programs

Research: Bonning's research program spans insect pathology, insect physiology and biotechnology with the goal of developing novel, environmentally benign alternatives to chemical insecticides for insect pest management. She is a leader in innovation toward biotechnology-based insect pest management tools drawing on fundamental research on molecular insect-pathogen interactions to devise innovative solutions for pest management in agriculture. Her current research emphasis is on citrus, with a focus on management of Asian citrus psyllid, *Diaphorina citri*, including characterization of psyllid gut surface proteins, establishment of *D. citri* cell lines, and use of pesticidal proteins derived from *Bacillus thuringiensis* for psyllid control. Bonning has published 187 papers, 6 patents, secured >$20 million in research funding and received nine awards in recognition of outstanding research and innovation. She is a Fellow of AAAS, the National Academy of Inventors, and the Entomological Society of America.

***Teaching*:** Bonning has trained 21 graduate students including 5 that received awards for outstanding doctoral research, developed 5 new courses, and mentored 72 other research personnel (33 postdoctoral researchers, 45 undergraduate and high school students, 9 research/ biological scientists). Bonning received two awards in recognition of her mentoring activities.

Administration: As inaugural director of the NSF Industry-University Cooperative Research Center, the Center for Arthropod Management Technologies (CAMTech; established August 2013; https://www.iucrc-camtech.org/), Bonning oversees the operation of the center. The mission of CAMTech is to provide foundational knowledge, methods and tools to streamline the delivery of products for efficient management of arthropod and nematode pests of agricultural, human and animal health importance. Fundamental research within the center is aligned with the needs of industry to promote innovation and expedite the delivery of new tools for pest management. The center has funded 42 research projects totaling >$5.5 million (29 projects totaling $3.34 million since 2018), resulting in significant advances toward pest management technology development.

Education:

1985 to 1988 Department of Entomology, London School of Hygiene and Tropical Medicine, University of London, UK Ph.D (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*:**

2023	Professional Development Leave, University of Leeds, UK (6 months)
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

2024 UF/IFAS Large Grant Leadership Award for the NSF IUCRC Phase II award / CAMTech

2023 Fellow of the National Academy of Inventors

2023 UF Innovation Award (U.S. Provisional Patent Application No 63/114278)

2023 UF/IFAS High Impact Publication Recognition (for manuscript #105 below).

2023 UF/IFAS Culture of Nomination Award

2020 Entomological Society of America (ESA) Recognition Award in Insect Physiology, Biochemistry and Toxicology

2016 Iowa State University (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 (Biological Sciences)

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 (100 presentations) including *Karl Maramorosch Lecture* at Rutgers University, *Charles Chesley Doane Distinguished Lecture* at University of Wisconsin, Madison, *Robert L. 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
Applied Microbiology International

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

National Academy of Inventors (2024 to present)
Royal Entomological Society of London (1985 to 2005; 2023 to present)

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, 41st Annual meeting of the Society for Invertebrate Pathology, held in Warwick, UK, August 2008
2004 to 2005	Program Chair, 38th Annual meeting of the Society for Invertebrate Pathology, Anchorage, Alaska, August 2005
2010 to present	Publications Committee
2021 and ad hoc	Cross Divisional / Divisional Symposium organizer

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 187 publications (130 refereed journal articles, 31 refereed reviews, 26 book chapters) h-index 50; 8614 citations (Jan 6, 2025). ORCID # 0000-0002-9956-9613

Refereed Journal Articles in reverse chronological order; * indicates mentee

130. Wu, K., Vu, E., Ghosh, S., Mishra, R., **Bonning, B.C**. 2025. Continuous cell lines derived from the Asian citrus psyllid, *Diaphorina citri* (Liviidae; Hemiptera) harbor viruses and Wolbachia. Sci Reports doi. 10.1038/s41598-024-83671-2

129. Vu, E.D., Liu, S., **Bonning, B.C.** 2024. Phasmavirus-derived genome sequences and endogenous viral element identified in the small hive beetle, *Aethina tumida*, Murray. J. Invertebr. Pathol. 108265. doi: 10.1016/j.jip.2024.108265

128. Tavares, C.S., Stelinski, L.L., **Bonning, B.C.** 2024. The sandwich feeding assay for use with first instar nymphs of the Asian citrus psyllid, *Diaphorina citri* confirms the highest susceptibility of this life stage to bacterial pesticidal proteins. Journal of Invertebrate Pathology 207: 108208 doi: 10.1016/j.jip.2024.108208

127. Vu, E.D., Chiavini, B.E., Gratton, E.M., Dolezal, A.G., **Bonning, B.C.** 2024. Representative honey bee viruses do not replicate in the small hive beetle, *Aethina tumida* Murray. Journal of Invertebrate Pathology 207:108207 doi: 10.1016/j.jip.2024.10820

126. Jiménez, J., Mishra, R., Wang, X., Magee, C.M., **Bonning, B.C.** 2024. Composition and abundance of midgut surface proteins in two major hemipteran vectors of plant viruses, *Bemisia tabaci* and *Myzus persicae*. Arch. Insect Biochem. Physiol. 116(3):e22133. doi: 10.1002/arch.22133

125. Iredale*, M.E., Cobb*, G., Vu*, E.D., Ghosh*, S., Ellis, J.D., **Bonning, B.C.** 2024. Development of a multiplex real-time quantitative reverse-transcription polymerase chair reaction for the detection of four honey bee viruses. J. Virol. Methods 328:114953. doi: 10.1016/j.jviromet.2024.114953

124. Tavares*, C.S., Mishra, R., Kishk, A., Wang, X., Ghobrial*, P.N., Killiny, N., **Bonning, B.C.** 2024. The beta pore-forming bacterial pesticidal protein Tpp78Aa1 is toxic to the Asian citrus psyllid vector of the citrus greening bacterium. J. Invertebr. Pathol. 204:108122. doi: 10.1016/j.jip.2024.108122

