

**John G. Hildebrand**

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 Spouse: Gail D. Burd, Ph.D.

**Education**

- 1964 A.B. Harvard University (Biology – mentors: John Law & Konrad Bloch)
- 1966 Harvard Medical School, summer training program in general pathology
- 1969 Ph.D. Rockefeller University (Bio-organic chemistry – mentors: Leonard Spector & Fritz Lipmann)
- 1969-71 Postdoctoral Fellow, Harvard Medical School, Department of Neurobiology  
(mentor: Edward Kravitz)
- 1977 Cold Spring Harbor Laboratory course, Methods in Cellular Neurophysiology
- 1993 DNA Methods Course, University of Arizona Division of Biotechnology

**Employment****Present Positions**

- 2014-now International Secretary, U.S. National Academy of Sciences
- 2010-now Honors Professor, University of Arizona
- 1989-now Regents Professor, University of Arizona
- 1985-now Professor of Neuroscience, Chemistry & Biochemistry, Ecology & Evolutionary Biology, Entomology, and Molecular & Cellular Biology, University of Arizona

**Previous Positions**

- 2009-13 founding Head, Dept. of Neuroscience (formerly ARL Div. Neurobiology), Univ. of Arizona
- 2010-12 Chairman, Executive Committee, UA School of Mind, Brain and Behavior
- 1986-97 Chairman, UA Committee on Neuroscience, University of Arizona
- 1985-2009 founding Director, Arizona Research Laboratories Division of Neurobiology, Univ. of Arizona
- 1981-86 Adjunct Professor, Rockefeller University
- 1980-85 Professor of Biological Sciences, Columbia University
- 1980-81 Visiting Professor of Neurobiology, Harvard Medical School
- 1980-97 Associate in Behavioral Biology, Museum of Comparative Zoology, Harvard University
- 1977-80 Associate Professor of Neurobiology, Harvard Medical School
- 1972-77 Assistant Professor of Neurobiology, Harvard Medical School
- 1970-80 Tutor in Biochemical Sciences, Department of Biochemistry and Molecular Biology and Eliot House, Harvard University
- 1970-71 Instructor in Neurobiology, Harvard Medical School

**Honors****Academies and Learned Societies**

- 2019 Elected Corresponding Member, Brazilian Academy of Sciences
- 2014 Elected Member, American Philosophical Society
- 2011 Elected Foreign Member, Royal Norwegian Society of Sciences and Letters (Trondheim)
- 2007 Elected Member, U.S. National Academy of Sciences
- 2001 Elected Fellow, American Academy of Arts and Sciences
- 1999 Elected Foreign Member, Norwegian Academy of Science and Letters (Oslo)
- 1998 Elected Member, German National Academy of Sciences ‘Leopoldina’

**Honorary Degree**

- 2000 *Laurea honoris causa*, Università degli Studi di Cagliari, Italy

### **Other Awards, Prizes, and Other Honors**

- 2016 Wigglesworth Memorial Award & Lectureship, Royal Entomological Society, London  
 2015 Nu Rho Psi, the National Honor Society in Neuroscience (elected faculty member)  
 2014 Galileo Circle Fellow, University of Arizona College of Science  
 2013 University of Arizona Graduate Interdisciplinary Programs Honored Faculty Award  
 2012 Fellow, International Society for Neuroethology  
 2012 Honorary Fellow, Royal Entomological Society of London  
 2012 AChemS Max Mozell Award for Outstanding Achievement in the Chemical Senses  
 2011 Westlake Friendship Award (“the highest award given to foreign experts by the government of Zhejiang Province,” People’s Republic of China)  
 2009 Honorary Professor, Wenzhou Medical College, Wenzhou, Zhejiang, P.R. China  
 2008 Fellow, Entomological Society of America  
 2008 Einstein Professorship, Chinese Academy of Sciences, P.R. China  
 2006 Lifetime Achievement Award, Am. Psychol. Assoc., Diversity Program in Neuroscience  
 2006 Outstanding Service Award for Contributions to the Biological Sciences, AIBS  
 2006 Henry and Phyllis Koffler Prize for Research/Scholarship/Creative Activity, Univ. of Arizona  
 2006 Silver Medal, International Society of Chemical Ecology (ISCE’s highest award)  
 2005 Kerry-Manheimer Award, Monell Chemical Senses Center, Philadelphia, PA  
 2000 University of Arizona Mortar Board National Senior Honor Society Faculty Award  
 1997 Humboldt Research Award, Alexander von Humboldt-Stiftung, Germany  
 1997 IFF Award for Innovative Research in the Chemoreception Sciences  
 1997 Founders Memorial Award, Entomological Society of America  
 1991 Wellcome Visiting Professorship, Meharry Medical College, Nashville, TN  
 1990 Max Planck Research Award of the Max-Planck-Gesellschaft & A. von Humboldt-Stiftung  
 1990 R.H. Wright Award in Olfactory Research  
 1989 Awarded Regents Professorship, University of Arizona  
 1986 Elected Fellow, American Association for the Advancement of Science (AAAS)  
 1986 MERIT Award, NIAID, NIH  
 1986 Javits Neuroscience Award, NINCDS, NIH (later changed to Pepper Award, NIDCD)  
 1984 Elected Fellow, Royal Entomological Society (London)  
 1973-77 Alfred P. Sloan Foundation Postdoctoral Research Fellowship  
 1972-77 Established Investigatorship of the American Heart Association  
 1969-72 Helen Hay Whitney Foundation Postdoctoral Research Fellowship  
 1967 Elected to Sigma Xi, Rockefeller University  
 1964 Elected to Phi Beta Kappa, Harvard College  
 1964 A.B. *Magna cum laude*, Harvard College

### **Honorary Lectureships**

- 2017 James C. Smith Lecturer, Florida State University, Tallahassee, FL  
 2014-16 Sigma Xi Distinguished Lecturer  
 2012 Distinguished Lecturer, Max-Planck-Institut für Neurobiologie, Munich (Martinsried), Germany  
 2012 Lawrence Gilbert Distinguished Lecturer, Univ. of North Carolina  
 2012 2012 Walter F. Heiligenberg Lecturer, Univ. California-San Diego  
 2011 First Hector Maldonado Memorial Lecturer, Argentinian Society for Neuroscience (SAN)  
 2011 Siemens Stiftung Lecturer, Munich, Germany  
 2009-10 Phi Beta Kappa Visiting Scholar  
 2009 Martinez-Townsel Lecturer, Marine Biological Laboratory, Woods Hole, MA  
 2008 Charles Doane Lecturer, University of Wisconsin, Madison, Dept. of Entomology  
 2008 Grass Foundation Lecturer, South East Nerve Net annual meeting, Atlanta  
 2007 Ernst Florey Lecture, International Society for Invertebrate Neurobiology, Hungary  
 2007 Neuroscience Distinguished Lecturer, Colby College, Waterville, ME  
 2007 Edward A. Kravitz Lecturer, Marine Biological Laboratory, Woods Hole, MA  
 2006 Silver Medal Lecture, International Society of Chemical Ecology  
 2005 Mastertaste-Manheimer Lecturer, Monell Chemical Senses Center, Philadelphia

2004	Cajal Lecturer, Cajal Institute, Madrid, Spain
2003	Bobby Pass Student Choice Speaker, Dept. of Entomology, University of Kentucky
2003	Padykula Lecturer, Wellesley College, Wellesley, MA
2003	Class of 1960 Neuroscience Scholar Lecturer, Williams College, Williamstown, MA
2002	Grandpierre Memorial Lecturer, Dept. of Chemistry, Columbia University
2001	Alfred M. Boyce Lecturer, University of California - Riverside
1999	Grass Foundation Lecturer, Eastern Nerve Net annual meeting, Woods Hole, MA
1998	Grass Foundation Lecturer, Halifax, NS, Chapter, Society for Neuroscience
1995	Felix Santschi Lecturer, Universität Zürich, Switzerland
1995	Kenneth D. Roeder Memorial Lecturer, Tufts University
1995	King Solomon Lecturer, Hebrew University, Jerusalem
1992	Jan de Wilde Memorial Lecturer, University of Wageningen, Netherlands
1992	Distinguished Lecturer, Boyce Thompson Institute, Cornell University
1991	D.T. Rolf Lecturer, Meharry Medical College, Nashville, TN
1990	Spencer Memorial Lecturer, University of British Columbia
1988	Grass Foundation Lecturer, Central Illinois Chapter, Society for Neuroscience
1986	Ralph W. Gerard Lecturer in Neurosciences, University of California – Irvine
1985	Givaudan Lecturer, Association for Chemoreception Sciences
1985	Lang Lecturer, Marine Biological Laboratory, Woods Hole, MA

### Memberships in Professional Scientific Societies

American Association for the Advancement of Science (AAAS, Fellow)  
 American Chemical Society (recognized for more than 50 years of membership)  
 American Institute of Biological Sciences (AIBS)  
 American Physiological Society  
 American Society for Biochemistry and Molecular Biology  
 Animal Behavior Society  
 Association for Chemoreception Sciences (AChemS; past President)  
 Entomological Society of America (Fellow)  
 European Chemoreception Research Organization (ECRO)  
 Faculty for Undergraduate Neuroscience (FUN)  
 International Society of Chemical Ecology (past President)  
 International Society for Neuroethology (Fellow; past President)  
 Royal Entomological Society (UK, Fellow; awarded Honorary Fellowship in 2012)  
 Society for Integrative and Comparative Biology (SICB)  
 Society for Neuroscience (past Treasurer)

### Other Professional Positions and Service

**U.S. Academies and Learned Societies** [NOTE: “NAS” is National Academy of Sciences; “NASEM” is the National Academies of Sciences, Engineering and Medicine, formerly NRC]

2021-now	member, Oversight Committee, NASEM New Voices in Sciences, Engineering and Medicine
2019-now	ex-officio member, NASEM Board on Research Data and Information (BRDI)
2018-now	NAS Council Development Committee
2018-now	ad hoc member, US National Member Organization for the International Institute for Applied Systems Analysis (IIASA)
2018-now	member, Steering Committee, American Academy of Arts & Sciences project “Challenges for International Scientific Partnerships”
2017-19	member, NAS Campaign Planning Group
2017-now	member, Patrick Suppes Prize Selection Committee in Psychology, American Philosophical Society
2015-now	chair, Oversight Committee for the NASEM Arab-American Frontiers in Science, Engineering, and Medicine
2014-20	member, Class II Committee, American Philosophical Society
2014-now	member, Lashley Prize Committee, American Philosophical Society

2014-now ex-officio member, Board of the NASEM Committee on Human Rights  
 2014-now ex-officio member, NASEM Committee for Division of Earth and Life Studies  
 2014-now ex-officio member, NASEM Committee for Division of Policy and Global Affairs  
 2014-now ex-officio member, NAS Committee on International Security and Arms Control (CISAC)  
 2014-now member, NASEM Board on International Scientific Organizations  
 2014-now elected International (previously Foreign) Secretary, National Academy of Sciences  
 2013-now member, NASEM Committee on Science, Engineering, Medicine & Public Policy (COSEMPUP)  
 2013-now ex-officio member, NASEM Board on Life Sciences  
 2013-now American Academy of Arts & Sciences Affiliate representative to the AAAS  
 2013-now member, NAS Committee on Publications  
 2012-14 elected member, NAS Council  
 2011-14 member, NAS Temporary Nominating Group (Class VI)  
 2009-now NAS representative to IBRO Governing Council  
 2008 member, NAS Nominating Committee  
 2004-10 co-chair, Committee on Science in the Liberal Arts Curriculum, Am. Acad. Arts & Sciences  
 2003-now member, Committee on Studies & Publications, American Academy of Arts & Sciences  
 1991 member, NAS Advisory Panel for *The Infinite Voyage*  
 1984-85 invited workshop participant, NAS Committee on Models in Biomedical Research

### **Scientific Societies, Agencies, etc.**

2020-22 elected member, AAAS Committee on Nominations  
 2019-now member, Committee for Science Planning (CSP), International Science Council (ISC)  
 2018-now member, Scholarships to Enhance and Empower Diversity (SEED) Neuroscience Committee, American Psychological Association  
 2016 Co-Organizer and Co-Chair, Vector Biology Session, 2016 World Life Science Conference of the China Association of Science & Technology (CAST), Beijing  
 2014-20 Chair, Nominating Committee, IBRO  
 2013-14 member, Program Committee, Annual Meeting, International Society of Chemical Ecology  
 2013-14 Co-Chair, Academic Committee, Tenth Conference of the Chinese Assoc. of Chem. Ecology  
 2013-18 member, Society for Neuroscience Finance Committee  
 2010-14 Soc. for Neuroscience representative to the FENS-IBRO Neuroscience Schools Committee  
 2008-now member, US/Canada Regional Committee of IBRO  
 2007-12 Councilor, International Society for Neuroethology  
 2005-10 Chairman, Membership Committee, International Society for Neuroethology  
 2004-06 Education Committee, International Society for Neuroethology  
 2004-05 Chairman, Section on Neuroscience, AAAS (Chairman-Elect, 2003-04)  
 2002-09 member, International Affairs Committee, Society for Neuroscience (also the US/Canada Regional Committee of IBRO)  
 2002-03 President, Association for Chemoreception Sciences (AChemS)  
 2001-10 Chairman, Board of Schools, International Brain Research Organization (IBRO)  
 1999-2002 member, Council of the Gordon Research Conferences  
 1998-99 Chairman, Electorate Nominating Committee, AAAS Section on Neuroscience  
 1998-2001 member, Social Issues Committee, Society for Neuroscience  
 1998-99 President, International Society of Chemical Ecology (Vice President, 1997-98)  
 1998 member, Gerard Prize Selection Committee, Society for Neuroscience  
 1997-99 Founding Chairman, Gordon Research Conference on Neuroethology (Oxford, 1999)  
 1995-98 President, International Society for Neuroethology (Past-President, 1998-2001)  
 1995-98 Member-at-Large, Neuroscience Section Steering Group, AAAS  
 1995 Organizer and Chairman, Ciba Foundation/WHO Symposium on Mosquito Olfaction  
 1993-97 member, Publications Committee, Society for Neuroscience  
 1993-now member, Dana Alliance for Brain Initiatives, Dana Foundation  
 1993-95 Councilor, Association for Chemoreception Sciences  
 1993-98 Chair, Committee on Developing Countries, Assoc. of Neurosci. Depts. & Programs

