

Michael D. Breed

Curriculum Vitae, January 2018

Department of Ecology and Evolutionary Biology
University of Colorado, Boulder, CO 80309-0334
Office: 303-492-7687 FAX: 303-492-8699
Email: michael.breed@colorado.edu

Present Positions:

Professor, Department of Ecology and Evolutionary Biology, The University of Colorado, Boulder; Faculty Fellow, Institute of Behavioral Genetics

Director, Baker Residential Academic Program, The University of Colorado, Boulder
Interim Executive Director of Residential Academic Programs, College of Arts and Sciences, The University of Colorado, Boulder

Educational Experience

Ph.D. 1977 Kansas University, Lawrence Kansas
M.A. 1975 Kansas University, Lawrence Kansas
B.A. 1973 Grinnell College, Grinnell, Iowa

Employment & Professional Experience

1977-present, Assistant Professor, Associate Professor, Professor, Department of Environmental, Population and Organismic Biology (now the Department of Ecology and Evolutionary Biology), The University of Colorado, Boulder

Current Professional Memberships

American Association for the Advancement of Science (Fellow)
Animal Behavior Society
International Union for the Study of Social Insects (Secretary-General, 1994-2002; Finance committee, 2010-2014, Editor-in-Chief 2014-present)
Kansas Entomological Society
Association for Tropical Biology
Sigma Xi (President, University of Colorado Chapter, 2004-2006)
American Institute for Biological Sciences (AIBS)
Entomological Society of America (Fellow)

Honors

2014 Elected fellow of the Animal Behavior Society
2009 Boulder Faculty Assembly Service Award
2006 Elected fellow of the Entomological Society of America
2006 Robert Stearns Award for service to the University of Colorado
2006 Herd Teaching Recognition Award, University of Colorado Alumni Association (awardees selected by an all-campus poll of students)
2002 Elected fellow of the AAAS

2001 Excellence in Teaching Award, Committee on Learning and Academic Support Services, University of Colorado
2000 University of Colorado Faculty Fellowship
1999 Listed, Who's Who in America, 53rd Edition
1998 Outstanding Professor Award, Mortar Board Society, University of Colorado
1974-1977 University of Kansas Graduate Honors Fellow

Professional Service (highlights)

2015-2016 Interim executive director, Residential Academic Programs, College of Arts and Sciences, University of Colorado
2015-present, Director, Baker Residential Academic Program, University of Colorado
2014-present, Editor-in-Chief, *Insectes Sociaux*
2012-2014, Chair, Board of Directors, Organization for Tropical Studies
2012-2013, Interim Director, Honors Program, College of Arts and Sciences, University of Colorado
2008-2009, Acting Director, Miramontes Arts and Sciences Program, University of Colorado.
2007-2012, fall semester 2013, Associate Chair (undergraduate programs) Department of Ecology and Evolutionary Biology
2007-2013, Member, Chair, Proposal Review Panel, Graduate fellowships, National Science Foundation
2006, Chair, Search Committee, Director, Study Abroad Programs, University of Colorado
2006-2009 Executive Editor, *Animal Behaviour*
2006-2011, Member, Proposal Review Panel, East Asian and Pacific Summer Institutes, National Science Foundation
2005, Member, Proposal Review Panel, Research Experiences for Undergraduates (Biology), National Science Foundation
2005 Member, Campus task force on Fall Break and Course Forgiveness policies
2004-2005 Chair, College task force on East Asian Programs, College of Arts and Sciences, University of Colorado, Boulder
2004-2013, Member, Chair, University Study Abroad Committee
2003-2010 Member, advisory committee, Colorado Diversity Initiative in Science, Math and Engineering
2003-2006, Editor, *Animal Behaviour*
2002-2007, Department Chair, East Asian Languages and Civilizations
2002-2004, Member, Proposal Review Panel, Graduate fellowships, National Science Foundation
2002-present Member, advisory committee, Biological Sciences Initiative, University of Colorado, Boulder
1997-1999, Department Chair, EPO Biology
1994-2002, Secretary-General, International Union for the Study of Social Insects
1994-1996, member, Executive Committee, Board of Directors, Organization for Tropical Studies
1993-1995, Member, Proposal Review Panel, Animal Behavior, National Science Foundation
1992-1994, Member, La Selva Advisory Committee (Chair, 1993-1994)
1991-1994, Officer, Section C, Entomological Society of America (Chair, 1994)
1991-1993, Acting Associate Dean, College of Arts and Sciences
1991-1993, Acting Chair, Department of Anthropology
1990-1995 Member, University Study Abroad Committee.
1989-1993 Member, Arts and Sciences Tenure and Promotion Committee.
1988-1991 Member, Boulder campus Program Review Panel.
1987-1993 Member, Boulder campus Graduate School Executive Committee.
1986-1990 Department Chair, EPO Biology.
1985-1986 Chair, Council on Research and Creative Work, University of Colorado
1984 President, Western Hemisphere Section, International Union for the Study of Social Insects.
1983-1986 Member, Council on Research and Creative Work. University of Colorado
1982-1984 Associate Chair, EPO Biology
1980-1983 Chair, Graduate Program Committee, EPO Biology

National Science Foundation Grants

1460906 REU Site: Achieving Heightened Goals: Undergraduate Research in Ecology at the Mountain Research Station. Principal Investigator: William Bowman; Co-Principal Investigator: Michael Breed; Organization: University of Colorado at Boulder; NSF Organization: DBI Start Date:04/01/2015; Award Amount:\$301,951

