

## FRED GOULD

### ACADEMIC RANK

University Distinguished Professor  
W. N. Reynolds Professor of Entomology  
Member of Graduate Faculty

### DATE/PLACE OF BIRTH

April 19, 1949  
New York City, New York

### SPECIALIZATION AND AREAS OF INTEREST

Research: Application of principles of ecology and evolutionary biology to the solution of agricultural problems and alleviation of insect-borne human diseases. Basic research on the ecology and evolution of insect diversity.

### CURRENT TEACHING (2014-2016):

GES 506/ENT791- Genetic Pest Management (with Scott, Lorenzen)  
GES 591-002- Genetic Engineering and Society Colloquium (weekly—each semester)  
GES 591-501- Pest Issues in Developing Countries (with Haenn and Delborne)  
REL 471/571 Darwinism and Christianity (three lectures)  
Single lectures in other NCSU courses

### EDUCATION

H.S. - Jamaica High School, Queens, N.Y. 1967  
B.S. - Queens College, City University of New York, 1971. Biology  
Ph.D. - State University of New York at Stony Brook, New York, 1977. Ecology & Evolutionary Biology

### PROFESSIONAL EXPERIENCE

1973-77 Teaching Assistant, SUNY at Stony Brook  
1977-78 Research Fellow, National Science Foundation  
1978-79 Research Associate, Dept. Entomology, N.C. State Univ., Raleigh  
1979-85 Assistant Professor, Dept. Entomology, N.C. State Univ., Raleigh  
1985-89 Associate Professor, Dept. Entomology, N.C. State Univ., Raleigh  
1990-93 Professor, Dept. Entomology, N.C. State Univ., Raleigh  
1993-Present - Reynolds Professor, Dept. of Entomology, N.C. State Univ., Raleigh  
2002-Present- Adjunct Professor, Dept. of Genetics, N.C. State Univ., Raleigh  
2011-Present- University Distinguished Professor

### PROFESSIONAL SOCIETIES

Entomological Society of America  
Entomological Society of North Carolina  
Society for the Study of Evolution  
Sigma Xi

### HONORS, AWARDS, CONSULTANTSHIPS, ADVISORY PANELS

Keynote address: Gordon Research Conference on Plant-Herbivore Interactions. 2017  
Plenary Address: International Congress of Entomology  
National Academy of Sciences, National Research Council. Chair of Committee on Genetically Engineered Crops: Experiences and Prospects. 2014-2016  
National Research Council, member of Board on Agriculture and Natural Resources 2014-Present  
Received Founders' Memorial Award from Entomological Society of America 2014  
Received NCSU Borlaug Award for Service to Society and Environment 2013  
Received O. Max Gardner Award --UNC faculty member with greatest contribution to human welfare 2012  
Elected to the National Academy of Sciences 2011  
Elected as Fellow of AAAS 2011  
Received NCSU Holladay Medal--Career achievements and contributions to NCSU 2011  
Tar Heel of the Week 2011 (NC citizen award)  
Sigma Xi George Bugliarello Prize for article on genetic control of human disease vectors 2007  
Annual Gates Foundation Grand Challenges meeting Co-organizer Modeling workshop 2007  
National Evolutionary Synthesis Center (NSF) Proposal review committee 2005-2008.