1992-94 Treasurer-Elect (1992-93) and Treasurer (1993-94), Society for Neuroscience  
 1992-93 Chair, International Brain Research Organization Committee on Developing Countries  
 1991-99 Councilor, International Society for Invertebrate Neurobiology  
 1990-92 Chair, International Program Committee, 3rd International Congress of Neuroethology  
 1990-93 member, Government and Public Affairs Committee, Society for Neuroscience  
 1990-2009 member, Advisory Committee, APA/ANDP/NIMH Diversity Program in Neuroscience  
 1989-90 member, Selection Committee, Young Investigator Award, Society for Neuroscience  
 1989 member, Prize Committee, International Society for Neuroethology  
 1989-92 member, Steering Committee, Complex Systems Summer School, Santa Fe Institute  
 1988-89 President, Association of Neuroscience Departments and Programs (ANDP)  
 1988-89 member, International Program Committee, 2nd International Congress of Neuroethology  
 1987-90 Chairman, Membership Committee, Society for Neuroscience  
 1986-87 member, Program Committee, Association for Chemoreception Sciences  
 1986-88 member, Program Committee, American Society for Neurochemistry  
 1982-83 Chairman, Program Committee, Society for Neuroscience  
 1979-80 member, Nominating Committee, Society for Neuroscience  
 1978-81 member, Program Committee, Society for Neuroscience

### **Editorial Boards**

2006-10 *TheScientificWorld Journal*  
 2003-05 *Neuroscience Letters*  
 2001-16 *Journal of Chemical Ecology*  
 2000-14 *Journal of Insect Science*  
 1997-2013 *Chemoecology*  
 1994-2020 *Invertebrate Neuroscience*  
 1990-2021 *Journal of Comparative Physiology A*  
 1989-95 *Journal of Comparative Neurology*  
 1989-92, '96-03 *Journal of Neurophysiology*  
 1988-89 *Journal of Experimental Biology*  
 1986-93 *Journal of Insect Behavior*  
 1983-94 *International Journal of Insect Morphology and Embryology*  
 1983-90 *Archives of Insect Biochemistry and Physiology*  
 1983-2013 *Quarterly Review of Biology*  
 1981-89 *Journal of Neurochemistry*  
 1981-91 *Trends in Neurosciences*  
 1981-91 *Annual Review of Neuroscience*  
 1981-84 *Neuroscience Commentaries* (Editor)  
 1980-88 *Journal of Neuroscience* (Section Editor, Developmental Neuroscience, 1983-88)  
 1977-90 *Insect Biochemistry*

### **Federal Government Agencies**

2009-12 member, Alan T. Waterman Award Selection Committee, NSF  
 2007 member, Workshop on Neuroscience and the Physical Sciences, NSF  
 1995-96 Co-Chairman, Special Committee to Review Training Programs, NINDS-NIH  
 1994 Chairman, Program Project Site Visit Team, Morehouse Medical School, NINDS  
 1992 member, Invertebrate Zoology Task Group, NSF  
 1989-91 Chairman, Advisory Committee for Biological, Behavioral & Social Sciences, NSF  
 1989 member, Oversight Review Committee, Div. of Behavioral & Neural Sciences, NSF  
 1986-88 member, Committee on Recommendations for U.S. Army Basic Scientific Research  
 1983 member, Neuroscience Workshop, Office of Technology Assessment, U.S. Congress  
 1983 member, Neurobiology Program Review Committee, NSF  
 1974-77 member, Advisory Panel for Neurobiology, NSF

**Foundations**

2005-06 member, Presidential Advisory Panel for Research, The Research Corporation  
 2001-07 Trustee, Grass Foundation  
 1992-10 member, Prize Selection Committee, Capranica Foundation (Chair every third year)  
 1985 Overseer for Grass Fellows Program, Grass Foundation  
 1984-2016 Consultant, Sherman Fairchild Foundation

**Industry**

1989, 1993 Consultant, Merck Research Laboratories  
 1984-91 Consultant, Monsanto Company  
 1982 Consultant, DuPont Corporation

**Institutional Service and Administration****University of Arizona**

2020 member, Search Committee for Lecturer, Dept. of Neuroscience  
 2020-21 CoPI, NSF Ethical and Responsible Research (ER2) project "*An Indigenous data governance approach for enhancing ethical research policies and practices.*"  
 2019-now member, Executive Committee, Center of Excellence in Data for Society (CEDS)  
 2019 member, Search Committee for viola instructor, School of Music  
 2018-19 member, Search Committee for Senior Vice President for Academic Affairs and Provost  
 2018-now member, Science, Health, and Engineering Policy and Diplomacy Initiative (SPDI)  
 2018-now member, Honors College Faculty Advisory Committee  
 2018 member, Search Committee for bassoon instructor, School of Music  
 2018 member, Search Committee for horn instructor, School of Music  
 2015 member, Search Committee for low-brass instructor, School of Music  
 2015-now Affiliated Faculty, Center for Latin American Studies  
 2013-15 member, Advisory Board of the School of Mind, Brain and Behavior  
 2012-now member, Graduate and Professional Student Council Advisory Council  
 2011-12 member, Advisory Council for the UofA Presidential search  
 2011-13 member, Dean's Board of Advisors, UofA College of Science  
 2010-11 member, Search Committee for Dean, College of Agriculture and Life Sciences  
 2010-14 member, Research Policy Committee  
 2009-11 member, Executive Committee, Grad. Interdisc. Prog. in Entomology & Insect Science  
 2009-13 member, Executive Committee, School of Mind, Brain, and Behavior (Chair, 2010-12)  
 2008-09 member, planning team for School of Mind, Brain, and Behavior  
 2008 member, Academic Program Review Committee for Department of Neurology  
 2008-11 member, University of Arizona Strategic Advancement Committee  
 2007-09 member, University of Arizona Science Center Task Force  
 2007-13 member, B2 Institute Steering Committee, College of Science  
 2005 member, search committee for Director of Development, UAPresents  
 2004-05 member, General Education Review Committee  
 2004 member, Academic Program Review Self-Study Team, GIDP in Insect Science  
 2004 member, Faculty Senate committee to review School of Planning  
 2002-06 co-founder and member, Regents Professors' Focused Excellence Task Force  
 2001-02 Co-Chair, Organizing Committee, 4th Internat. Symposium on Molecular Insect Science  
 2000-19 elected member, Committee of Eleven (University faculty governance committee)  
 1998-99 member, Team on Research for University of Arizona NCA Re-Accreditation  
 1998-2012 member, Coordinating Committee, Program for Academic Leadership  
 1998-99, 01-03 elected member, Graduate Interdisciplinary Programs Advisory Council  
 1997-2003 member, Graduate Student Admission & Recruitment Committee, Graduate Interdisciplinary Program in Neuroscience (chairman 1997-2000)  
 1997-98 Co-Chair, Organizing Committee, 3rd Internat. Symposium on Molecular Insect Science  
 1997-2002 member, Sponsored Projects Services Users Group

1997-2001	member, Executive Committee, Interdisciplinary Research Training Group on Plant-Insect Interactions
1996-now	UA Faculty Representative to the Federal Demonstration Partnership
1996-now	Regents Professorship Advisory Committee (chairman 1999-present)
1994	member, Provost's Planning Group for Undergraduate Core Curriculum Development
1994-09	member, faculty of the Graduate Interdisciplinary Program (GIDP) in Insect Science
1993	member, Selection Committee, Dept. Awards for Outstanding Achievement in Undergraduate Education
1993-94	member, Search Committee for Head, Department of Physics
1991-92	member, Task Force on Undergraduate Education
1991-93	member, faculty of the Graduate Interdisciplinary Program in Physiological Sciences
1991-92	member, University Relations Advisory Board
1991-96	member, Advisory Board, Institute for Neurogenic Communication Disorders
1990-91	member, Search Committee for President
1990-94 & 2000-21	elected member, Faculty Senate
1990-92	member, Laboratory Safety Committee
1990	member, Special Committee on Faculty Participation in University Governance
1989-92	member, International Programs Advisory Committee
1989	Chairman, Search Committee for Director, Center for Insect Science
1989	Vice Chairman, Search Advisory Committee for Provost
1989-2006	member, Advisory Committee for Vice President for Research
1989-92	member, University Research Collections and Systematics Committees
1988	member, Search Advisory Committee for Vice President for Research
1988	member, Internal Review Committee, Department of Speech & Hearing Sciences
1987	member, Committee to Review Graduate Programs in the Biological Sciences
1986-87	Chairman, Search Committee for Head for Dept. of Microbiology & Immunology
1986-91	member, Executive Committee, Center for Complex Systems
1986-2020	member, Executive Committee, & Co-Founder, Center for Insect Science
1986-2000	member, Committee of Biological Sciences Department Heads (Chairman, 1987-88)
1986-2003	member, Executive Committee, Committee on Neuroscience
1986-97	Founding Chairman, University Committee on Neuroscience

### **Marine Biological Laboratory, Woods Hole**

2013-now	member, MBL Society (formerly MBL Corporation)
2012	Chairman, Review Committee for the Whitman Center
2004	Scholar-in-Residence, Neural Systems & Behavior Course
1996-now	Instructor in Summer Program in Neuroscience, Excellence and Success (SPINES)
1989	member, Committee to Review Gray Museum
1986-87	member, Search Committee for Director
1986-87	member, Committee on Laboratory Goals
1984-89	member, Instruction Committee
1984-85	member, Ad Hoc Housing Committee
1984	member, Decennial Review Committee
1983-88	member, Research Services Committee
1981-89, 1993	elected member, Board of Trustees (Executive Committee, 1981-88)
1980-2013	member of the Corporation (since 2013, the MBL Society)
1978-84	faculty member (Co-Director 1980-84), Summer Neurobiology Course

### **Columbia University**

1983-85	Chairman, Graduate Studies Committee, Dept. of Biological Sciences
1983-84	member, Provost's Task Force on Scientific Research
1982-83	member, Executive Committee, Graduate School of Arts and Sciences
1982-83	member, Psychiatry Chair Search Committee

1981-85 member, Horwitz Prize Committee  
 1980-85 member, Biology Appointments and Promotions Committee  
 1980-85 Chairman, Biology Library Committee  
 1980-83 Chairman, Neurobiology Search Committee, Dept. of Biological Sciences

### **Harvard University**

2005-06 Advisory Committee, Center for Brain Science  
 1992-95 Advisory Comm., NINDS Program Project Grant (E. Kravitz, PI), Dept. of Neurobiology  
 1977-80 member, Committee on Cell and Developmental Biology  
 1972-80 Chairman, Library Committee, Department of Neurobiology

### **Rockefeller University**

1996 Chairman, Committee on the Future of the Field Research Center  
 1983-84 Co-Chairman, Graduate Program 25th Anniversary Committee  
 1970-73 member, Board of Trustees (Alumnus Trustee)

### **Other Institutions (including State and Foreign Governments)**

2020-24 member, International Scientific Advisory Board, Chinese Academy of Sciences Center for Excellence in Biotic Interactions  
 2018-now member, Scientific Advisory Board, Puerto Rico Science and Technology Trust  
 2018-now member, International Scientific Council, NEURON Fund for Support of Science, Czech Republic  
 2014 member, Program Review team, Keck Center, North Carolina State University  
 2014 member, Site Visit Team, UCLA Dept. of Integrative Biology & Physiology  
 2012 member, Academic Program Review Panel, Dept. of Biology, U. Maryland  
 2010-14 member, External Advisory Committee, Institute of Neurobiology, U. Puerto Rico  
 2009 member, Selection Committee for 25th International Prize for Biology, JSPS, Japan  
 2006 member, Review Committee for the Biological Intelligence Main Research Theme of the Beckman Institute, University of Illinois at Champaign/Urbana  
 2006 member, Academic Program Review Panel, Dept. of Biology, Georgia State Univ.  
 2004-14 member, External Advisory Committee, State of Maine NIH IDEa Network of Biomedical Research Excellence  
 2001 consultant on interdisciplinary programs, East Carolina University, NC  
 2000-08 member, External Advisory Committee, Meharry Medical College, Center for Molecular and Behavioral Neuroscience and NINDS-sponsored Specialized Neuroscience Research Program  
 2000-08 member, External Advisory Committee, NIMH R25 Grant, Meharry Medical College  
 2000-04 member, External Advisory Committee, University of Puerto Rico's NIH-supported Center of Biomedical Research Excellence  
 2000 Chairman, External Review Committee, RIKEN Brain Science Institute, Japan  
 1999 Chairman, External Review Committee, Sec. of Neurobiol & Behavior, Cornell Univ.  
 1998 member, External Review Committee, Dept. of Biology, Univ. of Virginia  
 1997 member, External Review Committee, Ph.D. Program in Neurosciences, UCSD  
 1997 member, External Advisory Committee, School of Integrative Biology, Univ. of Illinois  
 1996-2007 member, Consiglio Scientifico, Stazione Zoologica, Naples, Italy  
 1996-99 member, External Advisory Committee, MBRs Program, Meharry Medical College  
 1996 External Reviewer for Life Sciences Consortium, Pennsylvania State University  
 1995-98 member, Fachbeirat, Max-Planck-Institut für Verhaltensphysiologie, Seewiesen  
 1995 member, Organizing Committee, 1995 Workshop, Krasnow Institute for Advanced Study, George Mason University  
 1994 reviewer, graduate programs, School of Biol. Sci., Univ. of California-Irvine  
 1993-94 SERC Invertebrate Neuroscience Initiative Review Panel, UK  
 1993 external reviewer for Doctoral Program in Neuroscience, SUNY-Syracuse  
 1993-95 RCMI External Advisory Committee, Meharry Medical College, Nashville, TN  
 1992-99 member, Steering Committee, Sussex Centre for Neuroscience, Univ. of Sussex, UK  
 1992 reviewer for Doctoral Program in Neuroscience, University of Miami



- 1990-95,  
 2007-12 member, Scientific Advisory Board, Whitney Marine Laboratory, Univ. of Florida  
 1989 Chairman, Biological Sciences Panel, Texas Advanced Technology/Advanced Research Program,  
 Texas Higher Education Coordinating Board  
 1981-86 member, Yale University Council Committee on Sciences – Biological

#### **Activities Outside Academe and Science (Community Service, etc.)**

- 2021-now member, Board of Trustees, Tucson Symphony Orchestra  
 2013-now member, Community Advisory Board, Arizona Public Media  
 2012-14 volunteer science teacher, J.B. Wright Elementary School, Tucson Unified School District  
 2012-14 member, Ambassadors of the Arizona Friends of Chamber Music  
 2005-20 member, Program Committee, UAPresents (performing arts presenting organization)  
 2003-05,  
 2014-15 member, search committee for Director, UAPresents  
 2003-10,  
 2012-14  
 2016-18 member, Advisory Board, UAPresents  
 1990-now occasional speaker at local alumni clubs, retirement communities, school groups, etc.

