

- **COMPLETE LIST OF PUBLICATION**

(In Reverse Chronological Order. As of January 20, 2009)

REFEREED SCIENTIFIC PAPERS

- [143] Leal, W. S., and Y. Ishida, "GP-9s are ubiquitous proteins unlikely involved in olfactory mediation of social organization in the red imported fire ant, *Solenopsis invicta*," *PLoS ONE* 3: e3762, 2008.
- [142] Z. Syed, and W. S. Leal, "Mosquitoes smell and avoid the insect repellent DEET," *Proc. Natl. Acad. Sci. USA*, vol. 105, pp. 13598-13603, 2008.
- [141] N. A. Hummel, W. S. Leal, and F. G. Zalom, "Potentially hygroreceptive sensilla on the anal stylus of the glass-winged sharpshooter, *Homalodisca vitripennis*," *J. Insect Sci.*, vol. 8, pp. 1536-1542, 2008.
- [140] Leal, W. S., R. M. Barbosa, W. Xu, Y. Ishida, Z. Syed, N. Latte, A. M. Chen, T. I. Morgan, A. J. Cornel, and A. Furtado, "Reverse and conventional chemical ecology approaches for the development of oviposition attractants for *Culex mosquitoes*," *PLoS ONE* 3: e3045, 2008.
- [139] Y. Ishida, and W. S. Leal, "Chiral discrimination of the Japanese beetle sex pheromone and a behavioral antagonist by a pheromone-degrading enzyme," *Proc. Natl. Acad. Sci. USA*, vol. 105, pp. 9076-9080, 2008.
- [138] W. Xu, and W. S. Leal, "Molecular switches for pheromone release from a moth pheromone-binding protein," *Biochem. Biophys. Res. Commun.*, vol. 372, pp. 559-564, 2008.
- [137] S. L. Lapointe, and W. S. Leal, "Describing seasonal phenology of the leafminer *Phyllocnistis citrella* (Lepidoptera: Gracillariidae) with pheromone lures: Controlling for lure degradation," *Florida Entomol.*, vol. 90, pp. 710-714, 2007.
- [136] Z. Syed, and W. S. Leal, "Maxillary palps are broad spectrum odorant detectors in *Culex quinquefasciatus*," *Chem. Senses*, vol. 32, pp. 727-738, 2007.
- [135] F. F. Damberger, Y. Ishida, W. S. Leal, and K. Wuthrich, "Structural basis of ligand binding and release in insect pheromone-binding proteins: NMR structure of *Antheraea polyphemus* PBP1 at pH 4.5," *J. Mol. Biol.*, vol. 373, pp. 811-819, 2007.

- [134] C. Lautenschlager, W. S. Leal, and J. Clardy, “*Bombyx mori* pheromone-binding protein binding nonpheromone ligands: implications for pheromone recognition,” *Structure*, vol. 15, pp. 1148-1154, 2007.
- [133] M. A. Braks, W. S. Leal, R. T. Carde, “Oviposition responses of gravid female *Culex quinquefasciatus* to egg rafts and low doses of oviposition pheromone under semifield conditions,” *J. Chem. Ecol.*, vol. 33, pp. 567-578, 2007.
- [132] P. H. G. Zarbin, W. S. Leal, C. J. Avila, and L. J. Oliveira, “Identification of the sex pheromone of *Phyllophaga cuyabana* (Coleoptera: Melolonthidae),” *Tetrahedron Lett.*, vol. 48, pp. 1991-1992, 2007.
- [131] A. L. Parra-Pedrazzoli, and W. S. Leal, “Sexual behavior of the navel orangeworm, *Amyelois transitella* (Walker) (Lepidoptera: Pyralidae),” *Neotrop. Entomol.*, vol. 35, pp. 769-774, 2006.
- [130] Z. Syed, Y. Ishida, K. Taylor, D. A. Kimbrell, and W. S. Leal, “Pheromone reception in fruit flies expressing a moth's odorant receptor,” *Proc. Natl. Acad. Sci. USA*, vol. 103, pp. 16538-16543, 2006.
- [129] A. Margaryan, R. Moaddel, J. R. Aldrich, J. M. Tsuruda, A. M. Chen, W. S. Leal, and I. W. Wainer, “Synthesis of an immobilized *Bombyx mori* pheromone-binding protein liquid chromatography stationary phase,” *Talanta*, vol. 70, pp. 752-755, 2006.
- [128] F. Grater, W. Xu, W. S. Leal, and H. Grubmuller, “Pheromone discrimination by the pheromone-binding protein of *Bombyx mori*,” *Structure*, vol. 14, pp. 1577-1586, 2006.
- [127] S. L. Lapointe, D. G. Hall, Y. Murata, A. L. Parra-Pedrazzoli, J. M. S. Bento, E. F. Villela, and W. S. Leal, “Field evaluation of a synthetic female sex pheromone for the leafmining moth *Phyllocnistis citrella* (Lepidoptera: Gracillariidae) in Florida citrus,” *Florida Entomol.*, vol. 89, pp. 274-276, 2006.
- [126] M. Wogulis, T. Morgan, Y. Ishida, W. S. Leal, and D. K. Wilson, “The crystal structure of an odorant binding protein from *Anopheles gambiae*: Evidence for a common ligand release mechanism,” *Biochem. Biophys. Res. Commun.*, vol. 339, pp. 157-164, 2006.
- [125] W. S. Leal, A. L. Parra-Pedrazzoli, A. A. Cosse, Y. Murata, J. M. S. Bento, and E. F. Villela, “Identification, synthesis, and field evaluation of the sex pheromone from the citrus leafminer, *Phyllocnistis citrella*,” *J. Chem. Ecol.*, vol. 32, pp. 155-168, 2006.