National Research Council NAS—Report Review Coordinator 2003, 2006, 2009  
 Entomological Society of America—Selection Committee for Fellows 2005-2008  
 Selection committee for Reynolds professors—Chair 2005  
 Alexander Von Humboldt Award --for most important agricultural research over 5-year period, 2004  
 National Science Foundation Grants review panel member-population biology. 2004  
 National Academy of Sciences—Selected as National Associate, 2003  
 Entomological Society of America—Selected as Fellow 2003  
 Univ. Arizona, Dept. Entomology, External Reviewer, 2002  
 National Academy of Sciences, National Research Council. Committee on Environmental Effects of Commercialization of Transgenic Plants, Chair, 2000-2002  
 Conference of American Catholic Bishops, Scientific Consultant on Transgenic Crops, 2000  
 National Academy of Sciences, National Research Council. Committee to develop recommendations on “Genetically Modified Pest Protected Crops” 1999-2000  
 US State Department, Undersecretary for Global Affairs. Briefing on scientific assessment of risks associated genetically engineered crops, 1999  
 University of Wisconsin, external reviewer of Department of Entomology, 1999  
 North Carolina Entomological Society. Award for Excellence, 1998  
 National Academy of Science, NRC, Committee to develop recommendations on “The Future Role of Pesticides in American Agriculture,” 1998-1999  
 EPA Science Advisory Subcommittee on Resistance Management, 1998,1999, 2000, 2002, 2009, 2010  
 World Bank/CGIAR. Consultant on genetically engineered crops, 1996-97  
 Annual Review of Entomology. Editorial Committee, 1996-present  
 USDA-ARS. Co-organizer of National Workshop on Bt-Resistance Management, 1996  
 Entomological Society of America. Award for Excellence in IPM Research, 1996  
 National Academy of Science-National Research Council. Committee to Develop Recommendations for Enhancing Biological Control and Bio-based Control, 1992-1995  
 Ecological Society of America, Associate Editor for *Ecological Applications*, 1992-1995; 1999-2003  
 William Neal Reynolds Professorship. Distinguished Professor appointment based on research accomplishments and leadership, 1993  
 Rockefeller Foundation, Bellagio Conference: Biotechnology and Integrated Pest Management for Developing Countries, 1993.  
 International Centre of Insect Physiology and Ecology (ICIPE), Kenya. Consultant, Charged to examine the future role of biotechnology in pest management programs of developing countries, 1992-1993  
*American Scientist* (Sigma Xi), Book review consultant, 1991-1999  
 USDA National Research Initiative, Manager of Competitive Grants Panel for Entomology/Nematology. Coordinated Review of over 250 research proposals, 1991-1992  
 Office of Technology Assessment for the U.S. Congress (OTA), Consultant-Writer. Evolution of Resistance to Toxic Compounds by Arthropods, Weeds, and Pathogens, 1991.  
 International Rice Research Institute (IRRI) - Consultant and participant in the Rice Biotechnology Project, 1990-present  
 Environmental Protection Agency (EPA), Science Advisory Panel, Subcommittees:  
     Biotechnology Risk Assessment, 1988  
     Ecological Mapping of the U.S., 1990  
     Genetically Engineered Crops, 1992  
 USDA-ARS Agricultural Biotechnology Research Advisory Committee (ABRAC), Member. Charged with developing scientifically based guidelines for assessing and reducing risks associated with field release of genetically engineered organisms, 1988-1990  
 N.C. Advisory Committee on Biotechnology in Agriculture, Member. Charged with developing state regulations for engineered organisms, 1988-1990  
 Office of Technology Assessment for the U.S. Congress (OTA), Consultant-Writer, Genetics of Host Range, 1987.  
 WRCC-60 Pesticide Resistance Committee, Member. Charged with coordinating research on weed, insect, and pathogen resistance to pesticides, 1986-present  
 CRC Press, Scientific Advisor for series on Plant-Insect Interactions, 1986-1993  
 Entomological Society of Canada, Associate Editor, The Canadian Entomologist, 1985-1991  
 USDA Competitive Grants Program, Panel Member for reviewing Entomology Grants, 1985  
 Entomological Society of America, Arthropod Resistance Management Committee, Member, 1984-present  
 Sigma Xi, Outstanding Young Researcher Award, 1984  
 National Academy of Science. Meeting to assess the status and potential for pesticide resistance management, 1984

Society for the Study of Evolution. National meeting. Organized a workshop on "Evolutionary Studies in Agricultural Systems," 1982