#### **Activities in Education**

##### **Extramural**

- 2012 faculty member, FENS-SfN-IBRO Bertinoro School on Chemical Senses, Bertinoro, Italy  
 2011 Co-Director, Second IBRO-Kemali Neuroscience School, Stazione Zoologica, Naples  
 2009 faculty member, IBRO Neuroscience School, Instituto Estable, Montevideo, Uruguay  
 2007 faculty member, IBRO Latino American School of Neuroethology, Buenos Aires  
 2003 faculty member, IBRO Neuroscience School, Instituto Estable, Montevideo, Uruguay  
 2002 faculty member, School and Conference on Chemical Senses: Molecules to Perception, Abdus Salam International Centre for Theoretical Physics, Trieste, Italy  
 2002 faculty member, International Course on Experimental Approaches in Neuroethology, University of Chile, Santiago and Valparaiso  
 1978-84 faculty member (co-Director 1980-84), Summer Neurobiology Course, MBL, Woods Hole

##### **University of Arizona**

- 2019-now co-instructor (1 of several), ENGR 495A/595A, 'Science, Health and Engineering Diplomacy'  
 2012-14 co-instructor (1 of several), NRSC 560, 'Systems Neuroscience'  
 2012-14 co-instructor (1 of 2), Neuroscience (NROS) 307, 'Cellular Neurophysiology'  
 2011-now co-instructor (1 of 2), HNRS 195I, 'Biomedical Ethics, Health Policy and Society'  
 2011-16 occasional lecturer on chemical senses for Neurosurgery Residents  
 2010 co-instructor (1 of 2), HNRS 195I-004, 'The Brain—the Organ that Makes Us Human'  
 2008-10 co-instructor (1 of 4), Integrated Science 195A  
 1998-2000 &  
 2004-11 co-instructor, Neuroscience (NRSC) 589, 'Principles of Systems Neurobiology'  
 1992-97 course instructor, Neuroscience (NRSC) 195H, Honors First-Year Colloquium, 'The Brain'  
 1992-2011 instructor (1 of 2), MCB (also BIOC and NRSC) 407 (formerly 461), 'Neurobiology'  
 1988-90 instructor (1 of 3), NRSC (also BIOC, MCB, and PSIO) 588, 'Principles of Cellular and Molecular Neurobiology'  
 1989-91 instructor (1 of 3), NRSC 701, 'Communication in Neuroscience'  
 1986-97 Chairman, Committee on Neuroscience & Founding Director, Graduate Interdisciplinary Program in Neuroscience

##### **Postdoctoral Research Associates**

- Rella Abernathy, Ph.D. (1995-96) [co-advisor: Dr. Elizabeth Bernays], UA Plant-Insect Group  
 Postdoctoral Fellowship, *currently Integrated Pest Management  
 Coordinator, City of Boulder CO*

- Rachel Bober, Ph.D. (2011-12), Vaadia-BARD Postdoctoral Fellow (Israel), *currently an officer of the Science and Technology Youth Center in the The Center for Pre-University Education at the Technion Institute of Technology*
- Thomas A. Christensen, Ph.D. (1983-87), *retired*
- Cécile Faucher, Ph.D. (2011-13), *currently working for Thermo-Fisher Scientific in Germany*
- Ann Fraser, Ph.D. (1998-2001), fellow, UA/NSF Plant-Insect Group Training Program, *currently Associate Professor, Kalamazoo College, Michigan*
- Nicholas J. Gibson, Ph.D. (1995-2006) [co-advisor: Dr. L.P. Tolbert], *retired*
- Corinna (Thom) Gilley, Ph.D. (2002-05) Deutsche Akademische Austauschdienst Fellow & Feodor Lynen Fellow of the A. von Humboldt Stiftung, *currently science writer & editor, New Jersey*
- John R. (Jack) Gray, Ph.D. (1999-2001) [co-advisor: Dr. M.A. Willis], *currently Prof. of Biology and Vice-Dean Research, Scholarly and Artistic Work, University of Saskatchewan*
- Pablo G. Guerenstein, Ph.D. (1999-2008), *currently Senior Researcher, National Research Council (CONICET, CICyTTP), Diamante, Entre Rios, Argentina*
- Susannah Hannaford, Ph.D. (1993-94) [co-advisor: Dr. T.A. Christensen], *currently Professor of Biology, University of Puget Sound*
- Eric Hanneman, Ph.D. (1988-90), American Cancer Society Postdoctoral Fellow, *currently with East Meets West Stem Cells, Portland OR*
- Bill S. Hansson, Ph.D. (1989-90), Swedish government fellowship, *currently Director, Max-Planck-Institut für Chemische Oekologie, Jena, Germany, and Past Vice President of the Max-Planck Gesellschaft*
- Jon H. Hayashi, Ph.D. (1986-90), NIH Postdoctoral Fellow, *currently faculty member, Paradise Valley Community College, Phoenix AZ; formerly Research Scientist, FMC, New Jersey*
- Akira Hishinuma, M.D., Ph.D. (1986-87), *currently Professor, Dept. of Infection Control and Clinical Laboratory Medicine, Dokkyo University School of Medicine, Japan*
- Uwe Homberg, Ph.D. (1984-88), Deutsche Forschungsgemeinschaft fellow, *currently Professor Emeritus of Zoology, Universität Marburg, Germany*
- Haruhiko Itagaki, Ph.D. (1986-90), NIH Postdoctoral Fellow 1987-90, *currently Professor of Biology, Kenyon College, Ohio*
- Nicole Kalberer, Ph.D. (2000-01), holder of a Swiss postdoctoral fellowship, *currently Research Associate, Zool. Institute, Univ. of Basel, Switzerland*
- Ryohei Kanzaki, Ph.D. (1987-90) [co-adviser: Dr. E.A. Arbas], *currently Professor, Graduate School of Information Science & Technology, University of Tokyo,*
- Jane Roche King, Ph.D. (1996-2001), *currently independent science writer & editor*
- Peter Kloppenburg, Ph.D. (1991-96), Deutsche Forschungsgemeinschaft fellow, *currently Professor of Animal Physiology, Zoologisches Institut, Universität zu Köln, Germany*
- Herman K. Lehman, Ph.D. (1988-93), *currently Professor of Biology, Hamilton College, Clinton, NY*
- Hong Lei, Ph.D. (1999-2004), *currently Assoc. Research Prof., School of Life Sciences, Arizona State University, Tempe*
- Wendy L. Mechaber, Ph.D. (1995-2003), *currently independently employed, Sherborn, MA*
- Robert F. Mitchell, Ph.D. (2012-15) Univ. of AZ Center for Insect Science PERT Fellow, *currently Assistant Professor of Biology, Univ. of Wisconsin-Oshkosh*
- Alan Nighorn, Ph.D. (1993-98), [co-advisor until 1997: Dr. David B. Morton], NIH Training Grant Postdoctoral Fellow, *currently Distinguished Professor & former Head, Dept. of Neuroscience, University of Arizona*

- Mark G. Novak, Ph.D. (1992-94) [co-advisor: Dr. J. Ribeiro], UA Center for Insect Science Postdoctoral Fellow, *currently Supervising Public Health Biologist, Vector-Borne Disease Section (Northern Region), California Dept. of Health Services, Elk Grove, CA*
- Robert A. Raguso, Ph.D. (1995-97) [co-advisor: Dr. Mark A. Willis], trainee on the Center for Insect Science NIH Training Grant, *currently Professor, Dept. of Neurobiology & Behavior, Cornell University*
- Carolina E. Reisenman, Ph.D. (2001-07) Pew Latin American Scholar, *currently Associate Researcher, Dept. of MCB, Univ. of California, Berkeley*
- Jeffrey A. Riffell, Ph.D. (2004-10) Univ. of AZ Center for Insect Science PERT Fellow, *currently Professor of Biology, Univ. of Washington*
- Wolfgang Rössler, Dr. rer. nat. (1995-99) [co-advisor: Dr. L.P. Tolbert], Deutsche Forschungsgemeinschaft fellow, *currently Professor, Biocenter, University of Würzburg, Germany*
- Vonnie D.C. Shields, Ph.D. (1995-2000), *currently Professor of Biological Sciences, Towson University, Maryland*
- Sakiko Shiga, Ph.D. (1998-99) [co-advisor: Dr. N.T. Davis], *currently Professor of Biological Sciences, Osaka University, Japan*
- Brian H. Smith, Ph.D. (1988-90), NIMH Postdoctoral Fellow, *currently Professor, School of Life Sciences, Arizona State University, Tempe AZ*
- Jordanna Sprayberry, Ph.D. (2006-08) Univ. of Arizona Center for Insect Science PERT Fellow, *currently Associate Professor of Biology & Neuroscience, Muhlenberg College, Allentown, PA*
- Xue Jun Sun, Ph.D. (1991-94) [co-advisor: Dr. L.P. Tolbert], Center for Insect Science Postdoctoral Fellow, *currently Staff Scientist, University of Alberta, Edmonton, Canada*
- Neil J. Vickers, Ph.D. (1995-98) [co-advisor: Dr. T.A. Christensen], *currently Professor of Biology & Co-Director, School of Biological Sciences, Univ. of Utah*
- Brian R. Waldrop, Ph.D. (1984-87), *currently Director, College of Arts & Sciences Administration, University of Buffalo, NY*
- Mark A. Willis, Ph.D. (1998-2001), *currently Professor and Chair of Biology, Case Western Reserve Univ., Cleveland, OH*
- Fumio Yokohari, Ph.D. (1988-89) [co-advisor: Dr. L.P. Tolbert], *currently Professor, University of Fukuoka, Japan*

### Graduate Students

- Aaron Beyerlein, M.S. in Entomology and Insect Science (M.S. conferred 2011), *currently R&D Specialist at Bayer CropScience, Carrboro, North Carolina*
- Andrew Dacks, Ph.D. in Insect Science (Ph.D. conferred 2007) [co-advisor with Dr. T.A. Christensen], *currently Associate Prof. of Biology, West Virginia U.*
- Thomas Heinbockel, Ph.D. in Neuroscience (Ph.D. conferred 1997), *currently Professor and Director of Graduate Studies, Dept. of Anatomy, Howard Univ. Coll. of Medicine, Washington, DC*
- Joshua P. Martin, Ph.D. Neuroscience (Ph.D. conferred 2012), *currently Assistant Prof. of Biology, Colby College, ME*
- Katja Selchow, Ph.D. in Neuroscience (Ph.D. conferred 1998), *currently an airline pilot*
- Kenneth A. Sorensen, Ph.D. in Molecular & Cellular Biology (Ph.D. conferred 1993), *currently Co-Founder & Director, American Stem Cell Corporation, Los Angeles, CA*
- Monika Stengl, Ph.D. in Molecular & Cellular Biology (Ph.D. conferred 1990), *currently Professor of Zoology, Universität Kassel, Germany*

### Visiting Students

- Martin Brill (2009), Universität Würzburg, Germany

Davide Dulcis (1999-2000) [co-advisor with Dr. N.T. Davis], Univ. of Cagliari, Italy  
 Alex Eaton-Mordas (2005), Dept. of Ecology & Evolutionary Biol, Univ. of Arizona  
 Edwin van der Jagt (1994-95) [co-advisor with Dr. N.T. Davis], University of Utrecht,  
 The Netherlands (Dutch Gov. fellowship)

Elisabeth Pasch (2008), Universität Würzburg, Germany  
 Marco Rosales (2004-05), Pima Community College, Tucson, AZ  
 Nadia Scascighini (2000), Swiss Federal Institute of Technology (ETH) Zürich  
 Paolo Solari (1998), University of Cagliari, Italy  
 Erich Staudacher (1991), Max-Planck-Institut für Verhaltensphysiologie, Germany  
 Michiel van Wijk (1999), Agricultural University, Wageningen, The Netherlands  
 Ning Zhang (2014), China Agricultural University, Beijing

**Undergraduate Research Assistants** [co-advisors: ¶Dr. T. Christensen, §Dr. N. Davis, °Dr. H. Lehman, †Dr. H. Lei, ‡Dr. W. Mechaber, ◆Dr. R. Mitchell, #Dr. A. Nighorn, ΔDr. C. Reisenman, ◇Dr. J. Riffell]

◆Arthur Abougou, Allison Agajanian, †Angelica Alvarez, †Arshed Al-Obeidi, ◆Lauren Amos, ◆Tiffany Bledsoe, †Nyssa Burdick, ‡Christopher Capaldo, †Hong-Yan (Vicki) Chiu, Dawn Clark, ◇Eleni Constantopoulos, ¶Christine Cuzzocrea, Engracia Dang, ΔBianca Demara, Charleston Dick, Erik Dillingham, ¶Sarah Dixon, ¶Dan Doty, Kristin Duffy, †Petimat Dudurkaeva, ‡Damian Elias, †Jessica Fletcher, ◇ΔAndrew Flores, °Zoe Forester, Robyn Forkos, Kim Frank, ¶Sabrina Geoffrion, ¶Nicole Giedinghagen, §Marianne Go, ◇ΔBreena Goodwin, §Tushara Gunatilaka, ‡Darren Hall, ‡Jennifer Hill, †JungMin Kim, #Eric Kennedy, Clint Kleppe, ‡Gina Kraft, †Laura Kulas, §George Lai, Emily Landeen, ¶Jason Lashbrook, ΔYan Mei Lee, #Dominique Leitner, Sara Lewis, Chris Ludwig, Jeff Ludwig, †Yessenia Magana; ‡Kristen McCoy, ◇ΔDavid Mikles, Cristina Murguic, Kayla Peck, ◇ΔAdrian Pesque, Anastasia Peterson, #David Rivers, †Aracely Romero, †Naghmeh Saghafi, Hetal Shah, †Bradley Shane, Stephen Shipman, †Yeeck Sim, Katie Skinner, ‡Tracey Smart, #Matt Stoker, #Sylvia Thompson, Andrew Tseng, ◇ΔMeredith Tuinstra, #Maggie Villamana, Andrew Waters, †Angela Wu, †Weijie Xiang, †Jinglei Zhang