123. Jiménez*, J.R., Kemmerer*, M., King, G.F., Polston, J.E., **Bonning, B.C.** 2024. Coat protein of a whitefly-vectored plant virus as a delivery system to target whitefly. Microbial Biotechnol. 17(4): e14468 doi: 10.1111/1751-7915.14468

122. Kishk, A., Tavares*, C., Mishra, R. **Bonning, B.C.,** Killiny, N. 2023. Influence of '*Candidatus* Liberibacter asiaticus' infection on the susceptibility of Asian citrus psyllid, *Diaphorina citri* to *Bacillus thuringiensis* bioinsecticidal proteins, Mpp51Aa1 and Cry1Ba1. J. Invertebr. Pathol. 200:107972. doi: 10.1016/j.jip.2023.107972

121. Mishra, R., Narayana, R., Ibanez-Carrasco, F., Achor, D., Shilts, T., El-Mohtar, C., Orbović, V., Stelinski, L., **Bonning, B.C.** 2023. Bacterial pesticidal protein Mpp51Aa1 delivered via transgenic citrus severely impacts the fecundity of Asian citrus psyllid, *Diaphorina citri*. Applied and Environmental Microbiology 89 (8): e00723-23. doi: 10.1128/aem.00723-23

120. Blackburn, M.B., Sparks, M.E., Mishra, R., **Bonning, B.C.** 2023. Genomic sequencing of fourteen *Bacillus thuringiensis* isolates: insights into geographic variation and phylogenetic implications. BMC Research Notes 16(1):134. doi: 10.1186/s13104-023-06411-1

119. Iredale*, M.E., Viadanna, P.H.O., Subramaniam, K., Tardif, E., **Bonning, B.C**., Ellis, J.D. 2023 Characterization of amoebic disease in a colony of western honey bees, *Apis mellifera*. Veterinary Pathology 60(5): 709-713. doi: 10.1177/03009858231179956

118. Orbović, V., Ravanfar, S.A., Achor, D., Shilts, T., Ibanez-Carrasco, F., Banerjee, R., El-Mohtar, C., Stelinski, L., **Bonning, B.C.** 2023. Cry1Ba1-mediated toxicity of transgenic *Bergera koenigii* and *Citrus sinensis* to the Asian citrus psyllid *Diaphorina citri*. Frontiers in Insect Science vol 3: 1125987. doi: 10.3389/finsc.2023.1125987

117. Wu, K., Ortgiesen*, G.J., Goodman, C.L. **Bonning, B.C.** 2023. Optimized conditions for the long-term growth of primary cell cultures derived from the Asian citrus psyllid, *Diaphorina citri* (Liviidae: Hemiptera). In Vitro Cell Dev Biol – Animal 59 (4): 235-240. doi 10.1007/s11626-023-00765-3

116. Tavares*, C.S., **Bonning, B.C**. 2022. Mpp51Aa1 toxicity to *Diaphorina citri* nymphs demonstrated using a new, long-term bioassay method. Journal of Invertebrate Pathology, 1 95:107845. doi: 10.1016/j.jip.2022.107845

115. Ravanfar, S.A., Achor, D.S., Killiny, N., Shilts, T., Chen, Y., El-Mohtar, C., Stelinski, L.L., **Bonning, B.C.,** Orbović, V. 2022. Genetic modification of *Bergera koenigii* for expression of the bacterial pesticidal protein Cry1Ba1. Frontiers in Plant Science 13:899624. doi: 10.3389/fpls.2022.899624

114. Tavares*, C.S., Mishra*, R., Ghobrial*, P.N., **Bonning, B.C.** 2022. Composition and abundance of midgut surface proteins in the Asian citrus psyllid, *Diaphorina citri*. J. Proteomics 261:104580 doi: 10.1016/j.jprot.2022.104580

113. Panneerselvam*, S., Mishra*, R., Berry, C., Crickmore, N., **Bonning, B.C.** 2022. BPPRC database: a web-based tool to access and analyze bacterial pesticidal proteins. Database (Oxford) baac022. doi: 10.1093/database/baac022

112. Banerjee*, R., Flores-Escobar*, B., Chougule, N.P., Canton*, P.E., Dumitru, R., **Bonning, B.C.** 2022. Peptide mediated, enhanced toxicity of a bacterial pesticidal protein against southern green stink bug. Microbial Biotech 15: 2071-2082. doi: 10.1111/1751-7915.14030

111. Kuwar*, S.S., Mishra*, R., Banerjee*, R., Milligan, J., Rydel, T., Du, Z., Xie, Z., Ivashuta, S., Kouadio, J.L., Meyer, J.M., **Bonning, B.C**. 2022 Engineering of Cry3Bb1 provides mechanistic insights toward countering western corn rootworm resistance. Curr. Res. Insect Sci. 2: 100033. https://doi.org/10.1016/j.cris.2022.100033

110. Liu*, S., Sappington, T.W., Coates, B.S., **Bonning, B.C.** 2022. Sequences encoding a novel toursvirus identified from southern and northern corn rootworms (Coleoptera: Chrysomelidae). Viruses 14(2): 397 doi: 10.3390/v14020397

109. Corcoran, J., Goodman, C.L., Saathoff, S., Ringbauer, J.A., Guo, Y., **Bonning, B.C.**, Stanley, D. 2021. Cell lines derived from the small hive beetle, *Aethina tumida*, express insecticide targets. In Vitro Cellular & Developmental Biology – Animal 57(9):849-855. doi: 10.1007/s11626-021-00633-y

108. Liu*, S., Zhang, S.M., Buddenborg, S.K., Loker, E.S., **Bonning, B.C.** 2021. Virus-derived sequences from the transcriptomes of two snail vectors of schistosomiasis, *Biomphalaria pfeifferi* and *Bulinus globosus* from Kenya. PeerJ 9:e12290. doi: 10.7717/peerj.12290