National Science Foundation, National Needs Postdoctoral Fellowship, 1977

Ohio State University. Acarology Program Scholarship, 1974

Phi Beta Kappa, 1972

GRANTS AND MEMOS OF AGREEMENT RECEIVED

NSF	\$ 13,000	1977-78	The relationship between mixed function oxidase activity and adaptation to secondary plant compounds.
NSF	\$ 600,000	1977-78	The differential effects of agroecosystem structures on the population dynamics of selected arthropod species and guilds (with R.L. Rabb and R.E. Stinner).
NSF	\$ 101,000	1983-86	The genetic structure of adaptation to host plant defenses in <i>Heliothis</i> species.
USDA	\$ 90,000	1984-87	Assessing the utility of natural feeding deterrents in alleviating crop stress (Competitive Grants Program)
NC Tobacco Foundation	\$ 24,000	1979-84	The ecology and behavior of tobacco wireworms (4 successive one-year grants)
NC Corn	\$ 8,000	1981-83	Effects of no-till agriculture on insect Growers Assoc. pests of corn (with J. Van Duyn and J.R. Bradley Jr.)
NC Corn	\$ 14,000	1982-84	The ecology and behavior of wireworms Growers Assoc. affecting corn production (3 successive one-year grants)
Merck Co.	\$ 2,000	1985	Chronic effects of avermectin on <i>Heliothis virescens</i> larvae.
USDA	\$120,000	1985-88	Assessing the genetic potential of <i>Heliothis</i> spp. to adapt to resistant cotton cultivars (Competitive Grants Program)
NAIAP	\$ 14,000	1988-89	Developing resistance management tactics for <i>Heliothis</i> spp. in cotton-soybean systems (with R. Leidy).
NC Biotech Center	\$ 4,000	1988	Conference on ecological and social issues in agricultural bioengineering (held at N.C. State Univ.).
NC Biotech Center	\$ 23,000	1988-89	Ecological-genetic approaches for the design of genetically engineered crops.
USDA	\$180,000	1988-91	Ecological-genetic approaches for the design of genetically engineered crops. (Competitive Grants Program)
NC Tobacco Foundation	\$ 7,000	1989-90	Combined efficacy of bioengineered tobacco and natural enemies.
NC Tobacco Foundation	\$ 7,000	1990-91	Combined efficacy of bioengineering tobacco and natural enemies.
USDA, IPM	\$ 58,000	1990-92	Combined efficacy of natural enemies and pesticidal plants.
Rockefeller Foundation	\$ 93,000	1990-92	Ecological approaches for engineering rice resistance to stem borers
USDA	\$210,000	1991-94	Effects of natural enemies on pest adaptation to resistant crops (with G. Kennedy) (Competitive Grants Program)

USDA, IPM	\$ 68,000	1992-94	Deployment patterns of engineered crops and pest/parasite population dynamics
Ciba-Geigy	\$ 15,000	1993-94	Resistance management strategies for transgenic pesticidal plants
NCSU/NSF	\$ 50,000	1993-94	Resistance management strategies for transgenic pesticidal plants
USDA Coop. Agreement	\$ 16,700	1993-94	Assessing the utility of mixtures of Bt-expressing potatoes and conventional potatoes
Nova Nordisk	\$ 11,000	1994	Efficacy of new Bt isolates against resistant insects
Monsanto	\$ 6,000	1995	Testing transgenic Bt cotton against strains of the tobacco budworm
USDA Coop.	\$ 18,400	1994-95	Impacts of interactions between plant mixtures and predators on potato beetle adaptation to <i>Bt</i> toxins
USDA	\$225,000	1994-97	Analysis and monitoring of <i>Bt</i> -resistance genes in <i>Heliothis virescens</i> (Competitive Grants Program)
NCSU/NSF IPM	\$ 15,000	1996-97	Toward the development of invisible crops
USDA	\$200,000	1996-99	Genetic analysis of host range differences between two <i>Heliothis</i> species
CIPM (Mycogen)	\$ 67,000	1995-98	Search for resistance-breaking strains of Bt
Abbott Labs	\$ 8,000	1997	Impacts of spore/crystal mixtures on Bt resistance
Monsanto	\$ 54,994	1997-98	Corn earworm resistance development and management in multiple crop environments (with J. VanDuyn, GG Kennedy, S. Peck, N. Storer)
USDA	\$200,000	1996-99	Genetic analysis of host range differences between two <i>Heliothis</i> species.
Mycogen	\$ 50,000	1999	A novel approach for screening new Bt isolates
Monsanto	\$ 12,000	1999	Assessing new Bt cotton cultivars with Bt resistant <i>Heliothis virescens</i>
Monsanto	\$30,000	2000	Corn earworm resistance development and management in multiple crop environments
USDA-Risk	\$225,000	1999-2002	Assessing the risk of bollworm adaptation to Bt crops by stable Assessment isotope analysis
NSF	\$195,000	2000-2002	Genetics of differences in host range of a generalist and specialist herbivore
USDA	\$200,000	2001-2004	Genetics of Heliothine resistance to <i>Bacillus thuringiensis</i> and its toxins
NSF	\$222,000	2003-2005	Evolution of insect sexual communications systems (with C. Schal)
USDA	\$210,000	2003-2005	Genetics of host range in the polyphagous pest, <i>Heliothis virescens</i>
North Carolina	\$120,000	2004-2007	Upgrading the capabilities of the CALS facility for DNA marker