**High-School Research Assistant** [co-advisor: ☼Dr. C. Faucher] ☼Monica Seng

### **Visiting Scientists**

Rafael Cantera (1989-90), University of Stockholm, Sweden  
 William Conner (2004), Wake Forest University, North Carolina  
 Blanka Kalinova (1993), Czech Academy of Sciences, Prague  
 Le Kang (2010), Chinese Academy of Sciences, Institute of Zoology, Beijing  
 Alison Mercer (several periods during 1992-96), University of Otago, New Zealand  
 B.K. Mitchell (1990, 1996), University of Alberta, Edmonton, Canada  
 R. Alexander Steinbrecht (1994), Max-Planck-Institut f. Verhaltensphysiologie, Seewiesen  
 Chenzhu Wang (2010), Chinese Academy of Sciences, Institute of Zoology, Beijing  
 Yanxue Yu (2014), Chinese Academy of Plant Inspection and Quarantine, Beijing

### **Columbia University**

1984 instructor, Biology G9007, Special Topics in Developmental Neurobiology  
 1982-84 instructor, Biology G4006, Biochemistry of Nerve Cells  
 1981-84 instructor, Biology G4004, Biology of Nerve Cells

### **Postdoctoral Fellows**

Ian D. Harrow, Ph.D. (1981-84), *currently Founder, Director & Principal Consultant at Ian Harrow Consulting Ltd., UK*  
 Sally G. Hoskins, Ph.D. (1982-85), *currently Professor of Biology, City College of New York*  
 Timothy G. Kingan, Ph.D. (1980-83), *last known position: U.S. Patent and Trademark Office*

**Graduate Student**

Akira Hishinuma, M.D., Ph.D. (Ph.D. conferred 1986), *currently Professor, Dept. of Clinical Laboratory Medicine, Dokkyo University School of Medicine, Japan*

**Undergraduate Research Students**

Jeffrey E. Arle, Carla Cerami, Annemarie I. Coffman, Tristan Davies, Dennis Deltoro, Claire Kedeshian, William Korn, Robert Kovelman, Art Papier, Paul Quartararo

**Harvard University**

1979 course director and instructor, Biology 25, Neurobiology  
 1977 instructor, Eliot 111, Senior Seminar in Developmental Neurobiology  
 1976-80 instructor, Biology 126, Biochemistry of Nerve Cells (with E.A. Kravitz)  
 1975-77 instructor, Biology 240, Invertebrate Behavior (with Bert Hölldobler)  
 1973 co-instructor, Neurobiology 206, Physiology of Synaptic Transmission  
 1971-73 lecturer in Neurobiology 210, Introductory Neurobiology  
 1963-64 teaching Assistant in Natural Sciences 5 (General Biology)

**Postdoctoral Fellows**

Scott M. Camazine, M.D., Ph.D. (1978-79), *currently physician in private practice*  
 Nikolai E. Klemm, Ph.D. (1978), *current position unknown*  
 Steven G. Matsumoto, Ph.D. (1977-80), NIH Postdoctoral Fellow, *currently Associate Professor, Oregon Health & Science University*  
 Gerald D. Maxwell, Ph.D. (1975-79), NIH Postdoctoral Fellow, *currently Professor Emeritus of Neuroscience, University of Connecticut Medical School*  
 Margaret C. Nelson, Ph.D. (1975-79), *currently a free-lance writer and illustrator*  
 David J. Prescott, Ph.D. (1974-75), *retired from faculty of Biology, Bryn Mawr College*  
 Leslie P. Tolbert, Ph.D. (1978-81), NIH Postdoctoral Fellow, *currently Regents Professor Emerita of Neuroscience, Univ. of Arizona*

**Graduate Students**

Karla S. Kent, Ph.D. (Ph.D. conferred 1985), *currently Professor Emerita of Integrative Biosciences, Oregon Health & Science University*  
 Joshua R. Sanes, Ph.D. (Ph.D. conferred 1975), *currently Professor of Molecular & Cellular Biology, Harvard University, Cambridge, MA*  
 Anne M. Schneiderman, Ph.D. (Ph.D. conferred 1984), *currently an attorney in private practice, Ithaca, New York*

**Undergraduate Research Students**

Paul J. Deutsch, Margaret Drickamer, Marcia M. Moore, Erik S. Schweitzer, Jonathan F. Tait

**Rockefeller University**

1965-67 instructor, Summer Biology Program for high school students

**Marine Biological Laboratory**

1996-now instructor, summer SPINES program  
 1988 lecturer, Methods in Computational Neuroscience Course  
 1985 lecturer, Neural Systems and Behavior Course  
 1984 lecturer, Review and Update in Neurobiology for Neurosurgeons  
 1980-84 Co-Director and instructor, Summer Neurobiology Course  
 1978-79 instructor, Summer Neurobiology Course

## Research

My research long has combined anatomical, behavioral, chemical, molecular, and neurophysiological approaches in multidisciplinary studies of the of the nervous system in insects and other arthropods. My principal research interests include: the physiology, functional organization, behavioral roles, and postembryonic development of the olfactory system; sensory control of mating behavior and insect-host interactions, including feeding and oviposition behaviors; chemical ecology and behavioral aspects of interactions with host plants; olfactory learning; and the behavior and sensory neurobiology of local species of Triatomine insects (“kissing bugs”) as potential vectors of Chagas Disease. The main goal of this work has been to discover fundamental principles and mechanisms common to many or all nervous systems through studies of the experimentally favorable nervous systems of these invertebrate animals. In view of the importance of insects in their own right, my coworkers and I also have aimed to contribute to knowledge that will help to alleviate the harm done by insects that are predators of plants cultivated for food, fuel or fiber or are vectors of microbial or parasitic pathogens. Our principal research contributions have come in the following areas:

(i) *Functional organization and physiology of the insect olfactory system.* Our work has focused mainly on the olfactory system of the giant sphinx moth *Manduca sexta*. Using intracellular recording and staining methods, extracellular and multi-unit recording techniques, and pharmacological manipulations, we have explored the neuronal circuitry and synaptic interactions in the antennal lobe (AL), the primary olfactory center in the moth's brain. We also have used histological and neuronal tracing methods to learn about the anatomical organization of the AL and its sensory inputs. The goal has been to understand mechanisms of information processing in the olfactory pathways in the central nervous system. Much of this work has focused on the sexually dimorphic olfactory subsystem in the male moth that is specialized to detect and process information about the female's sex pheromone. We also have conducted multi-level studies of the detection and central processing of sensory information about volatile organic compounds (VOCs) emitted by living plants. Particular effort has addressed central neural mechanisms encoding olfactory information about behaviorally significant mixtures of VOCs. In addition to the primary focus on the AL, the reach of the work has extended to the higher-order olfactory pathways in the protocerebrum that are involved in processing of the outputs of the ALs and their integration with information of other sensory modalities.

(ii) *Behavior and chemical ecology.* In parallel with studies of the olfactory system of *Manduca*, we have investigated the identities of the VOCs emitted by living host- and non-host plants and used a variety of chemical, physiological and behavioral methods to identify behaviorally significant compounds in those complex mixtures. We also have studied the effects of VOCs on the behavior of flying *Manduca* in the field and in a laboratory wind tunnel.

(iii) *Postembryonic, metamorphic development of the olfactory system.* We long have been interested in neural development and plasticity in the ALs during the postembryonic development of *Manduca*. Among the outcomes of this line of research is the finding that certain, sexually dimorphic glomeruli characteristic of male and female ALs develop only if the AL is innervated, respectively, by axons of genetically male or female olfactory receptor cells.

My research program was funded through competitive research grants from federal agencies throughout the period 1971-2016, including funding from NIH, NSF, USDA, and DoD. I have also received research support from NATO and the University of Arizona as well as private sources including the American Heart Association, the A.P. Sloan Foundation, Monsanto Company, and the Hasselblad Foundation. My laboratory closed in May, 2016.

## Invited Lectures and Seminars (2010-present)

- 2010      Stanford University Institute for Neuro-Innovation  
 Pomona College, Claremont, CA [*Phi Beta Kappa Visiting Scholar*]  
 Tennessee State University, Dept. of Biological Sciences  
 Florida State University, Tallahassee [*Phi Beta Kappa Visiting Scholar*]  
 Allegheny College, Meadville, PA [*Phi Beta Kappa Visiting Scholar*]

- Symposium in honor of Michael Arbib, "Multidisciplinary Approaches to Understanding the Mind and Brain," Tucson, AZ  
 International Symposium in Honeybee Neuroscience, Berlin  
 University of Oklahoma, Dept. of Zoology [*Presidential Dream Course in Neuroethology*]  
 Yale University, Dept. of Cellular & Molecular Physiology  
 University of Georgia, Dept. of Entomology  
 Emory University, Neuroscience & Behavioral Biology Program
- 2011 Association of Anatomy, Cell Biology & Neurobiology Chairpersons Annual Meeting, Tucson  
 8th International Congress of Comparative Physiology & Biochemistry, Nagoya, Japan [*plenary*]  
 Gordon Research Conference on Neuroethology, Stonehill College, MA  
 International Symposium on Invertebrate Neurobiology, Tihany, Hungary  
 International Symposium on Molecular Insect Science, Amsterdam  
 US-China Workshop on Insect Olfaction, Chinese Academy of Sciences, Beijing  
 5<sup>th</sup> Asian-Pacific Conference on Chemical Ecology, Beijing [*plenary lecturer*]  
 Argentinian Society for Neuroscience (SAN) Annual Meeting, Cordoba [*First Hector Maldonado Memorial Lecturer*]  
 Siemens Stiftung Lecture, Munich, Germany
- 2012 UC-San Diego [*2012 Walter F. Heiligenberg Lecture*]  
 University of North Carolina, Dept. of Biology [*2012 Lawrence Gilbert Distinguished Lecture*]  
 American Association of Anatomists annual meeting, San Diego  
 Max-Planck-Institut f. Neurobiologie, Munich [*Distinguished Lecturer*]  
 Norwegian University of Science & Technology, Trondheim [*symposium speaker*]  
 Washington University, St. Louis, Dept. of Biology  
 Latin American Association for Chemical Ecology Annual Meeting, Cordoba [*plenary lecturer*]
- 2013 Yale Club of Southern Arizona  
 University of Cincinnati, Dept. of Biology  
 Universität Würzburg, Biozentrum  
 Universität zu Köln, Institute of Zoology  
 Universität Kassel, Dept. of Animal Physiology  
 University of Sydney, Australia, School of Biological Sciences  
 International Chemical Ecology Conference (ICEC2013), Melbourne, Australia  
 Louisiana State University, Dept. of Biological Sciences  
 University of Chicago, Dept. of Neurobiology  
 Kuffler Symposium, Rockefeller University
- 2014 Confluence Center, University of Arizona  
 Symposium on Biologically Inspired Robotics, AAAS Annual Meeting [*organizer & chair*]  
 West Virginia University, Dept. of Biology  
 Chilean Society for Neuroscience Annual Meeting, Valdivia [*plenary speaker*]  
 University of Santiago, Chile  
 2014 Inter-Academy Seoul Science Forum
- 2015 College of Charleston, SC [*Sigma Xi Darwin Week Lecturer*]  
 Northern Michigan University, Marquette, MI [*Sigma Xi Lecturer*]  
 Kansas State University, Manhattan, KS [*Sigma Xi Lecturer*]  
 Physics Teachers of Southern Arizona meeting
- 2016 University of Michigan, Ann Arbor [*Sigma Xi Lecturer*]  
 Lamar University, Beaumont, TX [*Sigma Xi Lecturer*]  
 Case Western Reserve University, Cleveland OH

- NIH IRACDA Conference, Tucson, AZ  
 2016 XXV International Congress of Entomology, Orlando FL [*Wigglesworth Lecturer*]  
 Department of Neurobiology, Harvard Medical School, Boston [*50<sup>th</sup> anniversary celebration*]
- 2017 Florida State University, Tallahassee [*2017 James C. Smith Lecture*]  
 University of New England, Biddeford, ME, Center for Excellence in the Neurosciences  
 Israeli Entomological Society Annual Meeting in honor of Rachel Galun [*plenary lecture*]
- 2018 Yale Club of Southern Arizona  
 Philippine-American Academy of Science & Engineering 38<sup>th</sup> Annual Meeting, Tucson  
 ECRO 2018 Annual Meeting, Würzburg, Germany [*plenary lecture*]  
 Caribbean Academy of Sciences, 21<sup>st</sup> General Meeting, Kingston, Jamaica [*plenary lecture*]  
 Academia Sinica, 90<sup>th</sup> Anniversary Celebration, Taipei, Taiwan [*plenary lecture*]
- 2020 NAS Annual Meeting Symposium “NAS Grand Challenges”  
 Twelfth General Assembly of the African Academy of Sciences, Nairobi [*Zoom talk as a panelist*]  
 Annual Meeting of the Acoustical Society of America [*Zoom talk in a symposium*]
- 2021 Society for Neuroscience virtual meeting “Global Connectome” [*Zoom talk as a panelist*]  
 International conference “Insect Olfaction & Taste in 24 Hours Around the Globe” [*panelist*]



PUBLICATIONS

**John G. Hildebrand**

*h*-Index 82; >18000 citations (8/21 – Google Scholar data)

**Books**

- Hall ZW, Hildebrand JG, Kravitz EA (eds) (1974) *Chemistry of Synaptic Transmission: Essays and Sources*. Newton MA, Chiron Press
- Sattelle DB, Hall LM, Hildebrand JG (eds) (1980) *Receptors for Neurotransmitters, Hormones and Pheromones in Insects*. Amsterdam, Elsevier/North Holland
- Hagedorn HH, Hildebrand JG, Kidwell MG, Law JH (eds) (1990) *Molecular Insect Science*. New York, Plenum
- Ciba Foundation Symposium 200 (1996) *Olfaction in Mosquito-Host Interactions*. West Sussex, UK, Wiley [meeting and book organized by JGH]
- Meinwald J, Hildebrand JG (eds) (2010) *Science and the Educated American: A Core Component of Liberal Education*. American Academy of Arts and Sciences [available as a book or as a downloadable PDF: <https://www.amacad.org/sites/default/files/publication/downloads/SLACweb.pdf>]