- [124] A. L. Parra-Pedrazzoli, A. A. Cosse, Y. Murata, J. M. S. Bento, E. F. Vilela and W. S. Leal, "Towards the identification and synthesis of the sex pheromone of the citrus leafminer, *Phyllocnistis citrella* Stainton (Lepidoptera : Gracillariidae)," *Neotrop. Entomol.*, vol. 35, pp. 12-18, 2006.
- [123] Y. Ishida, and W. S. Leal, "Rapid inactivation of a moth pheromone," *Proc. Natl. Acad. Sci. USA*, vol. 102, pp. 14075-14079, 2005.
- [122] Leal, W. S., A. M. Chen, and M. L. Erickson, "Selective and pH-dependent binding of a moth pheromone to a pheromone-binding protein," *J. Chem. Ecol.*, vol. 31, pp. 2493-2499, 2005.
- [121] C. Lautenschlager, W. S. Leal, and J. Clardy. "Coil-to-helix and ligand release of *Bombyx mori* pheromone-binding protein," *Biochem. Biophysic. Res. Commun.*, vol. 335, pp. 1044-1050, 2005.
- [120] W. S. Leal, A. M. Chen, Y. Ishida, V. P. Chiang, M. L. Erickson, T. I. Morgan, and J. M. Tsuruda, "Kinetics and molecular properties of pheromone binding and release," *Proc. Natl. Acad. Sci. USA*, vol. 102, pp. 5386-5391, 2005.
- [119] W. S. Leal, A. L. Parra-Pedrazzoli, K.-E. Kaissling, T. I. Morgan, F. G. Zalom, D. J. Pesak, E. A. Dundulis, C. S. Burks, B. S. Higbee, "Unusual pheromone chemistry in the navel orangeworm: novel sex attractants and a behavioral antagonist," *Naturwissenschaften*, vol. 92, pp. 139-146, 2005.
- [118] E. Michel, F. Damberger, A. Chen, Y. Ishida, W. S. Leal, K. Wuthrich, "Assignments for the *Bombyx mori* pheromone-binding protein fragment BmPBP(1-128) at pH 6.5," *J. Biomol. NMR*, vol. 31, p. 65, 2005.
- [117] W. S. Leal, "Pheromone reception," *Top. Curr. Chem.*, vol. 240, pp. 1-36, 2005.
- [116] K.-E. Kaissling and W. S. Leal, "Biologische Nanokapseln für Duftstoffe." *Naturwissenschaftliche Rundschau*, vol. 57, pp. 66-71, 2004.
- [115] Y. Ishida, A. M. Chen, J. M. Tsuruda, A. J. Cornel, M. Debboun, and W. S. Leal, "Intriguing olfactory proteins from the yellow fever mosquito, *Aedes aegypti*," *Naturwissenschaften*, vol. 91, pp. 426-431, 2004.
- [114] W. S. Leal, "Pheromone unwrapping by pH flip-flopping," *Chem. Biol.*, vol. 11, pp. 1029-1031, 2004.

- [113] M. Maibeche-Coisne, A. A. Nikonov, Y. Ishida, E. Jacquin-Joly, and W. S. Leal, “Pheromone anosmia in a scarab beetle induced by in vivo inhibition of a pheromone-degrading enzyme,” *Proc. Natl. Acad. Sci. USA*, vol. 101, pp. 11459-11464, 2004.
- [112] D. Eliyahu, K. Mori, H. Takikawa, W. S. Leal, and C. Schal, “Behavioral activity of stereoisomers and new component of the contact sex pheromone of the female German cockroach *Blatella germanica*,” *J. Chem. Ecol.*, vol. 30, pp. 1839-1848, 2004.
- [111] C. Germeno, W. S. Leal, K. Mori, and C. Schal, “Behavioral and electrophysiological responses of the brownbanded cockroach, *Supella longipalpa*, to stereoisomers of its sex pheromone, supellapyrone,” *J. Chem. Ecol.*, vol. 29, pp. 1769-1783, 2003.
- [110] Y. Ishida, A. J. Cornel, and W. S. Leal, “Odorant-binding protein from *Culex tarsalis*, the most competent vector of West Nile virus in California,” *J. Asia Pacific Entomol.*, vol. 6, pp. 1-4, 2003.
- [109] M. Toth, M. Subchev, I. Sredkov, I. Szarukan, and W. S. Leal, “A sex attractant for the scarab beetle *Anomala solida* ER,” *J. Chem. Ecol.*, vol. 29, pp. 1643-1649, 2003.
- [108] A. C. Oehlschlager, W. S. Leal, L. Gonzalez, M. Chacon, and R. Andrade, “Trapping of *Phyllophaga elenans* with a female-produced pheromone,” *J. Chem. Ecol.*, vol. 29, pp. 27-36, 2003.
- [107] W. S. Leal, A. C. Oehlschlager, P. H. G. Zarbin, E. Hidalgo, P. J. Shannon, Y. Murata, L. Gonzalez, R. Andrade, and M. Ono, “Sex pheromone of the scarab beetle *Phyllophaga elenans* and some intriguing minor components,” *J. Chem. Ecol.*, vol. 29, pp. 15-25, 2003.
- [106] D. Lee, F. F. Damberger, G. Peng, R. Horst, P. Guntert, L. Nikonova, W. S. Leal, and K. Wuthrich, “NMR structure of the unliganded form of *Bombyx mori* pheromone-binding protein at physiological pH,” *FEBS Lett.*, vol. 531, pp. 314-318, 2002.
- [105] Y. Ishida, and W. S. Leal, “Cloning of putative odorant-degrading enzyme and integumental esterase cDNAs from the wild silkworm, *Antheraea polyphemus*,” *Insect Biochem. Molec. Biol.*, vol. 32, pp. 1775-1780, 2002.
- [104] Y. Ishida, V. P. Chiang, and W. S. Leal, “Protein that makes sense in the Argentine ant. *Naturwissenschaften*,” vol. 89, pp.505-507, 2002.
- [103] Y. Ishida, V. P. Chiang, M. I. Haverty, and W. S. Leal, “Odorant-binding proteins from a primitive termite,” *J. Chem. Ecol.*, vol. 28, pp 1887-1893, 2002.