107. Mishra*, R., Guo*, Y., Kumar*, P., Canton*, P.E., Tavares*, C.S., Banerjee*, R., Kuwar*, S., **Bonning, B.C**. 2021. Streamlined phage display protocols for identification of insect gut binding peptides highlight peptide specificity, Curr. Res. Insect Sci. 1: 100012 https://doi.org/10.1016/j.cris.2021.100012

106. Liu*, S., Sappington, T.W., Coates, B.S., **Bonning, B.C.** 2021. Nudivirus sequences identified from the southern and western corn rootworms (Coleoptera: Chrysomelidae). Viruses 13(2): 269 doi: 10.3390/v1302026

105. Crickmore, N., Berry, C., Panneerselvam*, S., Mishra, R., Connor, T.R., **Bonning, B.C.** 2021. A structure-based nomenclature for *Bacillus thuringiensis* and other bacteria-derived pesticidal proteins. J. Invertebr. Pathol. 186:107438. doi: 10.1016/j.jip.2020.107438

Associated web site and database: https://bpprc.org/

104. Liu*, S., Valencia-Jiménez, A., Darlington, M., Vélez, A.M., **Bonning, B.C**. 2020. *Diabrotica undecimpunctata virus 2*, a novel small RNA virus discovered from southern corn rootworm, *Diabrotica undecimpunctata howardi* Barber (Coleoptera: Chrysomelidae). Microbiology Resource Announc. 9(26):e00380-20. doi: 10.1128/MRA.00380-20

103. Liu*, S., Valencia-Jiménez, A., Darlington, M., Vélez, A.M., **Bonning, B.C**. 2020. Genome sequence of a small RNA virus of the southern corn rootworm, *Diabrotica undecimpunctata howardi* Barber (Coleoptera: Chrysomelidae). Microbiology Resource Announc. 9(26):e00379-20. doi: 10.1128/MRA.00379-20

102. Liu*, S., Coates, B.S., **Bonning, B.C**. 2020. Endogenous viral elements integrated into the genome of the soybean aphid, *Aphis glycines*. Insect Biochem. Molec. Biol. 11:103405. doi: 10.1016/j.ibmb.2020.103405

101. Geffre, A. C., Gernat, T., Harwood, G. P., Jones, B. M., Morselli Gysi, D., Hamilton, A. R., **Bonning, B. C.,** Toth, A. L., Robinson, G. E., Dolezal, A. G. 2020. Honey bee virus causes context-dependent changes in host social behavior. *Proceedings of the National Academy of Sciences USA*: doi: 10.1073/pnas.2002268117

100. Giordano, R. et al (**Bonning, B.C.** 25th of 63 authors). 2020. Soybean aphid biotype 1 genome: Insights into the invasive biology and adaptive evolution of a major agricultural pest. Insect Biochem. Mol. Biol. 120:103334. doi: 10.1016/j.ibmb.2020.103334.

99. Canton*, P.E., **Bonning, B.C**. 2020. Transcription and activity of digestive enzymes of *Nezara viridula* maintained on different plant diets. Frontiers in Physiology – Invertebrate Physiology 10:1553. doi: 10.3389/fphys.2019.01553

98. Kemmerer*, M., **Bonning, B.C.** 2020. Transcytosis of Junonia coenia densovirus VP4 across the gut epithelium of *Spodoptera frugiperda* (Lepidoptera: Noctuidae). Insect Science 117 (19) 10406-1041. doi: 10.1111/1744-7917.12600.

97. Liu*, S., **Bonning, B.C**. 2019. The principal salivary gland is the primary source of digestive enzymes in the saliva of the brown marmorated stink bug, *Halyomorpha halys*. Frontiers in Physiology – Invertebrate Physiology 10:1255. doi: 10.3389/fphys.2019.01255

96. Canton*, P.E., **Bonning, B.C**. 2019. Proteases and nucleases across midgut tissues of *N. viridula* (Hemiptera:Pentatomidae) display distinct activity profiles that are conserved through life stages. J. Insect Physiol. 119:103965. doi: 10.1016/j.jinsphys.2019.103965

95. Rutter, L., Carrillo-Tripp*, J., **Bonning, B.C.**, Cook, D., Toth, A.L., Dolezal, A.G. 2019. Transcriptomic responses to diet quality and viral infection in *Apis mellifera*. BMC Genomics 20:412. doi: 10.1186/s12864-019-5767-1

94. Fernandez-Luna*, M.T., Kumar*, P., Hall, D.G., Mitchell, A.T., Blackburn, M.B., **Bonning, B.C.** 2019. Toxicity of *Bacillus thuringiensis*-derived pesticidal proteins Cry1Ab and Cry1Ba against Asian citrus psyllid, *Diaphorina citri* (Hemiptera). Toxins pii: E173. doi: 10.3390/toxins11030173

93. Dolezal*, A.G., Carrillo-Tripp*, J., Judd, T., Miller, W.A., **Bonning, B.C.**, Toth, A.L. 2019. Interacting stressors matter: Diet quality and virus infection in honey bee health. R Soc Open Sci. 2019 Feb 6;6(2):181803. doi: 10.1098/rsos.181803

92. Liu*, S., Lomate*, P.R., **Bonning, B.C.** 2018. Tissue-specific transcription of proteases and nucleases across the accessory salivary gland, principal salivary gland and gut of *Nezara viridula*. Insect Biochem Molecul Biol 103: 36-45 doi: 10.1016/j.ibmb.2018.10.003

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 98(3):e21459 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 doi: 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, *Acyrthosiphon 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. doi: 10.1093/jee/tov301

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. doi: 10.1021/acs.joc.5b01428

76. Linz*, L.B., Liu*, S., Chougule*, N.P., **Bonning, B.C.** 2015. *In vitro* evidence supports membrane alanyl 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 iflavirus from the leafhopper, *Graminella nigrifons*. Genome Announcements 3: e00323-15. doi: 10.1128/genomeA.00323-15

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.0.069765-0.

