

KENNETH F. RAFFA

Emeritus Professor, Dept. Entomology
Hilldale / Vilas Distinguished Achievement / Douglas D. Sorenson Professor
Univ. Wisconsin-Madison

EDUCATION:

B.S.	St. Joseph's College	Biology	1972
M.S.	University of Delaware	Entomology	1976
Ph.D.	Washington State University	Entomology	1981

PROFESSIONAL EXPERIENCE:

USDA Forest Service, Pest Management Group, Asheville, NC., Forest Tech; 1973, 1974
Univ. Delaware, Res Assist, 1974-1976. Biological control of gypsy moth, *Lymantria dispar*.
Washington State Univ. Research Assistant, 1976-1980. Host resistance to bark beetles.
E.I. DuPont de Nemours & Co., Biochemicals Dept., Section Research Biologist, 1981-1985.
Nontraditional chemical discovery programs based on plant/insect interactions.
Univ. of Wisconsin, Dept. of Entomology, Professor. 1985-present.
Forest entomology; Plant/Insect interactions; Insect ecology, Biological control. Symbiosis

RESEARCH:

Impact: Web of Sci: H-Ind: 62, Citat: 14,815; **Google Schol**: H-Ind: 83, Citat: 25,604, 110-Ind: 280
Publications:

Refereed Journals: 290
Annual Reviews: 2
Book Chapters & Proceedings (Excl. Abstracts), Databases: 71
Technical Reports: 35
Books: 2

Presentations:

Invited Symposia: 134
Contributed Papers: 315
Invited Seminars: 80
Outreach: 59

Grants: 160: \$9,606,945

Research – 141: \$9,368,944
Instruction, Conference, & Equipment - 19: \$238,001

TEACHING:

Insects in Forest Ecosystem Function & Management: 1985-present
Plant-Insect Interactions: 1996-present
Techniques of Scientific Presentation: 1990-present
Seminars: Ecol. Genetics, Plant Role in Insect Pop Dynamics, Biological Cont, Invasive Species
Mentor Training
Completed Graduate Students: MS: 25; Ph.D: 17
Graduate Student Committees: @100, in 12 depts.
Undergraduate Internship Advisees: 32
Completed Postdoctoral Associates: 14
High School Advisees: 1
Visiting International Scientists: 8

AWARDS:

1979 Comstock Award, ESA

1981 Distinguished. Dissert., Council of Grad. Schools/Univ. Microfilms Intern.
 1991 Glenn Pound Research Award, UW College of Agric. & Life Sciences.
 1993-4 ESCOP/ASCOP Leadership Development Course.,
 1995. USDA Forest Service "Bridging Ideas and Partnerships" Award.
 1999 Robert G.F. and Hazel T. Spitze Land Grant faculty Award for Excellence.
 1999 Samuel C. Johnson Associate
 2000 Vilas Associate
 2008 Kellett Mid-Career Researcher Award
 2010 Beers-Bascom Professorship in Conservation, Univ. Wisconsin. \$75,000.
 2010. Entomological Society of America Founders Award.
 2011. Silverstein-Simeone Lecture Award: Internat. Soc. Chem. Ecol.
 2012. Fellow, Entomological Society of America.
 2015. University of Delaware CANR Distinguished Alumnus Award
 2015. Vilas /Sorenson Distinguished Achievement Professor
 2017. Hilldale Award in the Biological Sciences, Univ. Wisconsin.
 2018. Entomological Society of America Plant-Insects Ecosystems Lifetime Achievement Award.
 2010. Western Forest Insect Work Conference Founders Award

SERVICE:

Grant Panels

USDA CSRS Competitive Grants: Insect Pest Science Panel, 1986, 1987.
 NSF Competitive Grants: Ecology Panel, 1994-1998
 National Research Council: Study Committee - Future of Pesticides in Pest Management in U.S.
 Agriculture and Forestry: 1997-2000.
 National Center for Ecological Analysis and Synthesis: Tree Mortality: 2013
 USDA FS National Panel on Invasive Species Research: Chair 2006
 Associate Editor
 Forest Science. 1996-1998;
 Ecology: 2001- present
 Environ. Entomology, Symbiosis Subsection: 2008-2012
 Faculty Mentor Committees: 10
 University: Faculty Senate, 1987-1991; 2002-2009; Biometry Executive Comm: 1993-1995;
 Campus Plant Growth Facilities: 1992-1994; Biotron Committee: 1993-2000; UW Ecology
 Advisory Committee: 1995-present; Hilldale Undergraduate Research Award Comm: 1996;
 Spitze Award Committee: 1996-1998; 2004 - present; UW Arboretum Comm: 2005-2008.
 Madison Ecol Group; Events Chair (3 yrs); UW Lakeshore Preserve Comm 2007, 2012-present,
 Academic Planning Council: 2013-present. UW Vilas Res. Prof. Award Comm. 2015.
 Wisconsin Gypsy Moth Committee, 1985 - present
 CSRS Review Teams: North Carolina St. Univ. Univ. Minn.
 APHIS Steering Committee on Tree Biotechnology. 2003-2004.
 Forest Genomics Project, Can. (\$11,000,000 C) Advisory Board: 2005-present
 Wisconsin Council on Invasive Species: 2003-2018;
 Res. Comm. Chair 2003-present; Gov Council Insect & Disease SAG 2007-present.
 Wisconsin Emerald Ash Borer Coordinating Committee: 2007-Present;
 EAB Science Advisory 2007-Present

CURRENT POSITIONS OF FORMER STUDENTS & POSTDOCTORAL ASSOCIATES

<u>Name</u>	<u>Degree</u>	<u>Current or Next Position</u>
K. Klepzig	MS 1989, Ph.D. 1994	Director, Jones Ecol. Center
L. Rieske	MS 1990, Ph.D. 1994	Professor, Univ. KY
S. Codella	Ph.D 1994	Professor, Keane College
S. Krause	Ph.D 1993	Global Bus. Dev. Mngr Valent BioSciences

D. Robison	Ph.D 1993	Dean, College Agr & Life Sci, Iowa State Univ
R. Hofstetter	MS 1996	Assoc. Prof., N. Arizona Univ.
K. Wallin	MS 1996, Ph.D. 2001	Dean, N Dakota State Univ. College Science & Math.
J. Kruse	MS 1996	Entomologist, USDA FS, Lakewood, CO
A. Chenot	MS 1997	Sales Representative, Fisher Scient. Inc.
J. Powell	MS,1998, Ph.D. 2002	Research Associate, Portland St Univ.
N. Havill	MS 1998	Research Entomologist, USDA FS.
S. Werner	MS 1998, Ph.D. 2003	Plant Protection Section Chief, WI DATCP
B. Aukema	MS, 1999, Ph.D. 2003	Prof., Univ. Minnesota
B. Aukema	MS, 2003 Biometry	Prof., Univ. Minnesota
K. Haberkern	MS 2001	High School Science Teacher, NJ.
N. Broderick	MS 2001, Ph.D.,2009	Asst. Prof., John Hopkins Univ.
N. Erbilgin	Ph.D., 2001	Professor & Dept. Chair, Univ Alberta
R. Pinski	MS 2004	Forest, Entomol., WI DATCP.
R. Hoffman Gray	MS 2006	Forest Health Team Head WI Dept. Nat. Resources
A. Kendrick	MS 2006	Private Web Graphics Co.
M. Yanek	MS 2007	Reg. Affairs Manager, Sygenta Inc.
C. Boone	Ph.D. 2009	Provincial Entomol., Nova Scotia
E. Powell	MS 2010	Yorkshire Wolds Teacher Training
D. Coyle	Ph.D. 2011	Asst. Prof., Clemson Univ.
A. Lerch	MS 2013	Lomakatsi Restoration, Ashland OR
T. Johnson	MS 2013	Res. Assoc., Univ. New Hampshire
C. Mason	Ph.D. 2014	Research Scientist, USDA ARS
J. Uelmen	MS 2014	Res. Asst., Univ Illinois
J. Pfammatter	Ph.D. 2015	Res. Assoc., Univ. Wisconsin
R. Arango	Ph.D. 2016	Res. Entomol. USDA FS-FPL, Madison WI
M. Falk	MS, 2017	WI DATCP Wisconsin Gypsy Moth Coord.
M. Howe	MS, 2017, Ph.D. 2020	Instructor, Dept. FEM, Univ. Wisconsin
S. Jagemann	MS, 2017	WI DATCP Plant Pest & Disease Specialist
M. Howe	MS, 2020 Biometry	Instructor, Dept. FEM, Univ. Wisconsin
D. Hunt	Postdoctoral Assoc. 1989	Research Entomol., Agric. Canada
S. Salom	Postdoctoral Assoc. 1989	Professor, Virginia Techn. Univ.
G. Hoffman	Postdoctoral Assoc. 1992	Research Associate, Oregon St Univ
R. Ramachandran	Postdoctoral Assoc. 1992	Research Biologist, Sandoz, Inc.
K. Kleiner	Postdoctoral Assoc. 1996	Assoc. Professor, York College
K. Hobson	Postdoctoral Assoc. 1998	Curator, Insect Mus, Univ. OK
B. Kopper	Postdoctoral Assoc. 2003	Pest Survey Specialist, USDA APHIS
I. Delalibera	Postdoctoral Assoc. 2003	Professor, EMBRAPA Brazil
B. Aukema	Postdoctoral Assoc. 2003-5	Prof, Univ. Minnesota
Y. Cardoza	Postdoctoral Assoc. 2003-6	Res. Team Leader BASF/Bayer
A. Vasanthakumar	Postdoctoral Assoc. 2004-6	Postdoct. Assoc, Harvard Univ.
C. Boone	Postdoctoral Assoc. 2009-10	Research Assoc, Univ. N. British Columbia
A. Adams	Postdoctoral Assoc. 2006-11	Brewmeister and Brewpub owner
E. Schwatzberg	Postdoctoral Assoc. 2011-12	Adirondack Research Inst.
M. Jamieson	Postdoctoral Assoc. 2012-14	Assoc. Prof., Oakland Univ.