- [102] B. H. Alizadeh, S. Kuwahara, W. S. Leal, and H.-C. Men, "Synthesis of the racemate of (*Z*)-*exo*- α -bergamotenal, a pheromone component of the white-spotted spined bug, *Eysarcoris parvus* Uhler," *Biosci. Biochem. Biotech.* vol. 66, 1415-1418, 2002.
- [101] Y. Ishida, A. J. Cornel, and W. S. Leal, "Identification and cloning of a female antenna-specific odorant-binding protein in the mosquito *Culex quinquefasciatus*," *J. Chem. Ecol.* vol. 28, pp. 867-871, 2002.
- [100] A. A. Nikonov, G. Peng, G. Tsurupa, and W. S. Leal, "Unisex pheromone detectors and pheromone-binding proteins in scarab beetles," *Chem. Senses*, vol. 27, pp. 495-504, 2002.
- [99] A. A. Nikonov and W. S. Leal, "Peripheral coding of sex pheromone and behavioral antagonist in the Japanese beetle," *J. Chem. Ecol.* vol 28, pp. 1079-1093, 2002.
- [98] J-Y. Kim, M. Hasegawa, and W. S. Leal, "Individual variation in pheromone emission and termination patterns in female *Anomala cuprea*," *Chemoecology*, vol. 12, pp. 121-128, 2002.
- [97] Z. Deyu, and W. S. Leal, "Conformational isomers of insect odorant-binding proteins," *Arch. Biochem. Biophys.* vol 397, pp. 99-105, 2002.
- [96] G. H. Peng, and W. S. Leal, "Identification and cloning of a pheromone-binding protein from the oriental beetle, *Exomala orientalis*," *J. Chem. Ecol.*, vol 27, pp. 2183-2192, 2001.
- [95] R. Horst, F. Damberger, P. Luginbuhl, P. Guntert, G. Peng, L. Nikonova, W. S. Leal, and K. Wuthrich, "NMR structure reveals intramolecular regulation mechanism for pheromone binding and release," *Proc. Natl. Acad. Sci. USA*, vol 98, pp. 14374-14379, 2001.
- [94] G. H. Peng, and W. S. Leal, "Identification and cloning of a pheromone-binding protein from the oriental beetle, *Exomala orientalis*," *J. Chem. Ecol.*, vol 27, pp. 2183-2192, 2001.
- [93] A. A. Nikonov, J. T. Valiyaveettil, and W. S. Leal, "A photoaffinity-labeled green leaf volatile compound 'tricks' highly selective and sensitive insect olfactory receptor neurons," *Chem. Senses*, vol 26, pp. 49-54, 2001.
- [92] W. S. Leal, J. M. S. Bento, Y. Murata, M. Ono, J. R. P. Parra, and E. F. Vilela, "Identification, synthesis, and field evaluation of the sex pheromone of the citrus fruit borer *Ecdytophaga aurantiana*," *J. Chem. Ecol.*, vol 27, pp. 2041-2051, 2001.

- [91] M. C. Larsson, W. S. Leal, and B. S. Hansson, "Olfactory receptor neurons detecting plant odours and male volatiles in *Anomala cuprea* beetles (Coleoptera : Scarabaeidae). *J. Insect Physiol.*, vol 47, pp. 1065-1076, 2001.
- [90] R. Horst, F. Damberger, G. H. Peng, L. Nikonova, W. S. Leal, and K. Wuthrich, "NMR assignment of the A form of the pheromone-binding protein of *Bombyx mori*," *J. Biomol. NMR*, vol 19, pp. 79-80, 2001.
- [89] J. M. S. Bento, J. R. P. Parra, E. F. Vilela, J. M. Walder, and W. S. Leal, "Sexual behavior and diel activity of citrus fruit borer *Ecdytolopha aurantiana*," *J. Chem. Ecol.*, vol 27, pp. 2053-2065, 2001.
- [88] F. Damberger, L. Nikonova, R. Horst, G. H. Peng, W. S. Leal, and K. Wuthrich, "NMR characterization of a pH-dependent equilibrium between two folded solution conformations of the pheromone-binding protein from *Bombyx mori*," *Protein Sci.* vol 9, pp. 1038-1041, 2000.
- [87] S. Marchese, S. Angeli, A. Andolfo, A. Scaloni, A. Brandazza, M. Mazza, J. F. Picimbon, W. S. Leal, and P. Pelosi, "Soluble proteins from chemosensory organs of *Eurycantha calcarata* (Insects, Phasmatodea)," *Insect Biochem. Molecular Biol.*, vol 30, pp. 1091-1098, 2000.
- [86] S. Kuwahara, T. Liang, W. S. Leal, J. Ishikawa, and O. Kodama, "Synthesis of all four possible stereoisomers of 5,9- dimethylpentadecane, the major sex pheromone component of the coffee leaf miner moth, *Perileucoptera coffeella*," *Biosci. Biotech. Biochem.*, vol 64, pp. 2723-2726, 2000.
- [85] S. Kuwahara, J. Ishikawa, W. S. Leal, S. Hamade, and O. Kodama, "Synthesis of both enantiomers of a novel sesquiterpene isolated from the pheromone gland of a stink bug, *Tynacantha marginata* Dallas," *Synthesis*, vol 2000, pp. 1930-1935, 2000.
- [84] S. Kuwahara, S. Hamade, W. S. Leal, J. Ishikawa, and O. Kodama, "Synthesis of a novel sesquiterpene isolated from the pheromone gland of a stink bug, *Tynacantha marginata* Dallas," *Tetrahedron*, vol 56, pp. 8111-8117, 2000.
- [83] J.-Y. Kim and W. S. Leal, "Ultrastructure of pheromone-detecting sensillum placodeum of the Japanese beetle, *Popillia japonica* Newmann (Coleoptera : Scarabaeidae)," *Arthropod Struc. Develop.*, vol 29, pp. 121-128, 2000.