Biotechnology Center			research (PI—FG with 6 Co-PI's)
NIH	\$1,300,000	2004-2010	Population genetics of transgenes in insect vectors. (PI—FG with 3 collaborators)
Iowa Farm Bureau	\$50,000	2007-2008	Resistance management of <i>Helicoverpa armigera</i> in China (with Kongming Wu)
USDA-NRI	\$389,000	2006-2010	Identifying genes that alter moth sexual communication: A combined QTL/candidate gene approach
USDA-BRAG	\$210,000	2006-2009	Assessing the risk of cross-resistance to diverse Bt toxins
NSF	\$409,000	2005-2009	Evolution of moth sexual communication systems (with Coby Schal)
Gates Foundation/FNIH	\$19,000,000	2005-2012	Genetic strategies for control of dengue virus transmission (our subcontract about \$385,000)
NSF	\$696,500	2010-2014	The genetic basis for evolution of moth sexual communication systems
NIH	\$1,350,000	2011-2017	Improving Robustness of a Tactical Model of Aedes/Dengue dynamics (PI—FG with 3 collaborators)
USDA	\$499,999	2012-2016	Genomic Approaches for Bt Resistance Risk Assessment and Improvement of Regulatory Triggers
NSF	\$50,000	2015-2016	Gene Drives: A Deliberative Workshop to Develop Frameworks for Research and Governance (PI J. Kuzma, CoPI Gould)
NSF	\$3,000,000	2011-2018	Genetic Engineering and Society: The case of transgenic pests (Director-FG with 4 Co-PIs)
W. M. Keck Foundation	\$1,000,000	2014-2017	Evolutionary Consequences of Invasions of Novel Genotypes and Selfish Genetic Elements. (PI A. A. James (UCI), Co-PI F. Gould)
USDA	\$225,000 for NCSU \$499,000 NCSU-sub-\$235,000	2016-2019	Improving Bt Risk Assessment and Management by Genomic Monitoring (PI Megan Fritz (UMD) Co-PI Gould)

**GRADUATE STUDENT ADVISORY: (\* = students and postdocs who had co-advisors)**

Name	Degree	Date	Current Occupation
Joyner, Kimberly	M.S.	1982	Scientific writer Thesis: "Developmental consequences of cannibalism in <i>Heliothis zea</i> Boddie (Lepidoptera: Noctuidae) on suboptimal diet."
Villani, Michael	Ph.D.	1984	Assoc. Prof., Cornell Univ. (deceased) Thesis: "Feeding and movement patterns of wireworms in response to biotic and abiotic factors."
Meinke, Lance	Ph.D.	1984	Prof., Univ. Nebraska Thesis: "Phenology and ovipositional ecology of the southern corn rootworm, <i>Diabrotica undecimpunctata howardi</i> Barber, in eastern North Carolina."
Waldvogel, Mike	Ph.D.	1986	N.C.S.U., Extension Specialist & Extension Prof. Thesis: "Genetic variation in oviposition preference in <i>Heliothis virescens</i> (F.) (Lepidoptera: Noctuidae)."
Nalepa, Christine	Ph.D.*	1987	N.C. Dept. Agric., Research Sci. Thesis: "Life history studies of the woodroach <i>Cryptocercus punctulatus</i> Scudder (Dictyoptera: Cryptocercidae) and their implications for the evolution of termite eusociality."
Landis, Douglas	M.S.*	1984	Thesis: "Effects of no-tillage corn and soybean production on the behavior, development and survival of <i>Heliothis zea</i> (Boddie) prepupae and pupae."