1004115 REU Site: Achieving Heightened Goals: Undergraduate Research in Ecology at the Mountain Research Station DBI RSCH EXPER FOR UNDERGRAD SITES 05/15/2010 Bowman, William (PI) Breed, Michael (co-PI) University of Colorado at Boulder \$263,734.00

0649011 REU Site: Undergraduate Research in Behavior, Ecology and Evolution DBI UNGRAD RES MENTORING IN BIO, RSCH EXPER FOR UNDERGRAD SITES 02/15/2007 Bowman, William (PI) Breed, Michael (co-PI) University of Colorado at Boulder \$258,812.00

0353732 REU Site: Undergraduate Research in Behavior, Ecology, and Evolution DBI RSCH EXPER FOR UNDERGRAD SITES. 05/01/2004 Breed, Michael \$240,084.00

0097528 REU Site: Undergraduate Research in Behavior, Ecology, and Evolution DBI RSCH EXPER FOR UNDERGRAD SITES. 06/01/2001 Breed, Michael \$200,455.00

9732519 Undergraduate Research in Behavior, Ecology, and Evolution DBI Ethics & Values of SET, RSCH EXPER FOR UNDERGRAD SITES 07/15/1998 Breed, Michael \$157,500.00

9408180 Nestmate Recognition in Honey Bees: Collaborative Research on Behavioral and Chemical Aspects IOB IBN ANIMAL BEHAVIOR 12/01/1994 Breed, Michael \$115,005.00

9209016 Nestmate Recognition in Honey Bees: Collaborative Research on Behavioral, Chemical and Genetic Aspects IOB SPECIAL PROGRAMS RESERVE, IBN ANIMAL BEHAVIOR. 10/15/1992 Breed, Michael \$60,537.00

8911078 Collaborative Research: Nestmate Recognition in Honey Bees IOB IBN ANIMAL BEHAVIOR 07/15/1989 Breed, Michael \$170,951.00

8605604 Collaborative Research: Nestmate Recognition by Honey Bees IOB CROSS-DIRECTORATE PROGRAMS, IBN ANIMAL BEHAVIOR 08/01/1986 Breed, Michael \$63,667.00

8216787 Recognition Systems in Honey Bees IOB IBN ANIMAL BEHAVIOR 02/01/1983 Breed, Michael \$11,000.00

8108893 Ninth Congress of the International Union For the Study of Social Insects; Boulder, Colorado; August 9-13, 1982 DEB ECOLOGICAL BIOLOGY CLUSTER, POP & EVOLUTIONARY PR CLUSTER. 08/01/1981 Breed, Michael \$10,450.00

8015135 Equipment For Undergraduate Laboratory Training in Behavioral Biology and Neuroethology SER ALT IN HIGH ED-INST SC EQ 10/15/1980 Breed, Michael \$19,422.00

7724898 Behavioral Ecology of Aggression: an Ethometric Approach IOB IBN ANIMAL BEHAVIOR 05/01/1978 Breed, Michael \$65,566.00

Other Grants

PI, Sloan Foundation Grant for Minority Graduate Student Fellowships. 2004-2009, number of fellowships each year depended on number of minority graduate students admitted to our PhD program.

I have also had grants from the National Institute for Mental Health and the National Geographic Society.

Books

Breed, M.D. 2017. Conceptual breakthroughs in ethology and animal behavior. Academic Press/Elsevier.

Breed, M. D. and J. Moore. 2011. Animal Behavior. Academic Press/Elsevier. 550 pp. 2nd edition published May 2015.

Breed, M. D. and J. Moore, eds. 2010. Encyclopedia of Animal Behavior. Academic Press/Elsevier. 300+ articles, 3 volumes, 2762 pp. 2010 American Publishers Awards for Professional and Scholarly Excellence, PROSE Award, multivolume reference/science. Selected as an Outstanding Academic Title for 2011 by Choice Magazine.

Tillberg, C. V., Breed, M. D., Hinners, S. J. 2007. Field and Laboratory Exercises in Animal Behavior. Academic Press. 232 pp.

Vander Meer, R. M. Breed, M. D., Winston, M. L., Espelie, K. E. eds. 1998. Pheromone Communication In Social Insects. Westview Press: Boulder. 368 pp.

M. Spivak, Fletcher, D.J.C., Breed, M.D., eds. 1991. The "African" Honey Bee. Westview Press: Boulder. 411 pp.

Breed, M. D., Page, R. E., eds. 1988. The Genetics of Social Evolution. Westview Press: Boulder. 213pp.

Breed, M.D., Michener, C.D., Evans, H.E., eds. 1982. The biology of social insects: Proceedings of the 9th Congress of the IUSSI. Westview Press: Boulder. 419 + xii pp.

Journal Publications and Chapters

Pacheco, J. and M. D. Breed. Ms in preparation. Specialization and change: behavioural transitions by middle-aged honeybees.

Zelagin, DM and MD Breed. submitted. Spatial Aspects of Corpse Removal in the Western Harvester Ant, *Pogonomyrmex occidentalis*. Journal of Insect Behavior

Cook, CN, CS Brent, MD Breed. 2017. Octopamine and tyramine modulate the thermoregulatory fanning response in honey bees (*Apis mellifera* L.). J. Exp. Biol. 220: 1925-1930.