**Original Reports**

- Hildebrand JG, Law JH (1964) Fatty acid distribution in bacterial phospholipids; The specificity of the cyclopropane synthetase reaction. *Biochem* 3:1304-1308
- Hildebrand JG, Spector LB (1969) Succinyl phosphate and the succinyl Coenzyme A synthetase reaction. *J Biol Chem* 244:2606-2613
- Hildebrand JG (1969) *Succinyl phosphate and the succinyl Coenzyme A synthetase reaction*. Ph.D. dissertation, Rockefeller University
- Walsh CT, Hildebrand JG, Spector LB (1970) Succinyl phosphate: its non-enzymatic hydrolysis and reaction with Coenzyme A. *J Biol Chem* 245:5699-5708
- Hildebrand JG, Barker DL, Herbert E, Kravitz EA (1971) Screening for neurotransmitters: a rapid radiochemical procedure. *J Neurobiol* 2:231-246
- Barker DL, Herbert E, Hildebrand JG, Kravitz EA (1972) Acetylcholine and lobster sensory neurones. *J Physiol (Lond)* 226:205-229
- Hildebrand JG, Townsel JG, Kravitz EA (1974) Distribution of acetylcholine, choline, choline acetyltransferase and acetylcholinesterase in regions and single, identified axons of the lobster nervous system. *J Neurochem* 23:951-963
- Sanes JR, Hildebrand JG (1975) Nerves in the antennae of pupal *Manduca sexta* (Lepidoptera: Sphingidae). *Wilhelm Roux' Archiv* 178:71-78
- Sanes JR, Hildebrand JG (1976) Structure and development of antennae in a moth, *Manduca sexta*. *Devel Biol* 51:282-299

- Sanes JR, Hildebrand JG (1976) Origin and morphogenesis of sensory neurons in an insect antenna. *Devel Biol* 51:300-319
- Sanes JR, Hildebrand JG (1976) Acetylcholine and its metabolic enzymes in developing antennae of the moth, *Manduca sexta*. *Devel Biol* 52:105-120
- Sanes JR, Hildebrand JG, Prescott DJ (1976) Differentiation of insect sensory neurons in the absence of their normal synaptic targets. *Devel Biol* 52:121-127
- Schweitzer ES, Sanes JR, Hildebrand JG (1976) Ontogeny of electroantennogram responses in the moth *Manduca sexta*. *J Insect Physiol* 22:955-960
- Sanes JR, Prescott DJ, Hildebrand JG (1977) Cholinergic neurochemical development of normal and deafferented antennal lobes during metamorphosis of the moth, *Manduca sexta*. *Brain Res* 119:389-402
- Prescott DJ, Hildebrand JG, Sanes JR, Jewett S (1977) Biochemical and developmental studies of acetylcholine metabolism in the central nervous system of the moth, *Manduca sexta*. *Comp Biochem Physiol* 56C:77-84
- Maxwell GD, Tait JF, Hildebrand JG (1978) Regional synthesis of neurotransmitter candidates in the CNS of the moth *Manduca sexta*. *Comp Biochem Physiol* 61C:109-119
- Hildebrand JG, Hall LM, Osmond BC (1979) Distribution of binding sites for <sup>125</sup>I-labeled  $\alpha$ -bungarotoxin in normal and deafferented antennal lobes of *Manduca sexta*. *Proc Natl Acad Sci USA* 76:499-503
- Starratt AN, Dahm KH, Allen N, Hildebrand JG, Payne TL, Rölller H (1979) Bombykal, a sex pheromone of the sphinx moth *Manduca sexta*. *Z Naturforsch* 34C:9-12
- Maxwell GD, Moore MM, Hildebrand JG (1980) Metabolism of tyramine in the central nervous system of the moth *Manduca sexta*. *Insect Biochem* 10:657-665
- Maxwell GD, Hildebrand JG (1981) Anatomical and neurochemical consequences of deafferentation in the development of the visual system of the moth *Manduca sexta*. *J Comp Neurol* 195:667-680
- Matsumoto SG, Hildebrand JG (1981) Olfactory mechanisms in the moth *Manduca sexta*: response characteristics and morphology of central neurons in the antennal lobes. *Proc Roy Soc Lond B* 213:249-277
- Tolbert LP, Hildebrand JG (1981) Organization and synaptic ultrastructure of glomeruli in the antennal lobes of the moth *Manduca sexta*: a study using thin sections and freeze-fracture. *Proc Roy Soc Lond B* 213:279-301
- Schneiderman AM, Matsumoto SG, Hildebrand JG (1982) Trans-sexually grafted antennae influence development of sexually dimorphic neurones in moth brain. *Nature* 298:844-846
- Tolbert LP, Matsumoto SG, Hildebrand JG (1983) Development of synapses in the antennal lobes of the moth *Manduca sexta* during metamorphosis. *J Neurosci* 3:1158-1175
- Kingan TG, Hildebrand JG (1985)  $\gamma$ -Aminobutyric acid in the central nervous system of metamorphosing and mature *Manduca sexta*. *Insect Biochem* 15:667-675
- Hoskins SG, Homberg U, Kingan TG, Christensen TA, Hildebrand JG (1986) Immunocytochemistry of GABA in the antennal lobes of the sphinx moth *Manduca sexta*. *Cell Tiss Res* 244:243-252

- Kent KS, Harrow ID, Quartararo P, Hildebrand JG (1986) An accessory olfactory pathway in Lepidoptera: the labial pit organ and its central projections in *Manduca sexta* and certain other sphinx moths and silk moths. *Cell Tiss Res* 245:237-245
- Schneiderman AM, Hildebrand JG, Brennan MM, Tumlinson JH (1986) Trans-sexually grafted antennae alter pheromone-directed behavior in a moth. *Nature* 323:801-803
- Kent KS, Hildebrand JG (1987) Cephalic sensory pathways in the central nervous system of larval *Manduca sexta* (Lepidoptera: Sphingidae). *Phil Trans Roy Soc B* 315:1-35
- Homberg U, Kingan TG, Hildebrand JG (1987) Immunocytochemistry of GABA in the brain and suboesophageal ganglion of the sphinx moth *Manduca sexta*. *Cell Tiss Res* 248:1-24
- Christensen TA, Hildebrand JG (1987) Male-specific, sex pheromone-selective projection neurons in the antennal lobes of the moth *Manduca sexta*. *J Comp Physiol A* 160 553-569
- Waldrop B, Christensen TA, Hildebrand JG (1987) GABA-mediated synaptic inhibition of projection neurons in the antennal lobes of the sphinx moth *Manduca sexta*. *J Comp Physiol A* 161:23-32
- Kent KS, Hoskins SG, Hildebrand JG (1987) A novel serotonin-immunoreactive neuron in the antennal lobe of the sphinx moth *Manduca sexta* persists throughout postembryonic life. *J Neurobiol* 18:451-465
- Hishinuma A, Hockfield S, McKay R, Hildebrand JG (1988) Monoclonal antibodies reveal cell-type-specific antigens in the sexually dimorphic olfactory system of *Manduca sexta*. I. Generation of monoclonal antibodies and partial characterization of the antigens. *J Neurosci* 8:296-307
- Hishinuma A, Hockfield S, McKay R, Hildebrand JG (1988) Monoclonal antibodies reveal cell-type-specific antigens in the sexually dimorphic olfactory system of *Manduca sexta*. II. Expression of antigens during postembryonic development. *J Neurosci* 8:308-315
- Christensen TA, Hildebrand JG (1988) Frequency coding by central olfactory neurons in the sphinx moth *Manduca sexta*. *Chem Senses* 13:123-130
- Homberg U, Montague RA, Hildebrand JG (1988) Anatomy of antenno-cerebral pathways in the brain of the sphinx moth *Manduca sexta*. *Cell Tiss Res* 254:255-281
- Waldrop B, Hildebrand JG (1989) Physiology and pharmacology of acetylcholinergic responses of interneurons in the antennal lobe of the moth *Manduca sexta*. *J Comp Physiol A* 164:433-441
- Christensen TA, Mustaparta H, Hildebrand JG (1989) Discrimination of sex pheromone blends in the olfactory system of the moth. *Chem Senses* 14:463-477
- Kingan TG, Hildebrand JG (1989) Sexually dimorphic polypeptides in developing insect olfactory receptor cells. *J Neurosci* 9:1951-1960
- Homberg U, Hildebrand JG (1989) Serotonin-immunoreactive neurons in the median protocerebrum and suboesophageal ganglion of the sphinx moth *Manduca sexta*. *Cell Tiss Res* 258:1-24
- Homberg U, Hildebrand JG (1989) Serotonin-immunoreactivity in the optic lobes of the sphinx moth *Manduca sexta* and colocalization with FMRFamide- and SCP<sub>B</sub>-immunoreactivities. *J Comp Neurol* 288:243-253
- Kanzaki R, Arbas EA, Strausfeld NJ, Hildebrand JG (1989) Physiology and morphology of projection neurons in the antennal lobe of the male moth *Manduca sexta*. *J Comp Physiol A* 165:427-453

- Kaissling K-E, Hildebrand JG, Tumlinson JH (1989) Pheromone receptor cells in the male moth *Manduca sexta*. Arch Insect Biochem Physiol 10:273-279
- Christensen TA, Hildebrand JG, Tumlinson JH, Doolittle RE (1989) The sex-pheromone blend of *Manduca sexta*: Responses of central olfactory interneurons to antennal stimulation in male moths. Arch Insect Biochem Physiol 10:281-291
- Homberg U, Kingan TG, Hildebrand JG (1990) Distribution of FMRFamide-like immunoreactivity in the brain and suboesophageal ganglion of the sphinx moth *Manduca sexta* and colocalization with SCP<sub>B</sub>-, BPP-, and GABA-like immunoreactivity. Cell Tiss Res 259:401-419
- Stengl M, Hildebrand JG (1990) Insect olfactory neurons *in vitro*: morphological and immunocytochemical characterization of male-specific antennal receptor cells from developing antennae of male *Manduca sexta*. J Neurosci 10:837-847
- Hayashi JH, Hildebrand JG (1990) Insect olfactory neurons *in vitro*: morphological and physiological characterization of cells from the developing antennal lobe of *Manduca sexta*. J Neurosci 10:848-859
- Christensen TA, Geoffrion SC, Hildebrand JG (1990) Physiology of interspecific chemical communication in *Heliothis* moths. Physiol Entomol 15:275-283
- Kingan TG, Teplow DB, Phillips JM, Riehm JP, Rao KR, Hildebrand JG, Homberg U, Kammer AE, Jardine I, Griffin PR, Hunt DF (1990) A new peptide in the FMRFamide family isolated from the CNS of the hawkmoth, *Manduca sexta*. Peptides 11:849-856
- Itagaki H, Hildebrand JG (1990) Olfactory interneurons in the brain of the larval sphinx moth *Manduca sexta*. J Comp Physiol A 167:309-320
- Stengl M, Homberg U, Hildebrand JG (1990) Acetylcholinesterase activity in antennal receptor neurons of the sphinx moth *Manduca sexta*. Cell Tiss Res 262:245-252
- Homberg U, Davis NT, Hildebrand JG (1991) Peptide-immunocytochemistry of neurosecretory cells in the brain and retrocerebral complex of the sphinx moth *Manduca sexta*. J Comp Neurol 303:35-52
- Zufall F, Stengl M, Franke C, Hildebrand JG, Hatt H (1991) Ionic currents of cultured olfactory receptor neurons from antennae of male *Manduca sexta*. J Neurosci 11:956-965
- Kanzaki R, Arbas EA, Hildebrand JG (1991) Physiology and morphology of protocerebral olfactory neurons in the male moth *Manduca sexta*. J Comp Physiol A 168:281-298
- Homberg U, Hildebrand JG (1991) Histamine-immunoreactive neurons in the midbrain and sub-oesophageal ganglion of the sphinx moth *Manduca sexta*. J Comp Neurol 307:647-657
- Christensen TA, Itagaki H, Teal PEA, Jasensky RD, Tumlinson JH, Hildebrand JG (1991) Innervation and neural regulation of the sex pheromone gland in female *Heliothis* moths. Proc Natl Acad Sci USA 88:4971-4975
- Kanzaki R, Arbas EA, Hildebrand JG (1991) Physiology and morphology of descending neurons in pheromone-processing olfactory pathways in the male moth *Manduca sexta*. J Comp Physiol A 169:1-14
- Hansson B, Christensen TA, Hildebrand JG (1991) Functionally distinct subdivisions of the macroglomerular complex in the antennal lobes of the sphinx moth *Manduca sexta*. J Comp Neurol 312:264-278

- Christensen TA, Mustaparta H, Hildebrand JG (1991) Chemical communication in heliothine moths. II. Central processing of intra- and interspecific olfactory messages in the male corn earworm moth *Helicoverpa zea*. *J Comp Physiol A* 169:259-274
- Davis NT, Hildebrand JG (1992) Vasopressin-immunoreactive neurons and neurohemal systems in cockroaches and mantids. *J Comp Neurol* 320:381-393
- Stengl M, Zufall F, Hatt H, Hildebrand JG (1992) Olfactory receptor neurons from antennae of developing male *Manduca sexta* respond to components of the species-specific sex pheromone *in vitro*. *J Neurosci* 12:2523-2531
- Rospars JP, Hildebrand JG (1992) Anatomical identification of glomeruli in the antennal lobes of the male sphinx moth *Manduca sexta*. *Cell Tiss Res* 270:205-227
- Christensen TA, Lehman H, Teal PEA, Itagaki H, Tumlinson JH, Hildebrand JG (1992) Diel changes in the presence and physiological actions of octopamine in the female sex-pheromone glands of Heliothine moths. *Insect Biochem Molec Biol* 22:841-849
- Lehman HK, Murgic CM, Miller TA, Lee TD, Hildebrand JG (1993) Crustacean cardioactive peptide in the sphinx moth, *Manduca sexta*. *Peptides* 14:735-741
- Sun XJ, Tolbert LP, Hildebrand JG (1993) Ramification pattern and ultrastructural characteristics of the serotonin immunoreactive neuron in the antennal lobe of the moth *Manduca sexta*: a laser scanning confocal and electron microscopic study. *J Comp Neurol* 338:5-16
- Christensen TA, Waldrop BR, Harrow ID, Hildebrand JG (1993) Local interneurons and information processing in the olfactory glomeruli of the moth *Manduca sexta*. *J Comp Physiol A* 173:385-399
- Davis NT, Homberg U, Dirksen H, Levine RB, Hildebrand JG (1993) Crustacean cardioactive peptide-immunoreactive neurons in the hawkmoth *Manduca sexta* and changes in their immunoreactivity during postembryonic development. *J Comp Neurol* 338:612-627
- Homberg U, Hildebrand JG (1994) Postembryonic development of GABA-like immunoreactivity in the brain of the sphinx moth *Manduca sexta*. *J Comp Neurol* 339:132-149
- Christensen TA, Lashbrook JM, Hildebrand JG (1994) Neural activation of the sex-pheromone gland in the moth *Manduca sexta*: real-time measurement of pheromone release. *Physiol Entomol* 19:265-270
- Homberg U, Hoskins SG, Hildebrand JG (1995) Distribution of acetylcholinesterase activity in the deutocerebrum of the sphinx moth *Manduca sexta*. *Cell Tiss Res* 279:249-259
- Novak MG, Ribeiro JMC, Hildebrand JG (1995) 5-Hydroxytryptamine in the salivary glands of adult female *Aedes aegypti* and its role in regulation of salivation. *J Exp Biol* 198:167-174
- Sun XJ, Tolbert LP, Hildebrand JG (1995) Using laser scanning confocal microscopy as a guide for electron microscopic study: a simple method for correlation of light and electron microscopy. *J Histochem Cytochem* 43:329-335
- Kloppenborg P, Hildebrand JG (1995) Neuromodulation by 5-hydroxytryptamine in the antennal lobe of the sphinx moth *Manduca sexta*. *J Exp Biol* 198:603-611
- Mercer AR, Hayashi JH, Hildebrand JG (1995) Modulatory effects of 5-hydroxytryptamine on voltage-activated currents in cultured antennal-lobe neurons of the sphinx moth *Manduca sexta*. *J Exp Biol* 198:613-627