73. Carrillo-Tripp*, J., E.N. Krueger, R.L. Harrison*, A.L. Toth, W.A. Miller**, B.C. Bonning**. 2014. Lymantria dispar iflavirus 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. 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. doi: 10.1073/pnas.1222144110

69. Pal*, N., Yamamoto, T., King, G.F., Waine, C., **Bonning, B.C.** 2013. Aphicidal efficacy of scorpion- and spider-derived neurotoxins. Toxicon 70: 114-122. doi: 10.1016/j.toxicon.2013.04.015

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. doi:10.1371/journal.pone.0045161

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9. **Bonning, B.C**., Boughton*, A.J., Jin*, H., Harrison*, R.L. 2002. Genetic enhancement of baculovirus insecticides. In: Advances in Microbial Control of Insect Pests. Kluwar Academic/Plenum Publishers, London. Rajeev K. Upadhyay (Ed.) pp.109-125

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6. **Bonning, B.C**. and Hammock, B.D. 1994. Insect control by use of recombinant baculoviruses expressing juvenile hormone esterase. In: "Natural and Engineered Pest Management Agents" (P. Hedin, Ed.), American Chemical Society Symposium Series 551 Chapter 26 pp. 368-383.

5. Ichinose, R., **Bonning, B.C**., Maeda, S., Hammock, B.D. 1993. Pharmacokinetics and tissue uptake of the recombinant juvenile hormone esterase in insects. In: "Pesticides/Environment: Molecular Biological Approaches" (T. Mitsui, F. Matsumura, and I. Yamaguchi, Eds.) pp. 183-194. Pesticide ScienceSociety of Japan, Tokyo.

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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1. **Bonning, B.C**. 1990. Insensitive acetylcholinesterase in insecticide resistant mosquitoes. "Pesticides and Alternatives", Excerpta Medica International Congress Series, Elsevier, pp 433-437.

Technology Transfer

Bonning holds six patents in the field of biotechnological applications for pest management, all of which have garnered industrial support to her lab. Her most significant patents are those that deal with the delivery of insect specific neurotoxic agents such as venom-derived peptides, from the gut to their site of action. Insect-specific peptides from animal venoms represent an untapped resource for pest management due to their inability to cross the insect gut epithelium to their site of action. Bonning drew on knowledge gained from disparate fields of research to produce two novel insect management technologies (U.S. Patent Nos. 7,312,080 and 11,140,902). These technologies are based on the direct movement of some viruses from the gut into the body cavity of the insect without uncoating in the gut epithelial cells. Bonning demonstrated in both cases that the viral coat proteins are sufficient for transport of neurotoxic peptides across the insect gut epithelium. She also demonstrated that short peptides that bind to the insect gut can be used to block virus infection (U.S. Patent No. 7547677) and as artificial anchors to enhance the efficacy of gut-active toxins such as the widely used bacterial pesticidal proteins.

Patents

1. 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**.
2. 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.
3. U.S. Patent No. 6,673,340. Issued October 8, 2003. Basement membrane-degrading proteases as insect toxins and methods for use of same. R. L. Harrison and **B. C. Bonning**.
4. 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**.
5. U.S. Patent Application No. 7,547,677. Issued June 16, 2009. "Plant Virus Transmission Inhibitor and Methods". **B. Bonning,** W.A. Miller, S. Liu
6. U.S. Patent No. 12,016,333 Issued June 25, 2024. "Insect toxin delivery mediated by a densovirus coat protein". **B.C. Bonning**, M. Kemmerer.

Pending patent applications

7. "Modified insecticidal proteins". B.C. Bonning, R. Dumitru. U.S. Patent Application No 20240090511 (filed November 15,2021)
8. "Insect toxin delivery mediated by a begomovirus coat protein". B.C.Bonning, J. Jimemez, J. Polston. U.S. Provisional Patent Application No. 63/257,280 (filed October 19, 2021)
9. "Pesticidal Proteins and Uses Thereof". B.C. Bonning, C.S. Tavares. U.S. Provisional Patent Application No. 63/622,182 (submitted 1-18-2024) UF Tech ID T19240: Asian citrus psyllid
10. "Pesticidal Proteins and Methods of Use" B.C. Bonning, C. S. Tavares, R. Mishra. U.S. Provisional Patent Application No 63/566,610 (submitted 3-18-2024). UF Tech ID T19281: Whitefly
11. "Pesticidal Proteins and Uses Thereof" B.C. Bonning, B. Chiavini, A. Dolezal, R. Mishra, C. Tavares. U.S. Provisional Patent Application No 63/571,509 (submitted 3-29-24). UF Tech ID T19252: Small hive beetle

Grants Awarded *(1995-present)*

Principal investigator (PI) or Co-PI on >$20 million for research. Listed below are collaborating colleagues at ISU, UF and other institutions.

Name	Position	Department / Affiliation
Batuman, Ozgur	Assistant Professor	University of Florida
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, Nanasaheb	Assistant Scientist	Iowa State University
Dawson, William O.	Eminent Scholar	University of Florida
Dutt, Manjul	Assistant Professor	University of Florida
Falk, Bryce	Professor	University of California, Davis
Feiss, Michael	Professor	University of Iowa
Gassmann, Aaron	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
Keesling, James	Professor	University of Florida
Killiny, Nabil	Associate Professor	University of Florida
Leandro, Leonora	Professor	Iowa State University
Levy, Amit	Assistant Professor	University of Florida
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
CI	UF Institute of Food and Agricultural Sciences (IFAS), Citrus Initiative
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
NCSRP	North Central Soybean Research Program
NRI	USDA National Research Initiative
NSF	National Science Foundation
OTL	UF Office of Technology & Licensing
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	ISU	Bonning		1995-6	$12,000