Winter, C. and M. D. Breed. 2017. Homeward navigation in *Pogonomyrmex occidentalis* harvester ants. Insectes Sociaux 64: 55-64

McCreery HF, Correll N, Breed MD, Flaxman S. 2016. Consensus or Deadlock? Consequences of Simple Behavioral Rules for Coordination in Group Decisions. PLoS ONE 11(9): e0162768. doi:10.1371/journal.pone.0162768

McCreery HF, Dix Z, Breed MD, Nagpul, R. 2016. Collective strategy for obstacle navigation during cooperative transport by ants. J. Exp. Biol. 219: 3366-3375

Breed MD 2016. Charles Michener, 1918-2015 Obituary. APIDOLOGIE 47(4):491-494.

Cook CN, Breed MD, Flaxman S, Kaspar R. 2016. Rapidly changing environment modulates the thermoregulatory fanning response in honeybee groups. Animal Behaviour. 115:237-243.

- Cook, CN, Scheckel, K, Durzi SA, Breed MD. 2016 Larvae influence thermoregulatory fanning behavior in honeybees (*Apis mellifera* L.) *Insectes Sociaux* 63:271–278
- Breed, MD; Cook, CN; McCreery, H; Rodriguez, M. 2015. Nestmate and kin recognition in honeybees. in “Social Recognition in Invertebrates”, L. Aquiloni and E. Tricarico, eds., Springer. Pp 147-164.
- Breed, M. D. 2014. Kin and nestmate recognition: the influence of W.D. Hamilton on 50 years of research. *Animal Behaviour*. 92:271–279.
- McCreery, H. and M. D. Breed. 2014. Collective transport in ants. *Insectes Sociaux*. 61:99-110.
- Cook, C. N. and M. D. Breed. 2013. Honey bee thermoregulation depends on social context. *Animal Behaviour*. 86:323-329. Featured at: <http://blogs.scientificamerican.com/not-bad-science/2013/08/29/cooling-down-in-honeybees-is-affected-by-what-others-are-doing/>
- Lenz E., M. O. Krasnec and M. D. Breed. 2013. Identification of undecane as an alarm pheromone of the ant *Formica argentea*. *J. Insect Behav.* 26:101-108.
- Egley, R. and M. D. Breed. 2013. The fanner honey bee: behavioral variability and environmental cues in workers performing a specialized task. *J. Insect Behav.* 26:238-245.
- Krasnec, M. O. and M. D. Breed. 2013. Colony-specific cuticular hydrocarbon profile in *Formica argentea* ants. *J. Chem. Ecol.* 39:59-66.
- Mott, C. M. and M. D. Breed. 2012. Insulin modified honeybee worker behavior. *Insects* **2012**, 3, 1084-1092; doi:10.3390/insects3041084
- Krasnec, M. O., Cook, C. N. & Breed, M. D. 2012. Mating Systems in Sexual Animals. *Nature Education Knowledge* 3(10):72
- Lyon, C., Buchwald, R. and M. D. Breed. 2012. The use of flax oil to influence honeybee nestmate recognition. *Journal of Economic Entomology*. 105:1145-1148.
- Breed M. D., Cook C. and M. O. Krasnec 2012. Cleptobiosis in social insects. *Psyche*, Article ID 484765, 7 pages.
- Krasnec M.O. and M.D. Breed. 2011. Eusocial Evolution and the Recognition Systems in Social Insects. In C. López-Larrea ed., *Sensing Systems in Nature*. Landes Bioscience, Austin, TX. <http://www.landesbioscience.com/curie/chapter/4947/>
- Breed, M. D. 2010. Honeybees. in: Breed, M. D. and J. Moore, eds. 2010. *Encyclopedia of Animal Behavior*. Academic Press/Elsevier. vol. 2, pp 89-96.
- Breed, M. D. 2010. Social recognition. in: Breed, M. D. and J. Moore, eds. 2010. *Encyclopedia of Animal Behavior*. Academic Press/Elsevier. vol. 3, pp 267-272.
- Buchwald, R., Breed, M. D., Bjostad L., Hibbard B. E., Greenberg A. R. 2009. The role of fatty acids in the mechanical properties of beeswax. *Apidologie* 40:585-594.
- McPeck, M. A., DeAngelis, D. L., Shaw, R. G., Moore, A. J., Rausher, M. D., Strong, D. R., Ellison, A. M., Barrett, L., Rieseberg L., Breed, M. D., Sullivan, J., Osenberg, C. W., Holyoak, M., Elgar, M. A. 2009. The Golden Rule of Reviewing. *Am. Nat.* 173: E155-E158.
- Breed, M. D., Buchwald, R. 2008. Cue Diversity and Social Recognition. In *Organization of Insect Societies*, J. Gadau and J. H. Fewell, eds. Harvard University Press. Pp 171-192.