- Christensen TA, Harrow ID, Cuzzocrea C, Randolph PW, Hildebrand JG (1995) Distinct projections of two populations of olfactory receptor axons in the antennal lobe of the sphinx moth *Manduca sexta*. *Chem Senses* 20:313-323
- Christensen TA, Mustaparta H, Hildebrand JG (1995) Chemical communication in heliothine moths. VI. Parallel pathways for information processing in the macroglomerular complex of the male tobacco budworm moth *Heliothis virescens*. *J Comp Physiol A* 177:545-557
- Mercer AR, Kloppenburg P, Hildebrand JG (1996) Serotonin-induced changes in the excitability of cultured antennal-lobe neurons of the sphinx moth *Manduca sexta*. *J Comp Physiol A* 178:21-31
- Mercer AR, Kirchhof BS, Hildebrand JG (1996) Enhancement by serotonin of the growth *in vitro* of antennal lobe interneurons of the sphinx moth *Manduca sexta*. *J Neurobiol* 29:49-64
- Davis NT, Homberg U, Teal PEA, Altstein M, Hildebrand JG (1996) Neuroanatomy and immunocytochemistry of the median neurosecretory cells of the subesophageal ganglion of the tobacco hawkmoth, *Manduca sexta*: immunoreactivity to PBAN and other neuropeptides. *Microscopy Res & Technique* 35:201-229
- Tolbert LP, Sun XJ, Hildebrand JG (1996) Combining laser scanning confocal microscopy and electron microscopy in studies of the insect nervous system. *J Neurosci Meth* 69:25-32
- Christensen TA, Heinbockel T, Hildebrand JG (1996) Olfactory information processing in the brain: encoding the chemical and temporal features of odors. *J Neurobiol* 30:82-91
- Kloppenburg P, Camazine SM, Sun XJ, Randolph P, Hildebrand JG (1997) Organization of the antennal motor system in the sphinx moth *Manduca sexta*. *Cell Tiss Res* 287:425-433
- Christensen TA, Hildebrand JG (1997) Coincident stimulation with pheromone components improves temporal pattern resolution in central olfactory neurons. *J Neurophysiol* 77:775-781
- Sun XJ, Tolbert LP, Hildebrand JG (1997) Synaptic organization of the uniglomerular projection neurons of the antennal lobe of the moth *Manduca sexta*: a laser scanning confocal and electron microscopic study. *J Comp Neurol* 379:2-20
- Davis NT, Veenstra JA, Feyereisen R, Hildebrand JG (1997) Allatostatin-immunoreactive neurons of the tobacco hornworm, *Manduca sexta*, and isolation and identification of a new neuropeptide of the allatostatin family. *J Comp Neurol* 385:265-284
- Sun XJ, Tolbert LP, Hildebrand JG, Meinertzhagen IA (1998) A rapid method for combined laser scanning confocal microscopic and electron microscopic visualization of biocytin- or Neurobiotin-labelled neurons. *J Histochem Cytochem* 46:263-274
- Rössler W, Tolbert LP, Hildebrand JG (1998) Early formation of sexually dimorphic glomeruli in the developing olfactory lobe of the brain of the moth *Manduca sexta*. *J Comp Neurol* 396:415-428
- Heinbockel T, Kloppenburg P, Hildebrand JG (1998) Pheromone-evoked potentials and oscillations in the antennal lobes of the sphinx moth *Manduca sexta*. *J Comp Physiol A* 182:703-714
- Christensen TA, Waldrop BR, Hildebrand JG (1998) Multitasking in the olfactory system: context-dependent responses to odors reveal dual GABA-regulated coding mechanisms in single olfactory projection neurons. *J Neurosci* 18:5999-6008

- Heinbockel T, Hildebrand JG (1998) Antennal receptive fields of pheromone-responsive projection neurons in the antennal lobes of the male sphinx moth *Manduca sexta*. *J Comp Physiol A* 183:121-133
- Nighorn A, Gibson NJ, Rivers DM, Hildebrand JG, Morton DB (1998) The nitric oxide-cGMP pathway may mediate communication between sensory afferents and projection neurons in the antennal lobe of *Manduca sexta*. *J Neurosci* 18:7244-7255
- Vickers NJ, Christensen TA, Hildebrand JG (1998) Combinatorial odor discrimination in the brain: attractive and antagonist odor blends are represented in distinct combinations of uniquely identifiable glomeruli. *J Comp Neurol* 400:35-56
- Rössler W, Randolph PW, Tolbert LP, Hildebrand JG (1999) Axons of olfactory receptor cells of trans-sexually grafted antennae induce development of sexually dimorphic glomeruli in *Manduca sexta*. *J Neurobiol* 38:521-541
- Heinbockel T, Christensen TA, Hildebrand JG (1999) Temporal tuning of odor responses in pheromone-responsive projection neurons in the brain of the sphinx moth *Manduca sexta*. *J Comp Neurol* 409:1-12
- Shields VDC, Hildebrand JG (1999) Fine structure of antennal sensilla of the female sphinx moth, *Manduca sexta*. I. trichoid and basiconic sensilla. *Canad J Zool* 77:290-301
- Shields VDC, Hildebrand JG (1999) Fine structure of antennal sensilla of the female sphinx moth *Manduca sexta*. II. auriculate, coeloconic, and composite sensilla. *Canad J Zool* 77:302-313
- Kent KS, Oland LA, Hildebrand JG (1999) Development of the labial pit organ glomerulus in the antennal lobe of the moth, *Manduca sexta*: the role of afferent projections in the formation of identifiable olfactory glomeruli. *J Neurobiol* 40:28-44
- Teal PEA, Davis NT, Meredith JA, Christensen TA, Hildebrand JG (1999) Role of the ventral nerve cord and terminal abdominal ganglion in the regulation of sex pheromone production in the Tobacco Budworm (Lepidoptera: Noctuidae). *Ann Ent Soc Am* 92:891-901
- Rössler W, Oland LA, Higgins MR, Hildebrand JG, Tolbert LP (1999) Development of a glia-rich axon-sorting zone in the olfactory pathway of the moth *Manduca sexta*. *J Neurosci* 19:9865-9877
- Strausfeld NJ, Hildebrand JG (1999) Olfactory systems: common design, uncommon origins? *Curr Opin Neurobiol* 9:634-639
- King J Roche, Christensen TA, Hildebrand JG (2000) Response characteristics of an identified, sexually dimorphic olfactory glomerulus. *J Neurosci* 20:2391-2399
- Rospars JP, Hildebrand JG (2000) Sexually dimorphic and isomorphic glomeruli in the antennal lobes of the sphinx moth *Manduca sexta*. *Chem Senses* 25:119-129
- Lehman HK, Murguic CM, Hildebrand JG (2000) Characterization and developmental regulation of octopamine biosynthesis in the CNS of the moth, *Manduca sexta*. *Insect Biochem Molec Biol* 30:377-386
- Mechaber WL, Hildebrand JG (2000) Novel, non-solanaceous hostplant record for *Manduca sexta* (Lepidoptera: Sphingidae) in the southwestern United States. *Ann Ent Soc Am* 93:447-451
- Christensen TA, Pawlowski VM, Lei H, Hildebrand JG (2000) Multi-unit recordings reveal context-dependent modulation of synchrony in odor-specific neural ensembles. *Nature Neurosci* 3:927-931

- Rössler W, Tolbert LP, Hildebrand JG (2000) Importance of timing of olfactory receptor-axon outgrowth for glomerulus development in *Manduca sexta*. *J Comp Neurol* 425:233-243
- Shields VDC, Hildebrand JG (2001) Responses of a population of antennal olfactory receptor cells in the female moth *Manduca sexta* to plant-associated volatile organic compounds. *J Comp Physiol A* 186:1135-1151
- Vickers NJ, Christensen TA, Baker TC, Hildebrand JG (2001) Odour-plume dynamics influence the brain's olfactory code. *Nature* 410:466-470
- Davis NT, Dulcis D, Hildebrand JG (2001) Innervation of the heart and aorta of *Manduca sexta*. *J Comp Neurol* 440:245-260
- Dulcis D, Davis NT, Hildebrand JG (2001) Neuronal control of heart reversal in the hawkmoth *Manduca sexta*. *J Comp Physiol A* 187:837-848
- Christensen TA, D'Alessandro G, Lega J, Hildebrand JG (2001) Morphometric modeling of olfactory circuits in the insect antennal lobe: I. simulation of spiking local interneurons. *BioSystems* 61:143-153
- Gibson NJ, Rössler W, Nighorn AJ, Oland LA, Hildebrand JG, Tolbert LP (2001) Neuron-glia communication via nitric oxide is essential in establishing antennal-lobe structure in *Manduca sexta*. *Devel Biol* 240:326-339
- Mechaber WL, Capaldo CT, Hildebrand JG (2002) Behavioral responses of adult female tobacco hornworms, *Manduca sexta*, to hostplant volatiles change with age and mating status. *J Insect Sci* 2: no. 5. [Available online: [insectscience.org/2.5](http://insectscience.org/2.5)]
- Mercer AR, Hildebrand JG (2002) Developmental changes in the electrophysiological properties and response characteristics of *Manduca* antennal-lobe neurons. *J Neurophysiol* 87:2650-2663
- Mercer AR, Hildebrand JG (2002) Developmental changes in the density of ionic currents in antennal-lobe neurons of the sphinx moth, *Manduca sexta*. *J Neurophysiol* 87:2664-2675
- Lei H, Christensen TA, Hildebrand JG (2002) Local inhibition modulates synchronization of glomerulus-specific output neurons in the moth antennal lobe. *Nature Neurosci* 5:557-565
- Davis NT, Blackburn MB, Golubeva EG, Hildebrand JG (2003) Localization of myoinhibitory peptide immunoreactivity in *Manduca sexta*: indications that the peptide has a role in molting and ecdysis. *J Exp Biol* 206:1449-1460
- Shiga S, Davis NT, Hildebrand JG (2003) Role of neurosecretory cells in the photoperiodic induction of pupal diapause of the tobacco hornworm *Manduca sexta*. *J Comp Neurol* 462:275-285
- Fraser AM, Mechaber WL, Hildebrand JG (2003) Electroantennographic responses of the sphinx moth *Manduca sexta* to host plant headspace volatiles. *J Chem Ecol* 29:1813-1833
- Christensen TA, Lei H, Hildebrand JG (2003) Coordination of central odor representations through transient, non-oscillatory synchronization of glomerular output neurons. *Proc Natl Acad Sci USA* 100:11076-11081
- Reisenman CE, Christensen TA, Francke W, Hildebrand JG (2004) Enantioselectivity of projection neurons innervating identified olfactory glomeruli. *J Neurosci* 24:2602-2611



- Thom C, Guerenstein PG, Mechaber WL, Hildebrand JG (2004) Floral CO<sub>2</sub> reveals flower profitability to moths. *J Chem Ecol* 30:1285-1288
- Guerenstein PG, Yopez E, van Haren J, Williams DG, Hildebrand JG (2004) Floral CO<sub>2</sub> emission may signal food abundance to nectar-feeding moths. *Naturwissenschaften* 91:329-333
- Gibson NJ, Hildebrand JG, Tolbert LP (2004) Glycosylation patterns are sexually dimorphic throughout development of the olfactory system in *Manduca sexta*. *J Comp Neurol* 476:1-18
- Daly KC, Christensen TA, Lei H, Smith BH, Hildebrand JG (2004) Learning modulates the ensemble representations for odors in primary olfactory networks. *Proc Natl Acad Sci USA* 101:10476-10481
- Guerenstein PG, Christensen TA, Hildebrand JG (2004) Sensory processing of ambient-CO<sub>2</sub> information in the brain of the moth *Manduca sexta*. *J Comp Physiol A* 190:707-725
- Heinbockel T, Christensen TA, Hildebrand JG (2004) Representation of binary pheromone blends by glomerulus-specific olfactory projection neurons. *J Comp Physiol A* 190:1023-1037
- Lei H, Christensen TA, Hildebrand JG (2004) Spatial and temporal organization of ensemble representations for different odor classes in the moth antennal lobe. *J Neurosci* 24:11108-11119
- Mercer AR, Kloppenburg P, Hildebrand JG (2005) Plateau potentials in developing antennal-lobe neurons of the moth, *Manduca sexta*. *J Neurophysiol* 93:1949-1958
- Dacks AM, Christensen TA, Agricola H-J, Wollweber L, Hildebrand JG (2005) Octopamine-immunoreactive neurons in the brain and subesophageal ganglion of the hawkmoth *Manduca sexta*. *J Comp Neurol* 488:255-268
- Reisenman CE, Christensen TA, Hildebrand JG (2005) Chemosensory selectivity of output neurons innervating an identified, sexually isomorphic olfactory glomerulus. *J Neurosci* 25:8017-8026
- Abrell L, Guerenstein PG, Mechaber WL, Stange G, Christensen TA, Nakanishi K, Hildebrand JG (2005) Effect of elevated atmospheric CO<sub>2</sub> on oviposition behavior in *Manduca sexta* moths. *Global Change Biol* 11:1272-1282
- Davis NT, Hildebrand JG (2006) Neuroanatomy of the sucking pump of the moth, *Manduca sexta* (Sphingidae, Lepidoptera). *Arthropod Struc Devel* 35:15-33
- Dacks AM, Christensen TA, Hildebrand JG (2006) Phylogeny of a serotonin-immunoreactive neuron in the primary olfactory center of the insect brain. *J Comp Neurol* 498:727-746
- Riffell JA, Alarcón R, Abrell L, Davidowitz G, Bronstein JL, Hildebrand JG (2008) Behavioral consequences of innate preferences and olfactory learning in hawkmoth-flower interactions. *Proc Natl Acad Sci USA* 105:3404-3409
- Dacks AM, Christensen TA, Hildebrand JG (2008) Modulation of olfactory processing in the antennal lobe of *Manduca sexta* by serotonin. *J Neurophysiol* 99:2077-2085
- Reisenman CE, Heinbockel T, Hildebrand JG (2008) Inhibitory interactions among olfactory glomeruli do not necessarily reflect spatial proximity. *J Neurophysiol* 100:554-564
- Riffell JA, Abrell L, Hildebrand JG (2008) Physical processes and real-time chemical measurement of the insect olfactory environment. *J Chem Ecol* 34:837-853