- Landis, Douglas Ph.D. 1986 Prof., Michigan State University  
Thesis: "Assessing the utility of the feeding deterrent approach to crop protection."
- Suiter, Karl Ph.D. 1991 Associate Director NSF/NCSU Center for IPM,  
Thesis: "Variation in behavioral response and physiological resistance to residues of four synthetic pesticides in six populations of the twospotted spider mite, *Tetranychus urticae* Koch (Acari: Tetranychidae)."
- Follett, Peter Ph.D.\* 1993 Research Scientist, USDA  
Thesis: "Insecticide resistance management in the Colorado potato beetle."
- Sheck, Amy Ph.D. 1995 Dean of Science, North Carolina School of Sci. and Math  
Thesis: "The genetic basis for the evolution of host range in *Heliothis virescens* (F.)."
- Hruska, Allan Ph.D. 1995 UN-FAO Program Officer, Panama.  
Thesis: "Ecology and economics of insect pest management in maize in Nicaragua."
- Johnson, Tracy M.S. 1990  
Thesis: "Combined effects of genetically engineered host plant resistance and natural enemies on *Heliothis* populations in tobacco."
- Johnson, Tracy Ph.D.\* 1995 Research Scientist US Forest Service  
Thesis: "Influence of natural enemies on the rate of pest adaptation to host plants."
- Riggin Bucci, Toni Ph.D. 1995 Research Scientist and administrator, BASF Corp.  
Thesis: "Effects of *Bacillus thuringiensis* on population dynamics and oviposition behavior of the diamondback moth, *Plutella xylostella* (L.)."
- Klepetchka, Brad M.S. 1995 Washington State Agricultural extension  
Thesis: "Assortative mating in *Heliothis virescens*: impact on resistance management."
- Sumerford, Doug Ph.D. 1997 Transgenic cotton research, Monsanto Company  
Thesis: "Genetic analysis of adaptation to secondary plant compounds by *Heliothis virescens* (Lepidoptera: Noctuidae)."
- Sisterson, Mark MS. 1997 USDA Research Scientist  
Thesis "Natural history of *Heliothis subflexa* in the Southeastern US"
- Peck, Steve Ph.D.\* 1997 Professor, Brigham Young University  
Thesis: "Spatial aspects of the evolution of pesticide resistance: models and recommendations."
- Schliekelman, Paul Ph.D.\* 2000 Professor, University of Georgia  
Thesis: "Population genetic considerations in the development and release of transgenic insect pests".
- Oppenheim, Sara M.S. 2000 NSF postdoc at Museum of Nat. Hist. NYC  
Thesis: "The role of enemy-free space in the evolution of specialized herbivores"
- Rennie, Traci M.S. 2003 Research technician NSF/NCSU CIPM  
Thesis "Use of stable isotopes for determination of larval origins of *Helicoverpa zea* adults"
- Cabrera, Juan PhD\* 2002 Research Professor Lima, Peru  
Thesis "Tritrophic interactions of Bt-corn, Spodoptera exigua, and natural enemies"..
- Bateman, Melanie PhD 2006 Research analyst Commonwealth Agricultural Bureaux International (CABI)  
Thesis: The potential and realized host range of a specialist herbivore, *Heliothis subflexa*
- Benda, Nicole PhD \* 2007 USDA Postdoc  
Thesis: "Patterns and mechanisms of specialized oviposition behavior in *Heliothis subflexa*."
- Puente, Molly PhD\* 2007 NIH Grants administration  
Thesis: "The potential use of herbivore induced volatiles in crop protection: spatially explicit computer analyses"
- Petzold, Jen PhD 2009 Asst. Prof. Wartburg College, Waverly, IA  
Thesis: "Ecology and genetic of host location and feeding in *Heliothis subflexa*."
- Ward, Michael M.S. 2009 Unknown  
Thesis: "Determination of candidate genes involved in evolutionary diversification of moth pheromone blends"
- Oppenheim, Sara PhD 2010 NSF postdoc at Museum of Nat. Hist. NYC  
Thesis: "The genetic basis for the evolution of specialization in a lepidopteran species"
- Paa, Sandra M.S.\* 2010 Research Technician BASF  
Thesis: "Empirical test of the Killer-Rescue concept for temporally limited gene-drive"
- Katz, Rachael PhD. 2011 Faculty, Wake Technical Community College  
Thesis "Intra-specific larval competition in *Aedes aegypti* "