SELECTED HONORARY RECOGNITION AWARDS TO STUDENTS

Aukema, B: 1999. Entom. Soc. Can. Student Research and Training Grant. \$1400; 2001, 2003: ESA NCB Graduate Scholarship. \$500. WI Distinguished Fellowship Award: Louis & Elsa Thomsen Fellowship; 2003 Western Forest Insect Work Conf Memorial Scholarship. \$1000.
Boone, C. 2010. Outstanding publication, Ag. & For. Ent. 2009-2009.

Broderick, N. 2000. NSF-UW K-Infinity Fellowship \$32,400.; P.E.O. 2003. Scholar Award \$8000; ESA Pres. Award: Outstanding Student Pres, National Meetings. 2006.

Codella, S.G. 1989. Sigma Xi Research Grant. \$500

Coyle, D. 2005. Wisconsin Arborists Assoc Graduate Student Scholarship. \$400; 2006. Applied Ecol Services. \$2500; 2006. EPA Star Grant. \$81,000. 2009. ESA NCB Comstock Award.

Erbilgin, N. 1999. UW CALS Travel Fellowship. \$200

Green, K. 1998. UW Biology Center Independent Research. \$2,000

Hoffman, R. 2005. ESA Pres. Award: Outstanding Student Pres, National Meetings (Sect. C)

Howe, M. 2018. Wisconsin Ecology Outstanding Presentation Award, Spring Symposium. \$300; Howe, M. 2020 Western Forest Insect Work Conf Memorial Scholarship. \$1000.

Jagemann, S. 2015, 2016. Friends of Peninsula State Park. \$2000.

Klepzig, K.D. O.N. Allen Memorial Scholarship. 1991. \$2,000

Krause, S.C. 1989 Sigma Xi Res Grant \$500; 1989 UW Grad School Dome Travel Fell. \$518.