- [82] W. S. Leal, "Duality monomer-dimer of the pheromone-binding protein from *Bombyx mori*," *Biochem. Biophysic. Res. Commun.*, vol. 268, pp. 521-529, 2000.
- [81] S. Kuwahara, I. Nagashima, W. S. Leal, J. Ishikawa, and O. Kodama, "Preparation of (—)-periplanone D and its physical and spectroscopic properties," *Biosci. Biotechnol. Biochem.*, vol 64, pp. 600-602, 2000.
- [80] B. H. Sandler, L. Nikonova, W. S. Leal, and J. Clardy, "Sexual attraction in the silkworm moth; structure of the pheromone-binding-protein-bombykol complex," *Chem. Biol.*, vol. 7, pp. 143-151, 2000.
- [79] W. S. Leal, L. Nikonova, and G. Peng, "Disulfide structure of the pheromone binding protein from the silkworm moth, *Bombyx mori*," *FEBS Lett.*, vol. 464, pp. 85-90, 1999.
- [78] H. Wojtasek, J.-F. Picimbon, and W. S. Leal, "Identification and cloning of odorant binding proteins from the scarab beetle *Phyllopertha diversa*," *Biochem. Biophysic. Res. Commun.*, vol. 263, pp. 832-837, 1999.
- [77] H. Wojtasek and W. S. Leal, "Conformational change in the pheromone-binding protein from *Bombyx mori* induced by pH and by interaction with membranes," *J. Biol. Chem.*, vol. 274, pp. 30950-30956, 1999.
- [76] N. Mizutani, T. Wada, H. Higuchi, M. Ono, and W. S. Leal, "Effect of synthetic aggregation pheromone of *Riptortus clavatus* on density and parasitism of egg parasitoid *Ooencyrtus nezarae* Ishii (Hymenoptera: Encyrtidae) in soybean fields," *Jpn. J. Appl. Entomol. Zool.*, vol 43, pp. 195-202, 1999.
- [75] J.-F. Picimbon, and W. S. Leal, "Olfactory soluble proteins of cockroaches," *Insect Biochem. Mol. Biol.*, vol 29, pp. 973-978, 1999.
- [74] H. Wojtasek and W. S. Leal, "Degradation of an alkaloid pheromone from the pale-brown chafer, *Phyllopertha diversa* (Coleoptera: Scarabaeidae), by an insect olfactory cytochrome P450," *FEBS Lett.*, vol. 458, pp. 333-336, 1999.
- [73] M. C. Larsson, W. S. Leal, and B. S. Hansson, "Olfactory receptor neurons specific to chiral sex pheromone components in male and female *Anomala cuprea* beetles (Coleoptera: Scarabaeidae)," *J. Comp. Physiol. A*, vol. 184, pp. 353-359, 1999.
- [72] W. S. Leal, "Enantiomeric anosmia in scarab beetles," *J. Chem. Ecol.*, vol. 25, pp. 1055-1066, 1999.

- [71] J.-Y. Kim and W. S. Leal, "Eversible pheromone gland in a melolonthine beetle, *Holotrichia parallela*," *J. Chem. Ecol.*, vol. 25, pp. 825-833, 1999.
- [70] W. S. Leal, P. H. G. Zarbin, H. Wojtasek, and J. T. Tercio, "Biosynthesis of scarab beetle pheromones: enantioselective 8-hydroxylation of fatty acids," *Eur. J. Biochem.*, vol. 259, pp. 175-180, 1999.
- [69] M. Maekawa, T. Imai, S. Tsuchiya, T. Fujimori, and W. S. Leal, "Behavioral and electrophysiological responses of the soybean beetle, *Anomala rufocuprea* Motschulsky (Coleoptera: Scarabaeidae) to methyl anthranilate and its related compounds," *Appl. Entomol. Zool.*, vol. 34, pp. 99-103, 1999.
- [68] B. S. Hansson, M. C. Larsson, and W. S. Leal, "Green leaf volatile-detecting olfactory receptor neurones display very high sensitivity and specificity in a scarab beetle," *Physiol. Entomol.*, vol. 24, pp. 1-6, 1999.
- [67] S. Kuwahara, D. Itoh, W. S. Leal, and O. Kodama, "A convenient synthesis of a sex pheromone component of the Southern green stink bug, *Nezara viridula* (L.)," *Tetrahedron Lett.*, vol. 39, pp. 1183-1184, 1998.
- [66] S. Kuwahara, T. Tsuruta, W. S. Leal, and O. Kodama, "Synthesis of both enantiomers of 15-hexadecanolide, a sex pheromone component of the stink bug, *Piezodorus hybneri*," *Biosci. Biotechnol. Biochem.*, vol. 62, pp. 1261-1263, 1998.
- [65] S. Kuwahara, D. Itoh, W. S. Leal, and O. Kodama, "A convenient synthesis of (2S,3R,6S,7Z)- and (2R,3S,6S,7Z)-2,3-epoxy-7,10-bisabolene, the sex pheromone of the Southern green stink bug (*Nezara viridula*)," *Tetrahedron*, vol. 54, pp. 11421-11430, 1998.
- [64] H. Wojtasek, B. Hansson, and W. S. Leal, "Attracted or repelled? - A matter of two neurons, one pheromone binding protein, and a chiral center," *Biochem. Biophys. Res. Commun.*, vol. 250, pp. 217-222, 1998.
- [63] H. Wojtasek, B. S. Hansson, and W. S. Leal, "Chemical communication in scarab beetles with one pheromone binding protein, two olfactory receptor neurons and two enantiomeric pheromones," *Jpn. J. Taste Smell Res. (in Japanese)*, vol. 5, pp. 545-548, 1998.