- Pacheco, J., Breed, M. D. 2008. Sucrose-response thresholds and the expression of behavioural tasks by middle-aged honeybee workers. *Anim Behav.* 76: 1641-1646.
- Murphy, C. M. Breed, M. D. 2008. Nectar and resin robbing in stingless bees. *American Entomologist.* 54:36-44.
- Zelikova, J., Breed, M. D. 2008. Effects of habitat disturbance on ant community composition and seed dispersal by ants in a tropical dry forest in Costa Rica. *Journal of Tropical Ecology.* 24:309-316.
- Buchwald, R., Breed, M. D., Greenberg, A. 2008. The thermal properties of beeswaxes: unexpected findings. *Journal of Experimental Biology.* 211:121-127.
- Dias, C. M., Breed M. D. 2008. Untangling the interplay among navigational strategies utilized by the ant *Formica podzolica*. *Annals Entomological Society of America.* 101:1145-1149.
- Murphy C. M., Breed, M. D., 2008. Time-place learning in the stingless bee, *Trigona fulviventris*. *Journal of the Kansas Entomological Society.* 81:73-76.
- Breed, M. D., Deng, X-B., Buchwald, R. 2007. Comparative Nestmate recognition in Asian honey bees, *Apis florea*, *Apis andreniformis*, *Apis dorsata*, and *Apis cerana*. *Apidologie.* 38:411-418.
- Murphy C. M., Breed, M. D., 2007. A predictive distribution map for the giant tropical ant, *Paraponera clavata*. *Journal of Insect Science.* 7:08, available online: insectscience.org/7.08
- Buchwald, R. Breed, M. D. Greenberg, A. R. and Otis, G. 2006. Interspecific variation in beeswax as a biological construction material. *Journal of Experimental Biology* 209: 3984-3989. [Paper featured in *Inside JEB*, 209:iii.]
- Bucy, A. M. and Breed, M. D. 2006. Thermoregulatory trade-offs result from vegetation removal by a harvester ant. *Ecological Entomology* 423-429.
- Buchwald R., Breed M. D. 2005. Nestmate recognition cues in a stingless bee, *Trigona fulviventris*. *Animal Behaviour* 70: 1331-1337.
- Buchwald, R., A. R. Greenberg, Breed, M. D. 2005. A biomechanical perspective on beeswax. *American Entomologist* 51:39-41.
- Freiburger, B. J., M. D. Breed, Metcalf, J. L. 2004. Mating frequency, within-colony relatedness and male production in a yellow jacket wasp, *Dolichovespula arenaria*. *Molecular Ecology.* 13:3703-3707.
- Breed, M. D. 2004. "Communication: Honeybee dance language" in *Encyclopedia of Animal Behavior*, M. Bekoff, ed. Greenwood Press: Westport Connecticut. Pp. 359-362.
- Breed, M. D. 2004. "Communication-Olfaction: Chemical communication" in *Encyclopedia of Animal Behavior*, M. Bekoff, ed. Greenwood Press: Westport Connecticut. Pp. 364-368 [excl. p 365].
- Breed, M. D. 2004. "Education—Classroom activities: Insects in the classroom" in *Encyclopedia of Animal Behavior*, M. Bekoff, ed. Greenwood Press: Westport Connecticut. Pp. 532-533.
- Tillberg, C. V., Breed, M. D. 2004 Placing an omnivore in a complex food web: stable isotope analysis of dietary contributions to adult biomass of an ant. *Biotropica* 36: 266-271.
- Breed, M. D., Diaz, P. H., Lucero, K. D. 2004. Behavioural tests of models for information processing in nestmate recognition by honey bees, *Apis mellifera*. *Anim. Behav.* 68:921-928.

- Breed, M. D., Perry, S., Bjostad, L. B. 2004. Testing the blank slate hypothesis: why honey bee colonies accept young bees. *Insectes Sociaux*. 51:12-16.
- Breed, M. D., Guzmán-Novoa, E., Hunt, G. J. 2004. Defensive behavior of honey bees: Organization, genetics, and comparisons with other bees. *Ann. Rev. Entomol.* 49: 271-298.
- Breed, M. D. 2003. Nestmate recognition assays as a tool for population and ecological studies in eusocial insects: A review. *J. Kansas Entomol. Soc.* 76: 539-550.
- Breed, M. D., D. B. Williams, and A. Queral. 2002. Demand for task performance and workforce replacement: Undertakers in honeybee, *Apis mellifera*, colonies. *Journal of Insect Behavior* 15: 319-329.
- Breed, M. D. 2002. Allometry in the giant tropical ant, *Paraponera clavata*. *Insectes Sociaux* 49: 125-128.
- Breed M. D., E. M. Stocker, L. K. Baumgartner, and S. A. Vargas. 2002. Time-place learning and the ecology of recruitment in a stingless bee, *Trigona amalthea* (Hymenoptera, Apidae). *Apidologie* 33: 251-258.
- Pearce, A. N., Z.-Y. Huang, and M. D. Breed. 2001. Genetic and endocrine correlations of aggressive behavior in honey bees. *Journal of Insect Physiology* 47: 1243-1247.
- Wager, B. R. and M. D. Breed. 2000. Does honey bee sting alarm pheromone give orientation information to defensive bees? *Ann. Ent. Soc. Am.* 93:1329-1332.
- Breed, M. D., T.P. McGlynn, E. M. Stocker and A. N. Klein 1999. Thief workers and variation in nestmate recognition behavior in a ponerine ant, *Ectatomma ruidum*. *Insectes Sociaux*. 46:327-331.
- Breed, M. D., T. McGlynn, E. Stocker, M. Sanctuary, R. Cruz. 1999. Meliponine bees: distribution and abundance in a tropical wet forest. *Journal of Tropical Ecology*. 15:765-777.
- Breed, M. D. 1999. How do animals communicate? *Quarterly Review of Biology*. 74:205-207. (lead book review)
- Breed, M. D. 1998. Chemical cues in kin recognition: Criteria for identification, experimental approaches, and the honey bee as an example. In *Chemical communication in social insects*, R. K. Vander Meer, M. L. Winston, K. E. Espelie and M. D. Breed, eds. Westview Press: Boulder, pp. 57-78.
- Breed, M. D., Leger, E. A., Pearce, A. N., Wang, Y. J. 1998. Comb wax effects on the ontogeny of honey bee nestmate recognition. *Anim. Behav.* 55:13-20.
- Breed, M. D. 1998. Recognition pheromones on the honey bee. *Bioscience*. 48:463-470.
- Bowden, R. M., Williamson, S., Breed, M. D. 1998. Floral oils: Their effect on nestmate recognition in the Honey Bee, *Apis mellifera*. *Insectes Sociaux*. 45:209-214.
- Cunard, S. J. and Breed, M. D. 1998. Post-stinging behavior of worker honey bees (Hymenoptera: Apidae). *Ann. Entomol. Soc. Am.* 91:754-757.
- Jeral, J. M., Breed, M. D., Hibbard, B. E. 1997. Thief ants have reduced quantities of cuticular hydrocarbons in a ponerine ant, *Ectatomma ruidum*. *Physiol. Entomol.* 22:207-211.
- Mann, C. A. and Breed, M. D. 1997. Olfaction in guard honey bee discrimination of non-nestmates. *Ann. Entomol. Soc. Am.* 90:844-847.