Powell, J. 2000. Ruth Dicke Award. \$500

Rieske, L.K. Sigma Xi Research Grant. 1988. \$400; ESA Pres. Award: Outstanding Student Pres. National Meetings; 1993, 1994. Citation Merit, Assoc. Women in Science Educ. Found. \$250; 1995. Ent. Soc. Amer. Outstanding Graduate Student Comstock Award, NCB

Robison, D.J. 1988. Wisconsin Arborists Outstanding Graduate Student. \$200.; Sigma Xi Research Grant. 1989. \$400

Szele, A.Z., 1996. Howard Hughes Scholars Fellowship. \$4000

SELECTED PUBLICATIONS:

- Raffa, K.F., & A.A. Berryman. 1983. The role of host plant resistance in the colonization behavior and ecology of bark beetles. *Ecol. Monogr.* 53:27-49.
- Raffa, K.F., & A.A. Berryman. 1987. Interacting selective pressures in conifer-bark beetle systems: A basis for reciprocal adaptations? *Amer. Nat.* 129:234-262.
- Raffa, K.F., & K. D. Klepzig. 1989. Chiral escape of bark beetles from predators responding to bark beetle pheromones. *Oecologia.* 80:566-569.
- Raffa, K.F. 1991. Induced defensive reactions in conifer-bark beetle systems. P 245-276. In: D.W. Tallamy & M.J. Raupp (eds.), *Phytochemical Induction by Herbivores.* Acad Press.
- Raffa, KF & E.B. Smalley. 1995. Interaction of pre-attack and induced monoterpene concentrations in conifer defense against bark beetle-microbial complexes. *Oecologia.* 102:285-295.
- Codella, S.G., & KF Raffa. 1996. Individual and social components of wood ant response to conifer sawfly defense behavior (Hymenoptera: Formicidae, Diprionidae). *Anim. Behav.* 52: 801-811.
- Klepzig, K.D., Smalley, E.B., & K.F. Raffa. 1996. Combined chemical defenses against insects and fungi associated with a forest decline disease. *J. Chem. Ecol.* 22: 1367-1388.
- Paine, T.D., K.F. Raffa, & T.C. Harrington. 1997. Interactions among scolytid bark beetles, their associated fungi, and host conifers. *Ann. Rev. Entomol.* 42: 179-206.
- Raffa, K.F., Krause, S. & P. Reich. 1998. Long-term influence of defoliation on *Pinus resinosa* suitability to insect herbivores feeding on diverse plant parts. *Ecology* 79: 352-364.
- Havill, NP & KF Raffa 1999. Effects of eliciting treatment and genotypic variation on induced resistance in *Populus*: Impacts on gypsy moth development and feeding behavior. *Oecologia* 120: 295-303.
- Kleiner, K.W., Raffa, K.F., & R.E. Dickson, 1999. Partitioning of ¹⁴C labeled photosynthate to allelochemicals and primary metabolites in source and sink leaves of aspen: Evidence for phenolic turnover. *Oecologia* 119: 408-418.
- Havill, N.P., & K.F. Raffa. 2000. Compound effects of induced plant responses on insect herbivores and parasitoids: Implications for tritrophic interactions. *Ecol. Ent* 25: 171-179.
- Wallin, K.F., & K.F. Raffa. 2001. Effects of folivory on subcortical plant defenses: Can defense theories predict interguild processes? *Ecology* 82: 1387-1400.
- Raffa, K.F. 2001. Mixed messages across multiple trophic levels: The ecology of bark beetle chemical communication systems. *Chemoecology.* 11: 49-65.