- Lei H, Riffell JA, Gage SL, Hildebrand JG (2009) Contrast enhancement of stimulus intermittency in a primary olfactory network and its behavioral significance. *J Biol* 8:21, 1-21
- Riffell JA, Lei H, Christensen TA, Hildebrand JG (2009) Characterization and coding of behaviorally significant odor mixtures. *Curr Biol* 19:335-340
- Riffell JA, Lei H, Hildebrand JG (2009) Neural correlates of behavior in the moth *Manduca sexta* in response to complex odors. *Proc Natl Acad Sci USA* 106:19219-19226
- Reisenman CE, Riffell JA, Hildebrand JG (2009) Neuroethology of oviposition behavior in the moth *Manduca sexta*. *Ann NY Acad Sci* 1170:462-467
- Daly DC, Mercier PP, Bhardwaj M, Stone AL, Aldworth ZN, Daniel TL, Voldman J, Hildebrand JG, Chandrakasan AP (2010) A Pulsed UWB receiver SoC for insect motion control. *IEEE J Solid-State Circuits* 45:153-166
- Reisenman CE, Lawrence G, Guerenstein PG, Gregory T, Dotson E, Hildebrand JG (2010) Infection of kissing bugs with *Trypanosoma cruzi*, Tucson, Arizona, USA. *Emerg Infect Dis* 16:400-405
- Reisenman CE, Riffell JA, Bernays E, Hildebrand JG (2010) Antagonistic effects of floral scent in an insect-plant interaction. *Proc Roy Soc B* 277:2371-2379
- Tsang WM, Stone AL, Aldworth ZN, Hildebrand JG, Daniel TL, Akinwande AI, Voldman J (2010) Flexible split-ring electrode for insect flight biasing using multisite neural stimulation. *IEEE Trans Biomed Eng* 57:1757-1764
- Kalberer NM, Reisenman CE, Stein HL, Mechaber WL, Hildebrand JG (2010) Male moths bearing transplanted female antennae express characteristically female behaviour and central neural activity. *J Exp Biol* 213:1272-1280
- Alarcón R, Riffell JA, Davidowitz G, Hildebrand JG, Bronstein JL (2010) Sex-dependent variation in the floral preferences of the hawkmoth *Manduca sexta*. *Anim Behav* 80:289-296
- Reisenman CE, Dacks AM, Hildebrand JG (2011) Local interneuron diversity in the primary olfactory center of the moth *Manduca sexta*. *J Comp Physiol A* 197:653-665
- Reisenman CE, Gregory T, Guerenstein PG, Hildebrand JG (2011) Feeding and defecation behavior of *Triatoma rubida* and its potential role as a vector of Chagas Disease in Arizona, USA. *Am J Trop Med Hygiene* 85:648-656
- Lei H, Reisenman CE, Wilson C, Gabbur P, Hildebrand JG (2011) Spiking patterns and their functional implications in the antennal lobe of the Tobacco Hornworm *Manduca sexta*. *PloS One* 6(8): e23382
- Tsang WM, Stone AL, Otten D, Aldworth ZN, Daniel TL, Hildebrand JG, Levine RB, Voldman J (2012) Insect-machine interface: a carbon nanotube-enhanced flexible neural probe. *J Neurosci Meth* 204:355-365
- Reisenman CE, Savary W, Cowles J, Gregory TL, Hildebrand JG (2012) The distribution and abundance of triatomine insects, potential vectors of Chagas Disease, in a metropolitan area in Southern Arizona, United States. *J Med Entomol* 49:1254-1261
- Hinterwirth AJ, Medina B, Lockey J, Otten D, Voldman J, Lang JH, Hildebrand JG, Daniel TL (2012) Wireless stimulation of antennal muscles in freely flying hawkmoths leads to flight path changes. *PLoS One* 7(12): e52725. doi:10.1371/journal.pone.0052725

- Riffell JA, Lei H, Abrell L, Hildebrand JG (2013) Neural basis of a pollinator's buffet: olfactory specialization and learning in the *Manduca sexta* moth. *Science* 339:200-204 *Published online 6 December 2012* [DOI:10.1126/science.1225483]
- Martin JP, Lei H, Riffell JA, Hildebrand JG (2013) Synchronous firing of antennal-lobe projection neurons encodes the behaviorally effective ratio of sex-pheromone components in male *Manduca sexta*. *J Comp Physiol A* 199:963-979
- Lei H, Chiu H-Y, Hildebrand JG (2013) Responses of protocerebral neurons in male *Manduca sexta* to sex-pheromone mixtures. *J Comp Physiol A* 199:997-1014
- Goldman-Huertas B, Mitchell RF, Lapoint RT, Faucher CP, Hildebrand JG, Whiteman NK (2015) Evolution of herbivory in Drosophilidae linked to loss of behaviors, antennal responses, odorant receptors and ancestral diet. *Proc Natl Acad Sci USA* 112:3026-3031
- Mitchell RF, Hall LP, Reagel PF, McKenna DD, Baker TC, Hildebrand JG (2017) Odorant receptors and antennal lobe morphology offer a new approach to understanding olfaction in the Asian longhorned beetle. *J Comp Physiol A* 203:99-109
- Wilson JK, Tseng AS, Potter KA, Davidowitz G, Hildebrand JG (2017) The effects of the alkaloid scopolamine on the performance and behavior of two caterpillar species. *Arthropod-Plant Interactions*, <https://doi.org/10.1007/s11829-017-9548-y>

### **Reviews, Chapters, and Published Lectures**

- Hildebrand JG (1974) Acetylcholine and choline. In: Bergmeyer HU (ed) *Methods of Enzymatic Analysis*, vol 4. Berlin, Verlag Chemie, pp 1819-1824
- Hildebrand JG, Kravitz EA (1974) Transmitter biochemistry of single, identified neurons. In: Richter D (ed) *Lipmann Symposium: Energy, Biosynthesis and Regulation in Molecular Biology*. Berlin, deGruyter Verlag, pp 298-307
- Hildebrand JG, Maxwell GD (1980) Neurochemical explorations of the central nervous system of the moth *Manduca sexta* and especially of the antennal and visual pathways. In: *Insect Neurobiology and Pesticide Action (Neurotox 79)*. London, Soc Chem Ind, pp 101-107
- Hildebrand JG, Matsumoto SG, Camazine SM, Tolbert LP, Blank S, Ferguson H, Ecker V (1980) Organisation and physiology of antennal centres in the brain of the moth *Manduca sexta*. In: *Insect Neurobiology and Pesticide Action (Neurotox 79)*. London, Soc Chem Ind, pp 375-382
- Hildebrand JG (1980) Development of putative acetylcholine receptors in normal and deafferented antennal lobes during metamorphosis of *Manduca sexta*. In: Sattelle D, Hall LM, Hildebrand JG (eds) *Receptors for Neurotransmitters, Hormones and Pheromones in Insects*. Amsterdam, Elsevier/North Holland, pp 209-220
- Hildebrand JG (1982) Chemical signalling in the insect nervous system. In: *Neuropharmacology of Insects* (Ciba Foundation Symposium 88). London, Pitman, pp 5-11
- Hildebrand JG, Matsumoto SG, Tolbert LP, Schneiderman AM, Camazine SM (1982) Postembryonic development of the antennal lobes in the moth *Manduca sexta*. In: Goodman CS, Pearson KG (eds) *Neuronal Development: Cellular Approaches in Invertebrates*. *Neurosci Res Prog Bull* 20:891-900

- Hildebrand JG, Kent KS, Harrow ID, Camazine SM, Montague RA, Quartararo P, Imperato M (1984) Functional organization of chemical-sensory pathways in larval and adult *Manduca sexta*. In: Borkovec AB, Kelly TJ (eds) *Insect Neurochemistry and Neurophysiology*. New York, Plenum, pp 377-380
- Kingan TG, Hildebrand JG (1985) Screening and assays for neurotransmitters in the insect nervous system. In: Breer H, Miller TA (eds) *Neurochemical Techniques in Insect Research*. Berlin, Springer Verlag, pp 1-24
- Hoskins SG, Homberg U, Kingan TG, Hildebrand JG (1985) Neurochemical anatomy of the brain of the sphinx moth *Manduca sexta*. In: *Neuropharmacology and Pesticide Action (Neurotox 85)*. London, Soc Chem Ind, pp 84-87
- Hildebrand JG (1985) Metamorphosis of the insect nervous system: influences of the periphery on the postembryonic development of the antennal sensory pathway in the brain of *Manduca sexta*. In: Selverston A (ed) *Model Neural Networks and Behavior*. New York, Plenum, pp 129-148
- Schneiderman AM, Hildebrand JG (1985) Sexually dimorphic development of the insect olfactory pathway. *Trends Neurosci* 8:494-499
- Hildebrand JG, Montague RA (1986) Functional organization of olfactory pathways in the central nervous system of *Manduca sexta*. In: Payne TL, Birch MC, Kennedy CEJ (eds) *Mechanisms in Insect Olfaction*. Oxford, Oxford Univ Press, pp 279-285
- Hildebrand JG, Homberg U, Kingan TG, Christensen TA, Waldrop BR (1986) Neurotransmitters and neuropeptides in the olfactory pathway of the sphinx moth *Manduca sexta*. In: Borkovec AB, Gelman DB (eds) *Insect Neurochemistry and Neurophysiology 1986*. Clifton, NJ, The Humana Press, pp 255-258
- Hildebrand JG (1987) From semiochemical to behavior: olfaction in the sphinx moth *Manduca sexta*. In: Law JH (ed) *Molecular Entomology*. New York, Alan R. Liss, pp 21-31
- Christensen TA, Hildebrand JG (1987) Functions, organization, and physiology of the olfactory pathways in the lepidopteran brain. In: Gupta AP (ed) *Arthropod Brain: Its Evolution, Development, Structure and Functions*. New York, John Wiley, pp 457-484
- Hildebrand JG (1987) *Manduca* metamorphosis: postembryonic development and reorganization of neurons and behavior. In: Easter SS, Reichardt LF (eds) *1987 Short Course 1 Syllabus. The Roles of Cell Lineage and Epigenetic Factors in Neuronal Development*. Washington, DC, Society for Neuroscience, pp 82-93
- Christensen TA, Hildebrand JG (1987) Pheromonal information coding by projection neurons in the antennal lobes of the sphinx moth *Manduca sexta*. In: Roper SD, Atema J (eds) *Olfaction and Taste IX*. *Ann NY Acad Sci* 510:224-228
- Hildebrand JG (1988) Summing up and looking ahead -- Insect neurobiology and the future of pest control. In: Lunt GG (ed) *Neurotox '88, Molecular Basis of Drug & Pesticide Action*. Amsterdam, Excerpta Medica, Elsevier, pp 583-588
- Homberg U, Christensen TA, Hildebrand JG (1989) Structure and function of the deutocerebrum in insects. *Annu Rev Entomol* 34:477-501
- Hildebrand JG (1989) Mechanisms of olfactory control of moth behavior. In: Erber J, Menzel R, Pflüger H-J, Todt D (eds) *Neural Mechanisms of Behavior - Proceedings of the 2nd International Congress of Neuroethology*. Stuttgart, Georg Thieme Verlag, pp 241-242