- Fewell, J. H., Harrison, J. F., Lighton, J. R. B., Breed, M. D. 1996. Foraging energetics in of the ant, *Paraponera clavata*. *Oecologia* 105:419-427.
- Breed, M. D., Bowden, R. M., Garry, M. F., Weicker, A. 1996. Search time variation in response to differences in nectar quantity and quality in the giant tropical ant, *Paraponera clavata*. *J. Insect Behav.* 9:659-672.
- Breed, M. D., Stierstorfer, C., Furness, E., Jeral, J, Fewell, J. 1996. Individual constancy of localized search in the giant tropical ant, *Paraponera clavata*. *J. Insect Behav.* 9:673-682.
- Smith, B. H. and Breed, M. D. 1995. The chemical basis for nestmate recognition and mate discrimination in social insects. in *Chemical Ecology of Insects II*, R. T. Cardé and W. J. Bell, eds. Chapman and Hall: New York. pp. 287-317.
- Breed, M. D., Page, R. E. Jr., Bjostad, L., Hibbard, B. 1995. Genetic components of variation in comb wax hydrocarbons produced by honey bees. *J. Chem. Ecol.* 21:1329-1338.
- Breed, M. D., Garry, M. F., Pearce, A. N., Bjostad, L., Hibbard, B., Page, R. E. 1995. The role of wax comb in honey bee nestmate recognition: Genetic effects on comb discrimination, acquisition of comb cues by bees, and passage of cues among individuals. *Anim. Behav.* 50:489-496.
- Bowden, R. M., Garry, M. F., Breed, M. D. 1994. Discrimination of con- and heterospecific bees by *Trigona (Tetragonisca) angustula* guards. *J. Kansas Entomol. Soc.* 67:137-139.
- Breed, M. D., Welch, C. K., Cruz, R. 1994. Kin discrimination within honey bee colonies: An analysis of the evidence. *Behav. Proc.* 33:25-40.
- Breed, M. D. 1993. Odour detection in bees. *Nature.* 362:120.
- Breed, M. D. and Stiller, T. M. 1992. Honey bee, *Apis mellifera*, nestmate discrimination: hydrocarbons effects and the evolutionary implications of comb choice. *Anim. Behav.* 43:875-883.
- Breed, M. D., Snyder, L. E., Lynn, T. L., Morhart, J. A. 1992. Acquired chemical camouflage in a tropical ant. *Anim. Behav.* 44:519-523.
- Breed, M. D. and G. Julian. 1992. Honey bee nestmate recognition: Simple rules do not apply. *Nature.* 357:685-686.
- Breed, M. D., Smith, T. A., and Torres, A. 1992. Guard honey bees: role in nestmate recognition and replacement. *Annals Entomol. Soc. Am.* 85:633-637.
- Breed, M. D., Stiller, T. M., Blum, M. S., and Page, R. E., Jr. 1992. Honey bee nestmate recognition: effects of queen fecal pheromones. *J. Chem. Ecol.* 18:1633-1640.
- Fewell, J. H., Harrison, J. F., Stiller, T. M., Breed, M. D. 1992. A cost benefit analysis of distance effects on foraging and recruitment in the giant tropical ant, *Paraponera clavata*. *Oecologia.* 92:542-547.
- Spivak, M., Breed, M. D. 1991. Introduction. in *The "African" Honey Bee*. M. Spivak, D. J. C. Fletcher and M. D. Breed, eds. Westview Press: Boulder. pp. 1-9.
- Breed, M.D. 1991. Defensive behavior. in *The "African" Honey Bee*. M. Spivak, D.J.C. Fletcher and M.D. Breed, eds. Westview Press: Boulder. pp. 299-308.