- Aukema, B.H., & K. F. Raffa. 2002. Relative effects of exophytic predation, endophytic predation and intraspecific competition on a subcortical herbivore: Consequences to the reproduction of *Ips pini* and *Thanasimus dubius*. *Oecologia*. 133: 483-491.
- Wallin, K.F., & K.F. Raffa. 2004. Feedback between individual host selection behavior and population dynamics in an eruptive insect herbivore. *Ecol. Monogr.* 74: 101-116
- Broderick, N. A., K. F. Raffa, R. M. Goodman & J. Handelsman. 2004. Census of the bacterial community of the gypsy moth larval midgut using culturing and culture-independent methods. *Applied and Environ. Microbiology*. 2004 70: 293-300.
- Aukema, BH & KF Raffa. 2004. Gender- and sequence- dependent predation within group colonizers of defended plants: a constraint on cheating among bark beetles? *Oecologia*138: 253-258.
- Raffa KF , Aukema BH, Erbilgin N, Klepzig KD, & Wallin, KF. 2005. Interactions among Conifer Terpenoids and Bark Beetles across Multiple Levels of Scale: An attempt to understand links between population patterns and physiological processes. *Rec. Adv. Phytochem.* 39: 80-118.
- Broderick, N.A., K. F. Raffa, K.F. & J Handelsman. 2006. Midgut bacteria required for *Bacillus thuringiensis* insecticidal activity. *PNAS*. 103: 15196-15199.
- Raffa, K. F. Aukema, B. H., Bentz, B.J., Carroll A.L., Hicke, J.A., Turner MG, & W. H. Romme. 2008. Cross-scale drivers of natural disturbances prone to anthropogenic amplification: Dynamics of biome-wide bark beetle eruptions. *BioScience*.. 58: 501-517.
- Adams AS, Jordan MS, Adams SM, Suen G, Goodwin LA, Davenport KW, Currie CR, & Raffa KF. 2011. Community and genomic analysis of cellulose-degrading bacteria associated with the invasive woodwasp *Sirex noctilio*. *Intern. Soc. Microbial Ecology* 5: 1323-1331.
- McDowell NG, JS Amthor, DJ Beerling, RA Fisher, KF Raffa & M Stitt. 2011. The interdependence of mechanisms underlying vegetation mortality. *Trends in Ecol. & Evol.* 26: 523-532.
- Powell, EN, Townsend PA & KF Raffa. 2012. Wildfire provides refuge from local extinction but is an unlikely driver of outbreaks by mountain pine beetle. *Ecol. Monogr.* 82:69-84.
- Hicke, JA, CD Allen, AR Desai, MC Dietze, RJ Hall, ET Hogg, DM Kashian, D Moore, KF Raffa, RN Sturrock, J Vogelmann. 2012. Effects of biotic disturbances on forest carbon budgets of the United States and Canada. *Global Change Biology*. 18:7-34.
- Raffa KF, Powell EN & Powell & PA Townsend. 2013. Temperature-driven range expansion of an irruptive insect heightened by weakly coevolved plant defenses. *PNAS*. 110: 2193-2198.

SELECTED GRANTS:

- NSF. 1994. 3 yr. \$262,645. Altered semiochemistry as a source of partial escape from predators responding to insect pheromones. K.F. Raffa.
- NSF. 1996. \$200,000. 3 yr. Density-dependent host selection behavior as a possible contributing factor to the population dynamics of insect herbivores. K.F. Raffa.
- USDA NRI 1996. \$254,708. Application of chemical ecology to conservation & augmentation of bark beetle predators. K Raffa & D Dahlsten. 3 yrs.
- NSF. 1996. \$129,930. Long Term Ecological Research Site. Bonanza Creek, Alaska. K.F. Raffa, B. Illman, R. Werner. 7 yr.
- Center for Plant Biotechnology Research. 2001. \$20,000. Potentiators for microbial insecticides for biomass trees. K.F. Raffa, N. Broderick, R. Goodman, J. Handelsman.
- USDA NRI Entomology. 2001. \$180,000. Use of microbial symbionts in host finding by natural enemies of bark beetles. K,F. Raffa, D. Six, & D. Dahlsten. 2 yr.
- NSF LTREB. 2003. \$300,000. Interaction of below- and above- ground herbivory in forest gap formation: Long-term analysis of underlying mechanisms and spatio-temporal patterns. K Raffa, J Reeve, B.Aukema, M Clayton, E Nordheim, J Zhu, V Radeloff, D Young. 6 yrs
- USDA NRI. 2003. \$210,000. Net effects of ophiostomatoid fungal associates on bark beetle reproduction: Spruce beetles, tree defense chemistry, and competition for a restricted resource. K.F. Raffa, K.D. Klepzig, & B. Kopper. 3 yr.

NSF Ecology. 2008. \$497,853. A conceptual and mechanistic approach to understanding interactions among multiple disturbance agents: compound effects of fire on resource availability to bark beetles K. Raffa, P. Townsend, E. Powell. 3 yrs.

USDA NRI. 2008. \$449,950. How do interactions among microbial symbionts affect the host and range expansions of an eruptive forest insect?. K. F. Raffa, C. Currie, A. Adams. 3 yrs.