- [62] W. S. Leal, S. Kuwahara, X. Shi, H. Higuchi, C. E. B. Marino, M. Ono, and J. Meinwald, "Male-released sex pheromone of the stink bug *Piezodorus hybneri*," *J. Chem. Ecol.*, vol. 24, pp. 1817-1829, 1998.
- [61] W. S. Leal and K. Uchida, "Application of GC-EAD to the determination of mosquito repellents derived from a plant, *Cymbopogon citratus*," *J. Asia-Pacific Entomol.*, vol. 1, pp. 217-221, 1998.
- [60] W. S. Leal, J. I. L. Moura, J. M. S. Bento, E. F. Vilela, and P. B. Pereira, "Electrophysiological and behavioral evidence for a sex pheromone in the wasp *Bephratelloides pomorum*," *J. Chem. Ecol.*, vol. 23, pp. 1281-1289, 1997.
- [59] T. Imai, S. Tsuchiya, T. Maekawa, T. Fujimori, and W. S. Leal, "Methyl anthranilate, a novel attractant for the soybean beetle, *Anomala rufocuprea* Motschulsky (Coleoptera: Scarabaeidae)," *Appl. Entomol. Zool.*, vol. 32, pp. 45-48, 1997.
- [58] W. S. Leal, P. H. G. Zarbin, H. Wojtasek, S. Kuwahara, M. Hasegawa, and Y. Ueda, "Medicinal alkaloid as a sex pheromone," *Nature*, vol. 385, pp. 213, 1997.
- [57] S. Kuwahara, S. Hamade, Y. Yoshinaga, W. S. Leal, and O. Kodama, "Synthesis of (R,Z)-7,15-hexadecadien-4-olide, the sex pheromone of the yellowish elongate chafer (*Heptophylla picea*)," *Biosci. Biotech. Biochem.*, vol. 61, pp. 1696-1698, 1997.
- [56] J. R. Aldrich, W. S. Leal, R. Nishida, A. P. Khimian, C.-J. Lee, and Y. Sakuratani, "Semiochemistry of aposematic seed bugs," *Entomol. Exp. Appl.*, vol. 84, pp. 127-135, 1997.
- [55] S. Tada and W. S. Leal, "Localization and morphology of sex pheromone glands in scarab beetles (Coleoptera: Rutelinae, Melolonthinae)," *J. Chem. Ecol.*, vol. 23, pp. 903-915, 1997.
- [54] K. Nakamuta, W. S. Leal, T. Nakashima, M. Tokoro, M. Ono, and M. Nakanishi, "Increase of trap catches by a combination of male sex pheromones and floral attractants in longhorn beetle, *Anaglyptus subfasciatus*," *J. Chem. Ecol.*, vol. 23, pp. 1635-1640, 1997.
- [53] A. Zhang, P. S. Robbins, W. S. Leal, C. E. Linn Jr., M. G. Villani, and W. L. Roelofs, "Essential amino acid methyl esters: Major sex pheromone components of the cranberry white grub, *Phyllophaga anxia* (Coleoptera: Scarabaeidae)," *J. Chem. Ecol.*, vol. 23, pp. 231-245, 1997.

- [52] N. Mizutani, T. Wada, H. Higuchi, M. Ono, and W. S. Leal, "A component of a synthetic aggregation pheromone of *Riptortus clavatus* (Thunberg) (Heteroptera: Alydidae), that attracts an egg parasitoid, *Ooencyrtus nezarae* Ishii (Hymenoptera: Encyrtidae)," *Appl. Entomol. Zool.*, vol. 32, pp. 504-507, 1997.
- [51] X. Shi, W. S. Leal, and J. Meinwald, "Assignment of the absolute stereochemistry to an insect pheromone by chiral amplification," *Bioorg. Med. Chem.*, vol. 4, pp. 297-303, 1996.
- [50] W. S. Leal, S. Kuwahara, M. Ono, and S. Kubota, "(R,Z)-7,15-Hexadecadien-4-olide, sex pheromone of the yellowish elongate chafer, *Heptophylla picea*," *Bioorg. Med. Chem.*, vol. 4, pp. 315-321, 1996.
- [49] W. S. Leal, "Chemical communication in scarab beetles: Reciprocal behavioral agonist-antagonist activities of chiral pheromones," *Proc. Natl. Acad. Sci. USA*, vol. 93, pp. 12112-12115, 1996.
- [48] G. Yarden, A. Shani, and W. S. Leal, "(Z,E)- α -Farnesene, an electroantennogram-active component of *Maladera matrida* volatiles," *Bioorg. Med. Chem.*, vol. 4, pp. 283-287, 1996.
- [47] R. H. Cherry, M. G. Klein, and W. S. Leal, "Attraction of adult *Anomala marginata* (Coleoptera: Scarabaeidae) to anethole," *J. Agric. Entomol.*, vol. 13, pp. 359-364, 1996.
- [46] W. S. Leal, M. Hasegawa, M. Sawada, M. Ono, and S. Tada, "Scarab beetle *Anomala albopilosa albopilosa* utilizes a more complex sex pheromone system than a similar species *A. cuprea*," *J. Chem. Ecol.*, vol. 22, pp. 2001-2010, 1996.
- [45] W. S. Leal, C. P. S. Yadava, and J. N. Vijayvergia, "Aggregation of the scarab beetle *Holotrichia consanguinea* in response to female-released pheromone suggests secondary function hypothesis for semiochemical," *J. Chem. Ecol.*, vol. 22, pp. 1557-1566, 1996.
- [44] W. S. Leal, Y. Ueda, and M. Ono, "Attractant pheromone for male rice bug, *Leptocorisa chinensis*: Semiochemicals produced by male and female," *J. Chem. Ecol.*, vol. 22, pp. 1429-1437, 1996.
- [43] X. Shi, W. S. Leal, Z. Liu, E. Schrader, and J. Meinwald, "A new synthesis of alkylated 2H-pyran-2-ones and its application to the determination of the relative and absolute