Project Title	Agency	PI	Co-PI	Period	Amount
baculovirus for control of the European corn borer					
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
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

Project Title	Agency	PI	Co-PI	Period	Amount
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	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
Aphid-luteovirus interaction: Aphid receptors, lutovirus 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

Project Title	Agency	PI	Co-PI	Period	Amount
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 *Homalodisca coagulata Virus-1* for controlling *Homalodisca vitripennis*, the glassy-winged sharpshooter	CDFA	Falk	Bonning, Miller	2011-2013	$425,00 ($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
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, Blackburn	2013-2017	$500,000
Collaborative Research: I/UCRC:	NSF	Bonning	Palli	2013-	$482,500

Project Title	Agency	PI	Co-PI	Period	Amount
Center for Arthropod Management Technologies (CAMTech)	I/UCRC			2018	
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
Impact of host plant on the digestive enzymes of the southern green stink bug	CAMTech	Bonning	NA	2017-2018	$150,000
Development of a Bacterial Pesticidal Protein Information Resource Center	CAMTech	Bonning	Crickmore Berry Connor	2017-2022	$285,000
Bt-based strategies for management of *Diaphorina citri* and citrus greening	USDA SCRI	Bonning,	Blackburn Dawson Borneman Roper Orbovic Keesling Jetter Grafton-Cardwell Stelinski Setamou	2017-2022	$2,496,099
Phase II I/UCRC University of Florida: Center for Arthropod Management Technologies	NSF I/UCRC	Bonning		2018-2023	$750,000
Travel Awards for Research Grant EnhancemenT (TARGET)	UF IFAS	Bonning	Dale, DiGennaro, Grabau, Lucky, Mallinger, Wong	2019-2020	$17,500
Viral hijackers: Can viral pathogens manipulate honey bee behavior to increase disease transmission?	USDA	Dolezal	Bonning, Brent, Robinson	2019-2022	$499,822
A novel toxin delivery system for whitefly control	USDA NIFA	Bonning	Polston	2019-2021	$150,000
3D cell culture modeling of the *Spodoptera frugiperda* midgut	CAMTech	Schmidt	Bonning Stanley	2020-	$160,600

Project Title	Agency	PI	Co-PI	Period	Amount
epithelium				2022	
Targeting receptors to mitigate virus burden in the honey bee	USDA NIFA	Bonning	Dolezal	2020-2023	$396,985
Investigation of insect-specific viruses in Florida Asian citrus psyllid populations to develop a biological control	UF IFAS CI	Batuman	Levy, Bonning	2020-2023	$475,209 ($98,321 to BB p.a.)
Optimal Bt toxins and gene silencing RNAs for management	USDA ECDRE	Bonning	Dutt, El-Mohtar, Stelinski L, Killiny Rivera	2020-2023	$1,480,456
Bee safe, pathogen based tools for small hive beetle management	USDA NIFA	Bonning	Dolezal	2020-2023	$499,201
Gut binding peptides and gut surface proteomes of three hemipteran pests	CAMTech	Bonning	Mishra, Jimenez	2021-2023	$170,000
Targeting the Asian citrus psyllid to block CLas transmission	USDA ECDRE	Pelz-Stelinski	Bonning	2021-2023	$1,020,811 ($434,630 to BB)
REU: Arthropod Management Technologies	NSF	Bonning		2021-2022	$32,000
Mechanisms for plant-based control of insect pests	Genective	Bonning		2022-2024	$240,971
REU: Arthropod Management Technologies	NSF	Bonning		2022-2023	$48,000
Toward a reliable, insect cell culture-based technique for culturing CLas bacteria	USDA ECDRE	Pelz-Stelinski	Bonning Wang Stelinski	2022-2024	$793,286 ($226,224 to BB)
Stink bug secreted salivary proteomes and salivary gland physiology	NSF CAMTech	Swale	Bonning	2023-2024	$160,000
Center: IUCRC Phase III University of Florida: Center for Arthropod Management Technologies (CAMTech)	NSF	Bonning	Swale	2023-2028	$250,000
Identification of insect gut protein-binding motifs	NSF CAMTech	Bonning	Mishra Arora	2024-2025	$162,000
REU: Arthropod Management Technologies	NSF	Bonning	Swale	2024-2025	$16,000
Optimal combination of Bt toxins and gene silencing RNAs for management of citrus root weevil	CRDF	Bonning	Stelinski Killiny Dutt	2024-2027	$462,492
Lepidopteran gut surface proteomes	NSF CAMTech	Bonning	Mishra	2025-2027	$180,000

Invited Presentations – National (78)

2024 University of Florida Virology Symposium. The use of insect gut binding peptides to inform virus-vector molecular interactions. (12-6-24)

2022 Symposium talk, Entomological Society of America, Vancouver, Canada. Targeting Asian citrus psyllid with *Bacillus thuringiensis*-derived pesticidal proteins. (11-13-22)

2022 Symposium talk. ISCHPP, Clearwater, Florida. Targeting Asian citrus psyllid with the *Bacillus thuringiensis*-derived pesticidal protein, Cry1Ba1. (10-27-22)

2022 Invaio Sciences seminar. The hemipteran gut and delivery of bioactives. (8-30-22)

2021 University of Florida Virology seminar. Peptide-mediated protection of the honey bee against virus infection. (12-17-21)

2021 North Carolina State University, Department of Entomology & Plant Pathology. Targeting Asian citrus psyllid with *Bacillus thuringiensis*-derived pesticidal proteins (8-23-21)

2020 Entomological Society of America, PBT Networking session (virtual): *ESA Recognition Award in Insect Physiology, Biochemistry and Toxicology* presentation. Targeting hemipterans with *Bacillus thuringiensis*-derived pesticidal proteins. (11-17-20)

2020 *K. Maramorosch Lecture*, Rutgers University Department of Entomology. Peptide-mediated protection of the honey bee against virus infection. (2-21-20)

2019 Symposium talk, Entomological Society of America, INSTAR symposium: Bridging the gap between industry needs and academic research for arthropod management.