- Breed, M. D., Rogers, K. D. 1991. The behavioral genetics of colony defense in honey bees: Genetic variability for guarding behavior. *Behav. Genet.* 21:295-303.
- Breed, M. D., Stiller, T. M., Fewell, J. F., Harrison, J. M. 1991. Territoriality and nestmate discrimination in the giant tropical ant. *Biotropica* 23:301-306.
- Breed, M. D., Page, R. E. 1991. Intra-and interspecific nestmate recognition and colony defense in *Melipona* workers. *J. Insect Behav.* 4:463-469.
- Breed, M. D. 1991. Social Dominance. McGraw-Hill Encyclopedia of Science and Technology.
- Page, R. E., Breed, M. D., Getz, W. M. 1990. Reply to Carlin and Frumhoff. *Nature* 346:707.
- Breed, M. D., Abel, P., Bleuze, T. J., Denton, S. E. 1990. Thievery, home ranges, and nestmate recognition in *Ectatomma ruidum*. *Oecologia* 84:117-121.
- Breed, M. D., Robinson, G. E., Page, R. E. 1990. Division of labor during honey bee colony defense. *Behav. Ecol. Sociobiol.* 27:395-401.
- Breed, M. D. 1990. The behavioral genetics of social insects: An overview. in *Social insects and the environment*. G. K. Veeresh, B. Mallik, and C. A. Viraktamath, eds. Oxford & IBH: New Delhi. pp. 495-496.
- Breed, M.D., Rogers, K.B., Hunley, J.A., Moore, A.J. 1989. A correlation between guard behavior and defensive response in the honey bee. *Anim. Behav.* 37:515-516.
- Breed, M.D., Harrison, J. 1989. Arboreal nesting in the giant tropical ant, *Paraponera clavata*. *J. Kansas Entomol. Soc.* 62:133-135.
- Harrison, J. F., Fewell, J. H., Stiller, T. M., Breed, M. D. 1989. Effects of experience on use of orientation cues in the giant tropical ant. *Anim. Behav.* 37:869-871.
- Moore, A.M., Ciccone, W., Breed, M.D. 1988. The influence of social experience on the behavior of male cockroaches, *Nauphoeta cinerea*. *J. Insect Behav.* 1:157-168.
- Breed, M.D., Stiller, T.M., Moor, M.J. 1988. The ontogeny of kin discrimination cues in the honey bee, *Apis mellifera*. *Behavioral Genetics.* 18:439-448.
- Breed, M.D., Harrison, J. 1988. Individually discriminable trails in a ponerine ant. *Insectes Sociaux.* 34:222-226.
- Breed, M.D., Harrison, J. 1988. Caste in the giant tropical ant, *Paraponera clavata*. *J. Kansas Entomol. Soc.* 61:285-290.
- Breed, M. D., Fewell, J. H., Williams, K. R. 1988. Wax mediates the acquisition of honey bee nestmate recognition cues. *Proc. Nat. Acad. Sci.* 85:8766-8769.
- Breed, M.D. 1988. The guard bee and honey bee defensive behavior. in *Proceedings of the Africanized Honey Bee and Mite Conference*, R.E. Page, G. Needham, M. Delfinado-Baker, eds. Ellis Horwood Publishing Co. pp. 105-109.
- Breed, M.D. 1988. Genetics and labour in bees. *Nature* 333:299.

- Blaustein, A.R., Porter, R.H., Breed, M.D. 1988. Kin recognition in animals. Empirical evidence and conceptual issues. *Behavioral Genetics*. 18:405-407.
- Breed, M.D. 1988. Introduction: Theory and empirical results in sociogenetics. In *Genetics of Social Evolution*. M.D. Breed and R.E. Page, eds. Westview Press: Boulder. pp 1-13.
- Moore, A.M., Breed, M.D., Moor, M.J. 1987. The guard honey bee; ontogeny and behavioral variability of workers performing a specialized task. *Anim. Behav.* 35:1159-1167.
- Breed, M.D., Bennett, B. 1987. Kin recognition in highly eusocial insects. in *Kin recognition*. D.J.C. Fletcher and C.D. Michener, eds. John Wiley: New York. pp. 243-285.
- Breed, M.D., Fewell, J.H., Moore, A.J., Williams, K. 1987. Modulated recruitment in a ponerine ant. *Behav. Ecol. Sociobiol.* 20:407-411.
- Harrison, J., Breed, M.D. 1987. Temporal learning in a ponerine ant. *Physiol. Entomol.* 12:317-320.
- Page, R.E., Breed M.D. 1987. Kin recognition in social bees. *Trends in Ecology and Evolution.* 2:272-275.
- Breed, M.D. 1987. Multiple inputs in the nestmate discrimination system of the honey bee. in *Chemistry and Biology of Social Insects*. J. Eder, H. Rembold, eds. Verlag J. Peperny: Munich. pp. 461-462.
- Moore, A.M., Breed, M.D. 1986. Mate assessment in a cockroach, *Nauphoeta cinerea*. *Anim. Behav.* 34:1160-1165.
- Breed, M.D., Bennett, B. 1986. Learning and genetic influences in the discrimination of colony members by social Hymenoptera. *The Individual and Society*, L. Passera and J.P. Lachaud, eds. Privat Publishers. pp. 21-30.
- Bennett, B. Breed, M.D. 1985. The nesting biology, mating behavior and foraging ecology of *Peridita opuntiae*. *J. Kansas Entomol. Soc.* 58:185-194.
- Bennett, B., Breed, M.D. 1985. On the association between *Pentaclethra macroloba* (Mimosaceae) and *Paraponera clavata* (Hymenoptera: Formicidae) colonies. *Biotropica.* 17:253-255.
- Breed, M.D., Butler, L., Stiller, T.M. 1985. Kin recognition by worker honey bees in genetically mixed groups. *Proc. Nat. Acad. Sci.* 82:3058-3061.
- Breed, M.D. 1985. How bees recognize their nestmates: A re-evaluation from new evidence. *Bee World.* 66:113-118.
- Breed, M.D., Bennett, B. 1985. Mass recruitment to nectar sources in *Paraponera clavata*: A field study. *Insectes Sociaux* 33:198-208.
- Breed, M.D. 1985. Learning and genetic influences in the discrimination of colony members by social Hymenoptera. *Proc. 19th Internat. Conference Ethology.* 3:49-57.
- Breed, M.D. 1984. The ontogeny of orphaned honeybee queen-worker relationships: A quantitative analysis. *Annals of Entomology.* 2:27-37.
- Evans, L.D., Breed, M.D. 1984. Sibling associations in a cockroach, *Leucophea maderae*. *Ann. Entomol. Soc. Amer.* 77:574-577.