- configuration of supellapyrone, sex pheromone of the brownbanded cockroach, *Supella longipalpa*,” *Tetrahedron Lett.*, vol. 36, pp. 71-74, 1995.
- [42] W. S. Leal, H. Higuchi, N. Mizutani, H. Nakamori, T. Kadosawa, and M. Ono, “Multifunctional communication in *Riptortus clavatus* (Heteroptera: Alydidae): Conspecific nymphs and egg parasitoid *Ooencyrtus nezarae* use the same adult attractant pheromone as chemical cue,” *J. Chem. Ecol.*, vol. 21, pp. 973-985, 1995.
- [41] W. S. Leal, X. Shi, K. Nakamuta, M. Ono, and J. Meinwald, “Structure, stereochemistry, and thermal isomerization of the male sex pheromone of the longhorn beetle *Anaglyptus subfasciatus*,” *Proc. Natl. Acad. Sci. USA*, vol. 92, pp. 1038-1042., 1995.
- [40] W. S. Leal, “Sex pheromone of plant-feeding scarab beetles,” *Korean J. Appl. Entomol.*, vol. 34, pp. 9, 1995.
- [39] W. S. Leal, X. Shi, D. Liang, C. Schal, and J. Meinwald, “Application of chiral gas chromatograph with electroantennographic detection to the determination of the stereochemistry of a cockroach sex pheromone,” *Proc. Natl. Acad. Sci. USA*, vol. 92, pp. 1033-1037, 1995.
- [38] W. S. Leal, A. R. Panizzi, and C. C. Niva, “Alarm pheromone of leaf-footed bug *Leptoglossus zonatus* (Heteroptera: Coreidae),” *J. Chem. Ecol.*, vol. 20, pp. 1209-1215, 1994.
- [37] M. Toth, W. S. Leal, I. Szarukan, M. Lesznyak, and G. Szocs, “2-(*E*)-Nonen-1-ol: Male attractant for chafers *Anomala vitis* Fabr. and *A. dubia* Scop. (Coleoptera: Scarabaeidae),” *J. Chem. Ecol.*, vol. 20, pp. 2481-2487, 1994.
- [36] W. S. Leal, M. Hasegawa, M. Sawada, and M. Ono, “Sex pheromone of oriental beetle, *Exomala orientalis*: Identification and field evaluation,” *J. Chem. Ecol.*, vol. 20, pp. 1705-1718, 1994.
- [35] W. S. Leal, F. Kawamura, and M. Ono, “The scarab beetle *Anomala albopilosa sakishimana* utilizes the same sex pheromone blend as a closely related and geographically isolated species, *Anomala cuprea*,” *J. Chem. Ecol.*, vol. 20, pp. 1667-1676, 1994.
- [34] W. S. Leal, M. Hasegawa, M. Sawada, M. Ono, and Y. Ueda, “Identification and field evaluation of *Anomala octiescostata* (Coleoptera: Scarabaeidae) sex pheromone,” *J. Chem. Ecol.*, vol. 20, pp. 1543-1555, 1994.

- [33] W. S. Leal, J. M. S. Bento, E. F. Vilela, and T. M. C. Della Lucia, "Female sex pheromone of the longhorn beetle *Migdolus fryanus* Westwood: N-(2'S)-methylbutanoyl 2-methylbutylamine," *Experientia*, vol. 50, pp. 853-856, 1994.
- [32] W. S. Leal, M. Ono, M. Hasegawa, and M. Sawada, "Kairomone from dandelion, *Taraxacum officinale*, attractant for scarab beetle *Anomala octiescostata*," *J. Chem. Ecol.*, vol. 20, pp. 1697-1704, 1994.
- [31] W. S. Leal, M. Sawada, and M. Hasegawa, "The scarab beetle *Anomala cuprea* utilizes the sex pheromone of *Popillia japonica* as a minor component," *J. Chem. Ecol.*, vol. 19, pp. 1303-1313, 1993.
- [30] W. S. Leal, "(Z)- and (E)-Tetradec-7-en-2-one, a new type of sex pheromone from the Oriental beetle," *Naturwissenschaften*, vol. 80, pp. 86-87, 1993.
- [29] W. S. Leal and F. Mochizuki, "Sex pheromone reception in the scarab beetle *Anomala cuprea*: Enantiomeric discrimination by sensilla placodea," *Naturwissenschaften*, vol. 80, pp. 278-281, 1993.
- [28] W. S. Leal, M. Sawada, S. Matsuyama, Y. Kuwahara, and M. Hasegawa, "Unusual periodicity of sex pheromone production in the large black chafer *Holotrichia parallela*," *J. Chem. Ecol.*, vol. 19, pp. 1381-1391, 1993.
- [27] M. Hasegawa, W. S. Leal, and M. Sawada, "Field evaluation of *Anomala schonfeldti* Ohaus (Coleoptera: Scarabaeidae) synthetic sex pheromone," *J. Chem. Ecol.*, vol. 19, pp. 1453-1459, 1993.
- [26] W. S. Leal, M. Sawada, and M. Hasegawa, "The scarab beetle *Anomala daimiana* utilizes a blend of two other *Anomala* spp. sex pheromone," *Naturwissenschaften*, vol. 80, pp. 181-183, 1993.
- [25] Y. Kuwahara, W. S. Leal, K. Kurosa, M. Sato, S. Matsuyama, and T. Suzuki, "Chemical ecology on astigmatid mites XXXIII. Identification of (Z,Z)-6,9-heptadecadiene in the secretion of *Carpoglyphus lactis* (Acarina, Carpoglyphidae) and its distribution among astigmatid mites," *J. Acarol. Soc. Jpn.*, vol. 1, pp. 95-104, 1992.
- [24] W. S. Leal, "GC-FTIR potential for structure elucidation," *J. Braz. Chem. Soc.*, vol. 3, pp. 25-29, 1992.