- Christensen TA, Hildebrand JG (1990) Representation of sex-pheromonal information in the insect brain. In: Døving KB (ed) *ISOT X. Proceedings of Tenth International Symposium on Olfaction and Taste*. Oslo, University of Oslo, pp 142-150
- Kanzaki R, Shibuya T, Arbas EA, Hildebrand JG (1991) Neural processing of the higher order neurons in the olfactory pathways of the insect brain: responses and pathways of olfactory descending neurons. In: *Proceedings of the 25th Japanese Symposium on Taste and Smell*, Japanese Association for the Study of Taste and Smell (JASTS), pp 77-80
- Hildebrand JG, Christensen TA, Arbas EA, Hayashi JH, Homberg U, Kanzaki R, Stengl M (1992) Olfaction in *Manduca sexta*: cellular mechanisms of responses to sex pheromone. In: Duce IR (ed) *Proceedings of NEUROTOX 91 - Molecular Basis of Drug & Pesticide Action*. London, Elsevier Applied Science, pp 323-338
- Hildebrand JG, Christensen TA, Harrow ID, Homberg U, Matsumoto SG, Waldrop BR (1992) The roles of local interneurons in the processing of olfactory information in the antennal lobes of the moth *Manduca sexta*. In: *Proceedings of the Seventh International Symposium on Invertebrate Neurobiology* (Tihany, Hungary). Acta Biologica Hungarica 43:167-174
- Christensen TA, Hildebrand JG (1994) Neuroethology of sexual attraction and inhibition in heliothine moths. In: Schildberger K, Elsner N (eds) *Neural Basis of Behavioral Adaptations*, Fortschr Zool 39, Stuttgart, New York, Gustav Fischer Verlag, pp. 37-46
- Hildebrand JG, Hayashi JH, Kloppenburg P, Mercer A, Sun XJ, Christensen TA (1994) Serotonin in the antennal lobe of *Manduca sexta*: possible function as a neuromodulator. In: Borkovec AB, Loeb MJ (eds) *Insect Neurochemistry and Neurophysiology 1993*. Boca Raton, FL, CRC Press, Inc., pp 133-136
- Hildebrand JG, Christensen TA (1994) Olfactory mechanisms underlying processing of sex-pheromonal information in moths. In: Kurihara K, Suzuki N, Ogawa H (eds), *Olfaction and Taste XI -- Proceedings of ISOT XI / JASTS XXVII*. Tokyo, Springer-Verlag, pp. 827-830
- Hildebrand JG (1995) Analysis of chemical signals by nervous systems. Proc Natl Acad Sci USA 92:67-74
- Christensen TA, Hildebrand JG (1995) Neural regulation of sex-pheromone glands in Lepidoptera. Invert Neurosci 1:97-103
- Hildebrand JG (1996) King Solomon Lecture -- Olfactory control of behavior in moths: central processing of odor information and the functional significance of olfactory glomeruli. J Comp Physiol A 178:5-19
- Hildebrand JG, Christensen TA (1996) Olfactory mechanisms underlying sex-pheromonal information processing in moths. In: Koike H, Kidokoro Y, Takahashi K, Kanaseki T (eds), *Basic Neuroscience in Invertebrates*. Tokyo, Japan Scientific Societies Press, pp. 357-362
- Hildebrand JG, Shepherd GM (1997) Mechanisms of olfactory discrimination: converging evidence for common principles across phyla. Annu Rev Neurosci 20:595-631
- Hildebrand JG (1997) Sensory processing of pheromone signals. In: Cardé R, Minks A (eds), *Pheromone Research: New Directions*. New York, Chapman and Hall, pp 111-114
- Hildebrand JG, Rössler W, Tolbert LP (1997) Postembryonic development of the olfactory system in the moth *Manduca sexta*: primary-afferent control of glomerular development. Sem Cell Devel Biol 8:163-170

- Heinbockel T, Hildebrand JG (1997) Processing of intensity and temporal structure of pheromonal signals in the brain of the sphinx moth, *Manduca sexta* (L.). *Mitt Dtsch Ges Allg Angew Ent* 11:501-504
- Vickers NJ, Christensen TA, Hildebrand JG (1998) Primary processing of pheromone odours. *The Biochemist*: August 1998, pp 22-25
- Christensen TA, Waldrop BR, Hildebrand JG (1998) GABAergic mechanisms that shape the temporal response to odors in moth olfactory projection neurons. In: Murphy C (ed), *Olfaction and Taste XII*. Ann NY Acad Sci 855: 475-481
- Heinbockel T, Hildebrand JG (1998) Neuronale Mechanismen der Pheromonverarbeitung in den Antennalloben des Tabakaszümmers *Manduca sexta* (L.) (Lepidoptera: Sphingidae). *Verh Westd Entom Tag* 8:195-205
- Vickers NJ, Christensen TA, Hildebrand JG (1999) Integrating behavior with neurobiology: odor-mediated moth flight and olfactory discrimination by glomerular arrays. *Integrative Biology* 1:224-230
- Hildebrand JG, Christensen TA, Heinbockel T, King JR, Mechaber W, Rössler W, Selchow K, Shields VDC (1999) The olfactory neurobiology of host- and mate-attraction in moths. In: Elsner N, Eysel U (eds), *From Molecular Neurobiology to Clinical Neuroscience (Proc 1st Göttingen Conference of the German Neuroscience Society 1999 & 27th Göttingen Neurobiology Conference)*, Vol. I. Stuttgart: Thieme, pp 56-67
- Heinbockel T, Hildebrand JG (2000) Cellular mechanisms of odor processing in the antennal lobes of the sphinx moth, *Manduca sexta* (L.). *Mitt Dtsch Ges Allg Angew Ent* 12:549-553
- Hildebrand JG (2001) From molecule to perception: five hundred million years of olfaction, *IUBS Biology International* no. 41, pp 41-52
- Shields VDC, Hildebrand JG (2001) Recent advances in insect olfaction, specifically regarding the morphology and sensory physiology of antennal sensilla of the female sphinx moth *Manduca sexta*. *Microscopy Res & Technique* 55:307-329
- Christensen TA, Hildebrand, JG (2002) Electrophysiological analysis of olfactory coding in the CNS., Chapter 13 in Nicolelis MAL and Simon SA (eds) *Methods and Frontiers in Chemosensory Research*, part of CRC Series: Methods and Frontiers in Neuroscience. Boca Raton: CRC Press, pp 325-337
- Christensen TA, Hildebrand, JG (2002) Pheromonal and host-odor processing in the insect antennal lobe: how different? *Curr Opin Neurobiol* 12:393-399
- Pawlowski VM, Christensen TA, Lei H, Hildebrand JG (2005) A primer on multichannel neural ensemble recording in insects, Chapter 14 in Christensen TA (ed) *Methods in Insect Sensory Neuroscience*, Boca Raton: CRC Press, pp 393-415
- Guerenstein PG, Hildebrand JG (2008) Effects and roles of environmental carbon dioxide for insects. *Annu Rev Entomol* 53:161-178
- Dacks AM, Guerenstein PG, Reisenman CE, Riffell JA, Lei H, Hildebrand JG (2009). Olfaction in invertebrates: *Manduca*. In: Squire LR (ed). *Encyclopedia of Neuroscience*, Vol. 7, pp 49-57. Oxford: Academic Press
- Lei H, Oland LA, Riffell JA, Beyerlein A, Hildebrand JG (2010) Implications from microcircuits of a moth antennal lobe for olfactory information processing. Chapter 42, pp 417-426, in: Shepherd G, Grillner S (eds) *Handbook of Brain Microcircuits*. Oxford U Press

- Martin JP, Hildebrand JG (2010) Innate recognition of pheromone and food odors in moths: a common mechanism in the antennal lobe? *Front Behav Neurosci* 4:159. doi:10.3389/fnbeh.2010.00159
- Martin JP, Beyerlein A, Dacks AM, Reisenman CE, Riffell JA, Lei H, Hildebrand JG (2011) The neurobiology of insect olfaction: sensory processing in a comparative context. *Prog Neurobiol* 95:427-447
- Riffell JA, Hildebrand JG (2016) Adaptive processing in the insect olfactory system. In: von der Emde G, Warrant E (eds) *The Ecology of Animal Senses*. pp 3-24. Springer
- Lei H, Oland LA, Riffell JA, Beyerlein A, Hildebrand JG (2018) Implications from microcircuits of a moth antennal lobe for olfactory information processing [updated version]. in: Shepherd G, Grillner S (eds) *Handbook of Brain Microcircuits*. Oxford U Press

### **Book Reviews**

- Hildebrand JG (1977) review of Tower DB (ed) *The Nervous System*. *Science* 196:419-420
- Hildebrand JG (1978) review of Triggler DJ, Triggler CR *Chemical Pharmacology of the Synapse*. *Quart Rev Biol* 53:349
- Hildebrand JG (1981) review of Kurstak E et al. (eds) *Invertebrate Systems in Vitro*. *Trends Neurosci* 4:XXVIII
- Hildebrand JG (1983) review of Cowan WM (ed) *Studies in Developmental Neurobiology: Essays in Honor of Viktor Hamburger*. *BioScience* 33:133
- Hildebrand JG (1982) review of Bachelard HS *Brain Biochemistry*, 2nd edition. *Trends Neurosci* 5:365-366
- Hildebrand JG (1983) review of Lahue R (ed) *Methods in Neurobiology*. *Trends Neurosci* 6:65-66
- Hildebrand JG (1986) review of Bradford HF *Chemical Neurobiology*. *Science* 233:1101-1102
- Hildebrand JG (1987) review of Kandel ER, Schwartz JH (eds) *Principles of Neural Science*, 2nd edition. *Quart Rev Biol* 62:117-118
- Hildebrand JG (1987) review of Clark JM, Matsumura F (eds) *Membrane Receptors and Enzymes as Targets of Insecticidal Action*. *Quart Rev Biol* 62:309-310
- Hildebrand JG (1987) review of Finger TE, Silver WL (eds) *Neurobiology of Taste and Smell*. *Science* 237:203
- Hildebrand JG (2005) review of Wyatt TD *Pheromones and Animal Behaviour*; *Quart Rev Biol* 80:144

### **Miscellaneous Publications**

- Hildebrand JG (1990) A remembrance of Steve Kuffler. In: McMahan UJ (ed) *Steve - Remembrances of Stephen W. Kuffler*. Sunderland, MA, Sinauer Associates, pp. 87-89
- Hildebrand JG, Eisner T (1996) Vincent Gaston Dethier (obituary). *Proc Am Philosophical Soc* 140:221-226
- Hildebrand JG (1998) Kenneth Roeder: an appreciation. In: Roeder KD *Nerve Cells and Insect Behavior* (revised edition). Cambridge, MA, Harvard Univ Press, pp v-viii

- Hildebrand JG (1998) Vincent G. Dethier and chemosensory control of insect behavior. *American Entomologist* 44:179-187
- Hildebrand JG (1999) Foreword to Hansson BS (ed) *Insect Olfaction*. Berlin, Springer, pp vii-viii
- Nighorn A, Hildebrand JG (2002) Dissecting the molecular mechanisms of olfaction in a malaria-vector mosquito. *Proc Natl Acad Sci USA* 99:1113-1114
- Eisner T, Meinwald J, Hildebrand J (2004) Bugs, behavior, and biomolecules: the naturalist's guide to the future. *Bull Am Acad Arts & Scis* summer 2004, pp 26-31\
- Gelperin A, Hildebrand JG, Eisner T (2006) Vincent Gaston Dethier, 1915-1993 – A Biographical Memoir. *Biographical Memoirs, Natl Acad Sci USA*
- Meinwald J, Hildebrand JG (2011) Teaching science appreciation. *Science* 331:1010-1011
- Wild GC, Hildebrand JG (2014) Dilworth W. Woolley, 1914-1966 – A Biographical Memoir. *Biographical Memoirs, Natl Acad Sci USA*
- Hildebrand JG (2014) Toward breadth in baccalaureate education. Commentary in *Academy Data Forum*, American Academy of Arts & Sciences, <https://www.amacad.org/content/research/dataForumEssay.aspx?i=1571>
- Huete-Pérez J, Hildebrand J (2020) Nicaragua's COVID-19 crisis demands a response. *Science* 369:385  
DOI: 10.1126/science.abd4975
- Nishi R, Ford BD, Hildebrand JG (2020) Retrospective: James G. Townsel (1935-2020). *Science* 369:925

#### **Publications by Coworkers Resulting Mainly or Entirely from Research in my Laboratory**

- Nelson MC (1979) Sound production in the cockroach *Gromphadorhina portentosa*: the sound-producing apparatus. *J Comp Physiol* 132:27-38
- Nelson MC, Fraser J (1980) Sound production in the cockroach, *Gromphadorhina portentosa*: evidence for communication by hissing. *Behav Ecol Sociobiol* 6:305-314
- Kingan TG (1984) Development of GABA levels in the CNS of *Manduca sexta*. In: Borkovec AB, Kelly TJ (eds) *Insect Neurochemistry and Neurophysiology*. New York, Plenum, pp 405-407
- Kingan TG, Hishinuma A (1986) Transport and metabolism of L-glutamic acid by abdominal ganglia of the hawk moth *Manduca sexta*. *Comp Biochem Physiol* 87c:9-14
- Davis NT, Lehman H (1989) A vasopressin-like neurohemal system *Lymantria dispar* and *Manduca sexta*. In: Borkovec AB, Masler EP (eds) *Insect Neurochemistry and Neurophysiology 1989*. Clifton, NJ, Humana, pp 447-450
- Smith BH, Abramson CI, Tobin TR (1991) Conditional withholding of proboscis extension in honey bees (*Apis mellifera*) during discriminative punishment. *J Comp Psychol* 105:345-356
- Hanneman EH, Kanost MR (1992) Differential Alaserpin expression during development of the antennae in the tobacco hawkmoth *Manduca sexta*. *Arch Insect Biochem Physiol* 19:39-52



- Mitchell BK, Itagaki H (1992) Interneurons of the subesophageal ganglion of *Sarcophaga bullata* responding to gustatory and mechanosensory stimuli. *J Comp Physiol A* 171:213-230
- Stengl M (1993) Intracellular-messenger-mediated cation channels in cultured olfactory receptor neurons. *J Exp Biol* 178:125-147
- Oland LA, Hayashi JH (1993) Effects of the steroid hormone 20-hydroxyecdysone and prior sensory input on the survival and growth of moth central olfactory neurons *in vitro*. *J Neurobiol* 24:1170-1186
- Kloppenborg P, Ferns D, Mercer AR (1999) Serotonin enhances central olfactory neuron responses to female sex pheromone in the male sphinx moth *Manduca sexta*. *J Neurosci* 19:8172-8181
- Christensen TA, White J (2000) Representation of olfactory information in the brain. In: Finger TE, Silver WL, Restrepo D (eds) *The Neurobiology of Taste and Smell*, 2nd Ed., NY, Wiley-Liss, pp 201-232
- Kloppenborg P, Heinbockel T (2000) 5-Hydroxytryptamine modulates pheromone-evoked local field potentials in the macroglomerular complex of the sphinx moth *Manduca sexta*. *J Exp Biol* 203:1701-1709
- Riffell JA, Alarcón R, Abrell L (2008) Floral trait associations in hawkmoth-specialized and mixed pollination systems. *Communicative & Integrative Bio* 1:6-8.
- Strausfeld N, Reisenman CE (2009) Dimorphic olfactory lobes in the Arthropoda. *Ann NY Acad Sci* 1170:487-496
- Ribeiro JM, Assumpção TC, Pham VM, Francischetti IM, Reisenman CE (2012) An insight into the sialotranscriptome of *Triatoma rubida* (Hemiptera: Heteroptera). *J Med Entomol* 49:563-572
- Reisenman CE, Riffell JA, Duffy K, Pesque A, Mikles D, Goodwin B (2013) Species-specific effects of herbivory on the oviposition behavior of the moth *Manduca sexta*. *J Chem Ecol* 39:76-89
- Reisenman CE, Lee Y, Gregory T, Guerenstein PG (2013) Effects of starvation on the olfactory responses of the blood-sucking bug *Rhodnius prolixus*. *J Insect Physiol* 59:717-721