2019 *Charles Chesley Doane Distinguished Lecture*, University of Wisconsin, Madison. Orange juice, psyllids and Bt toxins. (11-1-19)

Second seminar: Bridging the gap between industry needs and academic research for arthropod management.

2019 Citrus Expo. Bt toxins for suppression of the Asian citrus psyllid. (8-15-19)

2018 University of Florida, Department Microbiology & Cell Science (9-17-18). *Bacillus thuringiensis*–derived insecticidal toxins: Retargeting to hemipteran pests.

2018 Symposium talk, 11th Annual Arthropod Genomics Symposium, University of Illinois at Urbana-Champagne (6-8-18). The insect virome.

2018 University of Florida Genetics Institute (2-23-18). Innovative approaches for management of the Asian citrus psyllid, *Diaphorina citri* and other pests.

2017 University of Florida, Genetics and Genomics Program (10-11-17). Invertebrate virus discovery and applications for management of snail-vectored 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 Distringuished 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-vectored 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, Manhatten 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 (27)

2024 Instituto de Biotecnologia, Universidad Nacional Autonoma de Mexico. Gut binding peptides to enhance bacterial pesticidal proteins and inform resistance mechanisms. Invited seminar 8-19-24.

2024 The use of insect gut binding peptides to inform vector-pathogen molecular interactions and for vector control, Genetic Biocontrol Conference, Gordon Research Conference, Barcelona, Spain 5-23-24

2023 Use of gut binding peptides as artificial anchors for improved toxicity of bacterial pesticidal proteins against Hemiptera. University of Leeds, UK, August 8, 2023. (Professional Development Leave)

2022 Symposium talk. The Insect Virome. Annual meeting of the Society for Invertebrate Pathology, August 1-4, 2022.

2018 The insect virome. 6-8-18. Invited speaker, 11th annual Arthropod Genomics Symposium, Illinois

2016 International Congress of Entomology. Invited talk in Symposium on Novel Biopesticides. 9-29-16. 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-vectored 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, NY.

1994 Superior expression of intracellular and extracellular proteins from the basic protein promoter of *Autographa cailfornica* 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 13 th 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 (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

Mentoring of Students, Postdoctoral Researchers and Other Scientists

Bonning has mentored 33 postdoctoral researchers, 43 undergraduate and high school students, and four biological scientists. Five of her doctoral students received major awards for their doctoral research.

* Research Excellence Awards recognize the top 10% of graduating doctoral students at Iowa State University; ** 2023 Best dissertation award, UF Entomology & Nematology Department and UF/IFAS

Name	Degree, Major, Title	Thesis Title or Area of Training	Support	Period	Current Position
Deist, Benjamin	MS, Microbiology	Engineering Cry4Aa for toxicity against the soybean aphid, *Aphis glycines* Matsumura	USDA	2012-2015	Applications Scientist, Advanced Analytical Technologies
Jin, Hailing	MS, Genetics	Polyhedral envelope protein mutants of Rachiplusia ou multi-nucleocapsid nucleopolyhedrovirus	RA	1999-2002	Director, Microarray Facility, ISU
Iredale, Marley	MS, Entomology	Viruses of honey bees	Endowment	2021-2023	Veterinary Pathologist for US zoos
Kemmerer, Mariah	MS, Microbiology	Transcytosis across the lepidopteran gut epithelium	CAMTech	2014 - 2017	Biological Scientist, UF to 2019: Snr Lab techn, Univ Delaware
Li, Shunji	MS Entomology	Honey bee viruses	USDA	2015-2017	PhD student, North Dakota Univ.
Miranda, Morgana	MS Entomology	Pesticidal proteins toxic to Asian citrus psyllid	Endowment	2024 - present	

Name	Degree, Major, Title	Thesis Title or Area of Training	Support	Period	Current Position
Nusawardani, Tyasning	MS, Entomology	Effects of a protease-expressing recombinant baculovirus insecticide on the parasitoid *Cotesia marginiventris* (Cresson)	BRAP	2002-2005	PhD, Univ Kentucky; Postdoc, ISU; Bayer
Ortgiesen, Grace	MS, Entomology	Virus replication in hemipteran cell lines	Citrus Initiative	2020-2021	RapidGenomics
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 *Rhopalosiphum padi* virus RNA in a plant cellular environment	PSI	2009-2010	Research Scientist, Monsanto
Sandgren, David	MS, Genetics	Removal of transposon target sites from the Autographa californica multiple nucleopolyhedrovirus fp25k gene	EPA	2004-2005	Industry
Schmidt, Nina	MS, Microbiology	Physiological impact of a *Bacillus thuringiensis* toxin on the black cutworm that enhances baculovirus pathogenicity	RA	2006-2009	DuPont Pioneer; Corteva
Tang, Hailin	MS, Toxicology	Tissue specificity of a baculovirus expressed, basement membrane-degrading protease in larvae of *Heliothis virescens*	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
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 JHE binding protein in	NSF	2001-2007	Postdoc, Harvard Medical School