- [23] W. S. Leal, S. Matsuyama, Y. Kuwahara, S. Wakamura, and M. Hasegawa, "An amino acid derivative as the sex pheromone of a scarab beetle," *Naturwissenschaften*, vol. 79, pp.184-185, 1992.
- [22] W. S. Leal, M. Hasegawa, and M. Sawada, "Identification of *Anomala schonfeldti* sex pheromone by high-resolution GC-behavior bioassay," *Naturwissenschaften*, vol. 79, pp. 518-519, 1992.
- [21] W. S. Leal, M. Hasegawa, F. Mochizuki, and T. Yasuda, "Behavioral and electrophysiological evidence of sex pheromone(s) in *Anomala schonfeldti* Ohaus (Coleoptera: Scarabaeidae)," *Appl. Entomol. Zool.*, vol. 27, pp. 592-594, 1992.
- [20] W. S. Leal and T. Kadosawa, "(E)-2-Hexenyl hexanoate, the alarm pheromone of the bean bug *Riptortus clavatus* (Heteroptera: Alydidae)," *Biosci. Biotech. Biochem.*, vol. 56, pp. 1004-1005, 1992.
- [19] W. S. Leal, F. Mochizuki, S. Wakamura, and T. Yasuda, "Electroantennographic detection of *Anomala cuprea* Hope (Coleoptera: Scarabaeidae) sex pheromone," *Appl. Entomol. Zool.*, vol. 27, pp. 289-291, 1992.
- [18] W. S. Leal, "(R,Z)-5-(—)-(Oct-1-enyl)oxacyclopentan-2-one, the sex pheromone of the scarab beetle *Anomala cuprea*," *Naturwissenschaften*, vol. 78, pp. 521-523, 1991.
- [17] W. S. Leal, Y. Kuwahara, and T. Suzuki, "Hexyl 2-formyl-3-hydroxybenzoate, a fungitoxic cuticular constituent of the bulb mite *Rhizoglyphus robini*," *Agric. Biol. Chem.*, vol. 54, pp. 2593-2597, 1990.
- [16] W. S. Leal, Y. Kuwahara, and T. Suzuki, "Robinal, a highly conjugated monoterpene from the mite *Rhizoglyphus robini*. Chemical ecology of astigmatid mites, XXVII," *Naturwissenschaften*, vol. 77, pp. 387-388, 1990.
- [15] Y. Kuwahara, W. S. Leal, and T. Suzuki, "Pheromone study on astigmatid mites XXVI. Comparison of volatile components between *Dermatophagoides farinae* and *D. pteronyssinus* (Astigmata, Pyroglyphidae)," *Jpn. J. Sanit. Zool.*, vol. 41, pp. 23-28, 1990.
- [14] W. S. Leal and F. Mochizuki, "Chemoreception in astigmatid mites," *Naturwissenschaften*, vol. 77, pp. 593-594, 1990.
- [13] Y. Kuwahara, W. S. Leal, T. Suzuki, M. Maeda, and T. Masutani, "Antifungal activity of *Caloglyphus polyphyllae* sex pheromone and other mite exudates. Pheromone study of astigmatid mites, XXIV," *Naturwissenschaften*, vol. 76, pp. 578-579, 1989.

- [12] Y. Kuwahara, W. S. Leal, Y. Nakano, Y. Kaneko, H. Nakao, and T. Suzuki, "Pheromone study of astigmatid mites XXIII. Identification of the alarm pheromone on the acarid mite, *Tyrophagus neiswanderi* and species specificities of alarm pheromones among four species of the same genus," *Appl. Entomol. Zool.*, vol. 24, pp. 424-429, 1989.
- [11] W. S. Leal, Y. Kuwahara, Y. Nakano, H. Nakao, and T. Suzuki, "2(E)-(4-Methyl-3-pentenyl)-butenedial, α -acaridial, a novel monoterpene from the acarid mite *Tyrophagus perniciosus* (Acarina, Acaridae)," *Agric. Biol. Chem.*, vol. 53, pp. 1193-1196, 1989.
- [10] W. S. Leal, Y. Kuwahara, T. Suzuki, and K. Kurosa, "The alarm pheromone of the mite *Suidasia medanensis* Oudemans, 1924 (Acariformes, Suidasiidae)," *Agric. Biol. Chem.*, vol. 53, pp. 2703-2709, 1989.
- [9] W. S. Leal, Y. Kuwahara, T. Suzuki, and H. Nakao, "Chemical taxonomy of economically important *Tyrophagus* mites (Acariformes, Acaridae)," *Agric. Biol. Chem.*, vol. 53, pp. 3279-3284, 1989.
- [8] W. S. Leal, Y. Kuwahara, T. Suzuki, and K. Kurosa, " β -Acaridial, the sex pheromone of the acarid mite *Caloglyphus polyphyllae*. Pheromone study of astigmatid mites, XXI," *Naturwissenschaften*, vol. 76, pp. 332-333, 1989.
- [7] T. Suzuki, K. Haga, W. S. Leal, S. Kodama, and Y. Kuwahara, "Secretion of thrips. IV. Identification of β -acaridial from three gall-forming thrips (Thysanoptera: Phlaeotripidae)," *Appl. Entomol. Zool.*, vol. 24, pp. 222-228, 1989.
- [6] W. S. Leal, Y. Kuwahara, T. Suzuki, Y. Nakano, and H. Nakao, "Identification and synthesis of 2,3-epoxyneral, a novel monoterpene from the acarid mite *Tyrophagus perniciosus* (Acarina, Acaridae)," *Agric. Biol. Chem.*, vol. 53, pp. 295-298, 1989.
- [5] W. S. Leal, Y. Kuwahara, and T. Suzuki, "2(E)-(4-Methyl-3-pentenylidene)-butanedial, β -acaridial: A new type of monoterpene from the mold mite *Tyrophagus putrescentiae* (Acarina, Acaridae)," *Agric. Biol. Chem.*, vol. 53, pp. 875-878, 1989.
- [4] W. S. Leal, Y. Nakano, Y. Kuwahara, H. Nakao, and T. Suzuki, "Pheromone study of acarid mites XVII. Identification of 2-hydroxy-6-methyl-benzaldehyde as the alarm pheromone of the acarid mite *Tyrophagus perniciosus* (Acarina: Acaridae), and its distribution among related mites," *Appl. Entomol. Zool.*, vol. 23, pp. 422-427, 1988.