- Breed, M.D., Velthuis, H.H.W. Robinson, G.E. 1984. Do worker honey bees discriminate among larval genotypes? *Ann. Entomol. Soc. Am.* 77:737-739.
- Breed, M.D. 1983. Cockroach mating systems. In *Orthopteran Mating Systems*, D.T. Gwynne, and G.K. Morris, eds. Westview Press: Boulder. pp. 268-284.
- Breed, M.D. 1983. Nestmate recognition in honeybees. *Anim. Behav.* 31:86-91.
- Breed, M.D., Bell, W.J. 1983. Hormonal control of aggression in invertebrates. In *Hormones and Aggressive Behavior*. B. Svare, ed., Plenum Press: New York. pp. 577-590.
- Breed, M.D. 1983. The anatomy of the neuroendocrine system of the honey bee: Neurosecretory relationships with the retrocerebral complex. *J. Apicult. Res.* 22:9-16.
- Hales, R.A., Breed, M.D. 1983. Female calling and reproductive behavior in the Brown Banded Cockroach, *Supella longipalpa* (F.). *Ann. Entomol. Soc. Amer.* 76:239-241.
- Breed, M.D. 1983. Correlations between aggressiveness and corpora allata volume, social isolation, age and dietary protein in worker honeybees. *Insectes Sociaux* 30:482-495.
- Smith, S.K., Breed, M.D. 1982. Olfactory cues in discrimination among individuals in dominance hierarchies in the cockroach, *Nauphoeta cinerea*. *Physiol. Entomol.* 7:337-341.
- Breed, M.D. 1982. Juvenile hormone and aggression in the honey bee. In *The biology of social insects: Proceedings of the 9th Congress of the IUSSI*, M.D. Breed, C.D. Michener, and H.E. Evans, eds. Westview Press: Boulder. pp. 233-237.
- Breed, M.D., Meaney, C., Deuth, D. 1981. Agnostic interactions of two cockroach species, *Gromphadorhina portentosa* and *Supella longipalpa*. *J. Kansas Entomol. Soc.* 54:197-208.
- Breed, M.D., Bekoff, M. 1981. Individual recognition and social relationships. *J. Theoret. Biol.* 88:589-593.
- Breed, M.D. 1981. Individual recognition and learning of queen odors by worker honeybees (*Apis mellifera*). *Proc. Nat. Acad. Sci.* 78:2635-2637.
- Breed, M.D., Smith, S., Gall, B.G. 1980. Systems of mate selection in a cockroach with male dominance hierarchies. *Anim. Behav.* 28:130-134.
- Breed, M.D., Rasmussen, C.D. 1980. Behavioral strategies during intermale agonistic encounters in a cockroach. *Anim. Behav.* 28:1063-1069.
- Snyder, G.K., Ungerman, G., Breed, M.D. 1980. Effects of hypoxia, hypercapnia, and pH on ventilation rate in *Nauphoeta cinerea*. *J. Insect Physiol.* 26:699-702.
- Bell, W.J., Gorton, R.E., Tourtellot, M.K. Breed, M.D. 1979. Comparison of male agonistic behavior in five species of cockroaches. *Insectes Sociaux* 26:252-263.
- Michener, C.D., Breed, M.D., Bell, W.J. 1979. Seasonal cycles, nests, and social behavior of some Columbian Halictine bees (Hymenoptera, Apoidea). *Revista de Biologia Tropical* 27:13-34.
- Breed, M.D., Byers, J. 1979. The effect of population density on spacing patterns and behavioral interactions in the cockroach, *Byrsotria fumigata*. *Behav. Neural. Biology* 27:523-531.

Bell, W.J., Robinson, S., Tourtellot, M.S., Breed, M.D. 1978. An ethometric analysis of agonistic behavior and social hierarchies in the cockroach *Eublaberus posticus*. *Z. Tierpsych.* 48:202-218.

Breed, M.D., Silverman, J.M., Bell, W.J. 1978. Agnostic behavior, social interactions and behavioral specialization in a primitively eusocial bee. *Insectes Sociaux* 25:351-364.

Breed, M.D., Gamboa, G.J. 1977. Control of worker activities by queen behavior in a primitively eusocial bee. *Science* 195:694-696.

Kukuk, P., Breed, M.D., Sobti, A., Bell, W.J. 1977. The contributions of kinship and conditioning to nest recognition and colony member recognition in a primitively eusocial bee, *Lasioglossum zephyrum*. *Behav. Ecol. Sociobiol.* 2:319-327.

Breed, M.D. 1977. Interactions among individuals and queen replacement in a primitively eusocial bee. *Proc. VIII Int. Cong. Int. Union for the Study of Social Insects*, 228-231.

Breed, M.D. 1976. The evolution of social behavior in primitively social bees: a multivariate analysis. *Evolution* 30:234-240.

Olomon, C.M., Breed, M.D., Bell, W.J. 1976. Ontogenetic and temporal factors affecting agonistic behavior in the American cockroach *Periplaneta americana*. *Behav. Biol.* 17:243-248.