Name	Degree, Major, Title	Thesis Title or Area of Training	Support	Period	Current Position
		D. melanogaster			
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 the tobacco budworm, *Heliothis virescens* (Fabricius)	RA	2005-2010	USDA ARS, MD
Tavares **, Clebson	PhD, Entomology	Physiology of the Asian citrus psyllid gut.	USDA CDRE	2019-2023	Postdoc, University of Florida
Vijayendran*, Diveena	PhD, Genetics	Aphid small RNAs and viruses	RA	2010-2014	Postdoc, Harvard Medical School
Vu, Emily	PhD, Genetics	Virome of small hive beetle	USDA	2021-2024	Postdoc, University of Tennessee
Arora, Arinder	Postdoc	Honey bee virus receptors	USDA	2021-2024	Postdoc, Texas A&M
Banerjee, Rahul	Postdoc	Bt toxin engineering to target Asian citrus psyllid	USDA SCRI	2018-2021	Corteva AgriScience
Boughton, Anthony	Postdoc	Risk assessment of recombinant baculovirus insecticides	BRAP	2001-2002	USDA APHIS
Canton, Emiliano	Postdoc	Host plant impact on stink bug digestive enzymes	CAMTech	2017-2019	Faculty member, Instituto Tecnológico y de Estudios Superiores de Monterrey, Campus Guadalajara.
Cao, Chun	Postdoc	Juvenile hormone esterase binding proteins in *Manduca sexta*.	NSF	2001-2003	Bioforce Nanosciences Inc.
Carrillo-Tripp, Jimena (co-advisee)	Postdoc	Viruses of aphids and bees	PSI, USDA	2009-2015	Ensenada Center for Scientific Research and Higher Education, Mexico
Chen, Yuting	Postdoc	Viruses of stink bugs	DAS	2014 - 2017	Postdoc, NC State Univ; BASF; Greenlight Biosiences
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	BASF

Name	Degree, Major, Title	Thesis Title or Area of Training	Support	Period	Current Position
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 - 2018	Researcher, NZ
Georgievska, Liljana	Postdoc	Plant virus coat protein delivery of neurotoxins	PSI	2008-2010	Project Manager, Univ. Coimbra, Portugal
Ghosh, Saptarshi	Postdoc	Pest control systems	Industry	2022-present	
Guo, Ya	Postdoc	Honey bee viruses	USDA	2018 to 2020	Assistant Professor, Northwest A & F University PRC
Harrison, Robert L.	Postdoc / Assist. Scientist	Recombinant baculovirus insecticides	IMBA USDA	1996 - 2003	Project Director, USDA ARS
Jaime Jimenez	Postdoc	Begomovirus-whitefly interactions	USDA	2019-2023	NRC Institute of Agricultural Science, Madrid, Spain
Kroemer, Jeremy	Postdoc	Glassy winged sharpshooter dicistrovirus; Capsoid delivery of silencing RNAs	CDFA / Monsanto Company	2011-2013	Monsanto Company / Bayer
Kumar, Pavan	Postdoc	Bt toxin engineering to target Asian citrus psyllid	USDA SCRI	2017 - 2019	Corteva Agriscience
Kuwar, Suyog	Postdoc	Toxin modification to overcome resistance	Monsanto	2016 to 12/2018	Assist. Prof. Institute of Bioinformatics and Biotechnol., Savitribai Phule Pune University, Pune, India
Li, Huarong	Postdoc	Recombinant baculovirus insecticides; Bt interaction with the hemipteran gut	USDA	2004-2008	Dow AgroSciences; Qingdao Kingagroot
Liu, Sijun	Assist / Assoc Scientist	Plant virus – aphid interactions; insect virus discovery	USDA, industry	2004 to 2021	Retired 2021.
Lomate, Purushottam	Postdoc	Digestive enzymes of stink bugs	CAMTech	2014 to 2016	Snr. Scientist, Ajeet Seeds, India
Pal, Narinder	Postdoc / Assist	JHE binding proteins in *Manduca sexta*; Plant	NSF; GIVF / DuPont	2004-2006;	Plant Introduction

Name	Degree, Major, Title	Thesis Title or Area of Training	Support	Period	Current Position
	Scientist	virus coat protein delivery of neurotoxins	Pioneer	2009-2012	Station, USDA ARS, Ames, IA
Paramasivan, Vijaya	Assist Scientist	Capsoid delivery of silencing RNAs	Monsanto Company	2012-2013	Assistant Scientist ISU
Mishra, Ruchir	Postdoc / Biological Scientist II (2021)	Toxin engineering for novel target sites; Toxin engineering to target ACP	BCS; USDA	2016 to present	
Pannerselvem, Suresh	Postdoc	Bacterial pesticidal protein database	CAMTech	2018 to 2022	University of Texas Southwestern Medical Center, Department of Bioinformatics.
Shanmugavelu, Madasamy	Postdoc	Identification of juvenile hormone esterase binding proteins in *Manduca sexta*	NSF	1997-1999	Staff Scientist, Catalyst Biosciences
Sinha, Divya	Postdoc	Transcytosis across the lepidopteran gut epithelium	CAMTech	2013-2014	Postdoc, University of Wisconsin
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
Tavares, Clebson	Postdoc	Interaction of Asian citrus psyllid with CLas	USDA ECDRE	2023-present	
Xie, Na	Postdoc	Gene silencing in Asian citrus psyllid	USDA ECDRE	2022-present	
Yang, Sheng	Postdoc	Toxin engineering for novel target sites	BCS	2015 - 2016	Postdoc, ISU
Brockhouse, Abbey	Res Scientist	Structure and function of *Manduca sexta* 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	Lab Assistant, ISU
Kemmerer, Mariah	Biological Scientist	Toxin delivery across the lepidopteran gut	UF	2017 - 2019	Snr Lab technician, Univ Delaware
Ke Wu	Biological Scientist IV	Hemipteran cell lines	UF	2021 – present	
K. Grace Crummer	Center Coordinator	CAMTech	NSF	2018 – 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 - 9)

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 2021
Kellee Britt	PhD	Plant Pathology	Ozgur Batuman	2018 to 2021
Emily Nooryke	MS	Entomology	Jamie Ellis	2019 to 2020
Bryce Shirk	MS	Entomology	Blair Siegfried	2019 to 2021
Jasmine Ayers	PhD	Biomedical Sciences	Lei Zhou & Rhoel Dinglasan	2019 to 2022
Erik R. Salazar	PhD	Entomology	Kirsten Pelz-Stelinski	2019 to 2023
Flinn O'Hara	PhD	Entomology	Daniel Swale	2023 to pres.
Charlotte Addae	PhD	Entomology	Estelle Martin	2023 to 2024
Bright Agbodzi	PhD	Genetics Genomics	Rhoel Dinglasan	2024 to pres.
Tony Frimpong	PhD	Chemical Eng.	Whitney Stoppel	2023 to pres
Flinn O'Hara	PhD	Entomology	Daniel Swale	2022 to pres

Service on Other Student Committees (ISU - 36)

Student	Degree	Program	Major Advisor	Dates
Gerardo Marquez	PhD	Entomology	Elliot Krafsur	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
Esterases of *Drosophila melanogaster*

Undergraduates/Summer students (total 45)

Iowa State University (19)

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 Ehrler, Iowa State University, Program for Women in Science and Engineering
2006	Amy Rohlfing, 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 (8th grade).