- [3] W. S. Leal, Y. Kuwahara, and T. Suzuki, "Neryl myristate from the acarid mite, *Aleuroglyphus ovatus* (Acarina, Acaridae)," *Agric. Biol. Chem.*, vol. 52, pp. 1299-1300, 1988.
- [2] Y. Kuwahara, W. S. Leal, K. Akimoto, Y. Nakano, and T. Suzuki, "Pheromone study of astigmatid mites XVI. Identification of hexenyl linolate in acarid mites and its distribution among the genus *Tyrophagus*," *Appl. Entomol. Zool.*, vol. 23, pp. 338-344, 1988.
- [1] Y. Kuwahara, K. Akimoto, W. S. Leal, H. Nakao, and T. Suzuki, "Isopiperitenone, a new alarm pheromone of the acarid mite, *Tyrophagus similis* (Acarina, Acaridae)," *Agric. Biol. Chem.*, vol. 51, pp. 3441-3442, 1987.

INVITED CHAPTERS AND REVIEW ARTICLES

- [16] W. S. Leal, "Molecular-based chemical prospecting of mosquito attractants and repellent," in *Insect Repellents: Principles, Methods, and Use*, M. Debboun, D. Strickman and S. P. France, Eds. CRC Press, pp. 229-242, 2007.
- [15] W. S. Leal, "Molecular basis of pheromone reception and signal inactivation," in *Semiochemicals in Pest Management and Alternative Agriculture*, R. J. Petroski, M. R. Tellez, and R. W. Behle, Eds. ACS, pp. 45-57, 2005.
- [14] W. S. Leal, "Proteins that make sense," in *Insect Pheromone Biochemistry and Molecular Biology, The biosynthesis and detection of pheromones and plant volatiles*, G. J. Blomquist, and R. G. Vogt, Eds. Elsevier Academic Press, pp. 447-476, 2003.
- [13] W. S. Leal, "Molecules and macromolecules involved in chemical communication of scarab beetles," *Pure Appl. Chem.*, vol 73, pp. 613-616, 2001.
- [12] W. S. Leal, "Mechanisms of chemical communication in scarab beetles," in *Environmental entomology: Behavior, physiology, and chemical ecology*, T. Hidaka, Y. Matsumoto, K. Honda, H. Honda, and K. Tatsuki, Eds. Tokyo: University of Tokyo Press, pp. 464-478, 1999.
- [11] W. S. Leal, "Beetles as crop pests: scarabids," in *Pheromones of non-lepidopteran insects in agriculture*, R. J. Hardie and A. K. Minks, Eds. New York: CAB International, pp. 51-68, 1999.

- [10] P. H. G. Zarbin, J. T. B. Ferreira, and W. S. Leal, "General methodologies employed on the isolation and structural identification of insect pheromones," *Quimica Nova (in Portuguese)*, vol. 22, pp. 263-268, 1999.
- [9] W. S. Leal, "Chemical communication in scarab beetles," *Kagaku to Seibustu (in Japanese)*, vol. 36, pp. 262-268, 1998.
- [8] W. S. Leal, "Chemical ecology of phytophagous scarab beetles," *Annu. Rev. Entomol.*, vol. 43, pp. 39-61, 1998.
- [7] W. S. Leal, H. Wojtasek, J.-F. Picimbon, S. Kuwahara, H. Saito, and M. Hasegawa, "Perireceptor events in pheromone perception in scarab beetles," *J. Asia-Pacific Entomol.*, vol. 1, pp. 1-8, 1998.
- [6] W. S. Leal, H. Wojtasek, and M. Miyazawa, "Pheromone-binding proteins of scarab beetles," *Annals New York Acad. Sci.*, vol. 855, pp. 301-305, 1998.
- [5] W. S. Leal, "Infrared and ultraviolet spectroscopy techniques," in *Methods in chemical ecology: Chemical methods*, vol. 1, M. J. G. and K. F. Haynes, Eds. Norwell: Kluwer Academic Publishers, 1998, pp. 185-206.
- [4] W. S. Leal, "Evolution of sex pheromone communication in plant-feeding scarab beetles," in *Insect pheromone research: New directions*, R. T. Carde and A. K. Minks, Eds. New York: Chapman & Hall, 1997, pp. 505-13.
- [3] M. Ono, M. Mori, and W. S. Leal, "Development of pheromone traps," *Nippon Nogeikagaku Kaishi (in Japanese)*, vol. 68, pp. 1281-1287, 1994.
- [2] W. S. Leal, "Sex pheromones of scarab beetles," *ShokubutsuBoeki (in Japanese)*, vol. 47, pp. 134-137, 1993.
- [1] W. S. Leal and Y. Kuwahra, "Cuticle wax chemistry of astigmatid mites," in *Modern acarology*, F. Dusbábek and V. Bukva, Eds. The Hague: Academic Press Prague and SPB Academic Publishing by, vol. 2, pp. 419-423