Breed, M.D. 1975. Life cycle and behavior of a primitively social bee, *Lasioglossum rohweri* (Hymenoptera: Halictidae). *J. Kansas Entomol. Soc.* 48:64-80.

Breed, M.D., Hinkle, C.M., Bell, W.J. 1975. Agonistic behavior in the German cockroach, *Blattella germanica*. *Z. Tierpsych.* 29:24-32.

Breed, M.D. 1975. Sociality and seasonal size variation in halictine bees. *Insectes Sociaux* 22:372-380.

Bell, W.J., Breed, M.D., Richards, K.W., Michener, C.D. 1974. Social, stimulatory and motivational factors involved in intraspecific nest defense of a primitively eusocial bee. *J. Comp. Physiol.* 93:173-181.

Breed, M.D. 1967. Zone refining of a C-11 fluoro alcohol. *Trans. Kansas Acad. Sci.* 70:149-50.

Essays

Breed M. 2017. Staying close to home. *Insectes Sociaux* 64(4):453-454

Breed M. 2017. Invasive social wasps. *Insectes Sociaux* 64(3):311-312

Breed M. 2017. Forced queen associations. *Insectes Sociaux* 64(2):177-178

Breed, M. D. 2017. Usurping the queen. *Insect. Soc.* 64: 3-4

Breed, M. D. 2016. The paraphyly controversy. *Insect. Soc.* 63: 487-488

Breed, M. D. 2016. Two views on invasive ants. *Insect. Soc.* 63: 357-358

Breed, M. D. 2016. Colony size evolution in ants. *Insect. Soc.* 63: 205-206

Breed, M. D. 2016. Social parasitism: the keys to the kingdom. *Insect. Soc.* 63:3-4

Breed, M. D. 2015. Genes, environment and caste in an ant. *Insect. Soc.* 62:383-384

Breed, M. D. 2015. A newly recognized eusocial bee. *Insect. Soc.* 62:253-254

Breed M. D. 2015. When is there not enough salt for ants? *Insect. Soc.* 62:119-120

Breed, M. D. 2015. Why are workers lazy? *Insectes Sociaux*, 62:7-8.

Breed, M. D. and McCreery, H. F. 2014. Animal Behavior: Social Recognition in Crickets. *CURRENT BIOLOGY* 24: R1123-R1124.

Breed, M. & Sanchez, L. (2010) Both Environment and Genetic Makeup Influence Behavior. *Nature Education Knowledge* 1(8):71

Breed, M. & Sanchez, L. (2010) What Functions of Living Systems Underlie Behavior? *Nature Education Knowledge* 1(8):70

Breed, M. D. 2009. Are All Workers Equal? *Animal Behaviour*, 78:1027-1028

Breed, M. D. 2009. When females choose, brains win out. *Animal Behaviour*, 78:776

Breed, M. D. 2009 The Sweet Smell of Spawning Success. *Animal Behaviour*, 78:578

Breed, M. D. 2009. Jump-starting Drones. *Animal Behaviour*, 78:221.

Breed, M. D. 2009. Wary prey. *Animal Behaviour*, 78:1-2

Breed, M. D. 2009. Egg Dumping in Wood Ducks: Unfavourable Publicity? *Animal Behaviour*, 77:1365.

Breed, M. D. 2009. Sex and Death: how Wolf Spiders improve the Chances of the Former, while Avoiding the Latter. *Animal Behaviour*, 77: 770

Breed, M. D. 2009. Shifty Parasites. *Animal Behaviour*, 77: 559-560

Breed, M. D. 2009. Dominant Ants. *Animal Behaviour*, 77: 274

Breed, M. D. 2009. 'Poor Territory Management Leads to Missed Opportunities and Meager Results'. *Animal Behaviour*, 77: 1.

Breed, M. D. 2008. L'Heure Entre Chien et Loup: Twilight, When a Person Cannot Distinguish a Wolf From a Dog. *Anim. Behav.* 76:1765.

Breed, M. D. 2008. Repeating the 'Lake Experiment'. *Anim. Behav.* 76:259.

Breed, M. D. 2008. Unequal Treatment. *Anim. Behav.* 76:2-3.

Breed, M. D. 2008. Strength in Numbers? *Anim. Behav.* 75:1819.

Breed, M. D. 2008. Female Fighters? *Anim. Behav.* 75:1601.

Breed, M. D. 2008. If you are among wolves you have to act like a wolf. *Anim. Behav.* 75:744.

Breed, M. D. 2008. Impact hunting in chimpanzees. *Anim. Behav.* 75:331.

Breed, M. D. 2008. Bystanders at social interactions: The watchers and the watched. *Anim. Behav.* 75: 2.

Breed, M. D. 2007. The mind of a thief. *Anim. Behav.* 74:1605.

Breed, M. D. 2007. Is bolder better? *Anim. Behav.* 74:1116.

Breed, M. D. 2007. To thine own self be true. *Anim. Behav.* 74:655.

Breed, M. D. 2007. Noise pollution and the breakdown of family values in finches. *Anim. Behav.* 74:359.

Breed, M. D. 2007. Sleep...balm of hurt minds. *Anim. Behav.* 74:161-162.

Breed M. D. 2007. Brotherly love. *Anim. Behav.* 74:3.

Breed, M. D. 2006. The ants vs. the professor. *The Denver Post*, July 29. (Guest commentary)

Breed, M. D. 2005. "Basis for aggression in dogs", December. *Animal News Network Newsletter*.