University of Florida (26)

2017	Abigail G. Prohofsky, Entomology undergraduate
2017	Luke Prescott, Entomology undergraduate
2018	Kristen Gaines, Entomology undergraduate
2019	Luke Vescovi, Biotechnology undergraduate; Emily Vu, Biochemistry undergraduate; Brooke Yudell, Chemical Engineering undergraduate.

2020	Pierre Ghobriel, Biochemistry undergraduate; Jordan Vann, Animal Science undergraduate; Julia Joseph and Xinyue (Serena) Wang (NSF REU student; Honors research program), Health Sciences (pre-Med) undergraduates.
2021	Ciara Magee, Microbiology & Cell Science (NSF REU student); Lucia Navia, Entomology; Vanessa Gonzalez (NSF REU student), Microbiology.
2022	Aarini Pandya, Neuroscience; Victoria Valby, Microbiology & Cell Sciences; Catherine Liu, Microbiology & Cell Science; Ashley Malcolm, Biotechnology major with minor in Innovation (NSF REU student).
2023	Haley Dabbs, Munheeb Khan, Maddie Sischo, David Castellanos, Gisella DePiazza, Kevin Fernandez, Morgana Miranda and Mackenzie Mekler
2024	Sherry Kang

SERVICE

University of Florida

University, College and Departmental Committees Served

2017 to 2019	IFAS Honors and Awards Committee
2019 to 2023	IFAS Distinguished Professor Nomination Committee
2019 to 2023	IFAS Dean for Research Advisory Committee -Organization of and participation in 2020 Research Forum
2018 to present	Faculty mentor for Assistant Professors Peter DiGennaro (to 2023), Andrea Lucky, Adam Wong, Estelle Martin, Ted Burgess.

Center and Interdepartmental Affiliations, University of Florida

2017 to present	UF Genetics & Genomics Institute
2017 to present	UF Emerging Pathogens Institute

Entomology & Nematology Department

2017-2018	Coordinator, departmental Research Retreat, held May 8, 2018
2018-2019	Search committee for Assistant Professor in Invertebrate Vectors of Disease
2018 to present	Coordinator, NCFDD Faculty Writing Accountability Groups
2020 to 2024	Chair, Awards and Honors Committee (Faculty and Staff)
2021 to 2023	Member, Department Chair Search Committee
2022 to 2023	Administrative Advisory Committee
2024 to present	Chair, Communications Committee

Enhancement of Research Infrastructure

Enhancement of research infrastructure 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.

Iowa State University

1995 to 2012	ISU Virology Journal Club Coordinator: Participating labs W. Allen Miller (Plant Pathology), Susan Carpenter (Animal Science), Steve Whitham (Pant Pathology), Dan Voytas (Zoology and Genetics), Brad Blitvich and Cathy Miller (VMPM).
2000 to 2006	"Fly by Night" Coordinator: Monthly meetings with six participating labs that use *Drosophila* 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.

University of Florida

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.
2017 to 2018	Coordinator, University of Florida Department of Entomology & Nematology research retreat, held at Citra, May 8, 2018.
2021 to 2023	Member UF Pollinator Initiative Executive Committee
2021 to present	Member, UF Virology Initiative Executive Committee: Virology Retreats I. December 13, 2022 at Austin Cary Forest Learning Center; II. December 7, 2023 Sweetwater Branch Hotel, Gainesville; III. December 6, 2024 Black Prong Resort, Bronson.

Iowa State University (1994-2017)

Center and Interdepartmental Affiliations

2013 to 2018	Director, NSF Industry / University Cooperative Research Center, the Center for Arthropod Management Technologies, Phase I
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 2017	Interdepartmental 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 2024	Editorial Board, Current Opinion in Insect Science
2025 to present	Editor in Chief, Current Opinion in Insect Science

Editor

2019	Insect Molecular Virology: Advances and Emerging Trends. (2019). Bonning, B.C. Ed. (Norfolk, UK: Caister Academic Press). 11 chapters.
2018	Genersch, E., Jensen, A.B., and Bonning, B.C. Eds. (2018). Bee disease. Special Issue of Current Opinion in Insect Science.
2015	Bonning, B.C. Ed. (2015) Virus-Insect Interactions. Special Issue of Current Opinion in Insect Science.

2011 Bonning, B.C. Ed. (2011) Insect Viruses in Medicine. Special Issue of Journal of Invertebrate Pathology. February 2011.
2009 Bonning, B.C. Ed. (2009) Honey Bee Disease. Supplementary Issue of Journal of Invertebrate Pathology. January 2010.
2006 Bonning, B.C. Ed. (2006). Insect Viruses: Biotechnological Applications. *Adv. Virus Res.* Vol. 68. 532 pp. Academic Press.

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. eLife, Applied and Environmental Microbiology, Biocontrol Science and Technology, Biology Letters, The ISME Journal, Pest Management Science, Toxicon.

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 Organismal Systems Program
Ecological and Evolutionary Physiology
Division of Environmental Biology
Industry-University Cooperative Research Centers
• 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
Department of Entomology, Virginia Tech., March 8-11, 2020

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 both Iowa State University and University of Florida.

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.