Robert, Michael	PhD* 2013 Postdoc Univ. Of New Mexico
	Thesis: Mathematical Models of Genetic Strategies for Controlling Dengue Vector, <i>Aedes aegypti</i> .
Antonelli, Tim	PhD* 2015 Assistant Professor Worcester State Univ. Mass.
	Thesis :Population Dynamics Models for Wolbachia and its Host, the Dengue Vector <i>Aedes aegypti</i>
Cash, Sarah	PhD* 2015 Teaching Postdoc, Oxford College, Atlanta, GA
	Thesis Evolutionary dynamics of a naturally occurring selfish genetic element
Zilnik, Gabe	MS 2017
	Thesis –The Evolution of Fitness Modifiers and their Impact on Insecticide Resistance
Baltzegar, Jen	PhD 2018
	Proposed Thesis –To be determined

**Graduate Student Committee Member** - Served on more than 40 M.S. and Ph.D. committees at N.C. State University, University of North Carolina at Chapel Hill, and Duke University

### **POSTDOCTORAL ADVISEMENT AND SABBATIC LEAVE ARRANGEMENTS**

<u>Name</u>	<u>Current Occupation</u>
Deitz, Lewis L*. 1979-80	Professor Emeritus, Dept. of Entomology, N.C. State Univ., Raleigh
Sims, Steven* 1981-82	Research Scientist, Whitmire Assoc., St. Louis, MO
Landis, Douglas 1987-88	Professor, Department of Entomology, Michigan State Univ.
Hertz, Paul 1987-88	Chairperson, Biology Department, Barnard Coll.
Simons, Andrew 1999-2000	Associate Professor, Carlton University, Ottawa, Canada
Demayo, Cesar 1990-93	Lecturer, University of the Philippines, Los Banos
Sheck, Amy 1998-2001	Dean of Science, N.C. School of Science & Math, Durham, NC
Groot, Astrid* 2001-2007	Professor Univ of Amsterdam
Wu, Kongming 2002	Head of Plant Protection—Chinese Academy of Agricultural Sciences
Rasgon, Jason 2003-2004	Assistant Professor, Johns Hopkins University, Baltimore, MD
Magori, Krisztian* 2004-2006	Post-Doc, School of Forestry & Wildlife Sci. Auburn University
Huang Yunxin * 2005-2009	Faculty, Dept. of Mathematics, Hubei University, PR China
Legros Mathieu * 2006-2011	Senior Researcher, ETH Zürich, Switzerland
Vasquez Gissella * 2006-2010	US Naval Medical Research unit-Ent. Deputy director Peru
Fong Hongqiang* 2007-2008	Visiting scholar from Chinese Academy of Agricultural Science
Xu Chonggang* 2009-2010	Research Scientist Los Alamos National Lab
Walsh, Rachael 2011-2012	Faculty, Wake Technical Community College
Okamoto, Kenichi* 2011-2014	Post-doc Yale Univ
Fritz, Megan 2012-2016	Assistant Professor Univ of Maryland
Griffiths, Emily* 2013-2015	Analyst--British Health System
Gunning, Christian 2014-present	Post-doc (with Alun Lloyd)
Dohle, Sumit 2016-present	Post-doc (with Alun Lloyd)

### **INVITED LECTURES**

**2017**—February 13<sup>th</sup> Keynote Address Gordon Research Conference on Plant-Herbivore Interactions. Ventura, California.

April 7<sup>th</sup> Introduction—Art’s work in the age of biotechnology: determining our genetic futures—NCSU workshop.

April 11<sup>th</sup> Elevating the discussion of genetically engineered crops. Hopkins Lecture. Kansas State Univ.

May 30<sup>th</sup> Future tiered approaches to regulation of new crop varieties. CropLife conference on Future of Plant Breeding Oversight in Canada—Ottawa

June 5<sup>th</sup> Keynote Address: Environmental effects of GM crops: Findings of a National Academies of Sciences, Engineering and Medicine (US-NASEM) report. 14<sup>th</sup> International Symposium on the Biosafety of Genetically Modified Organisms. Guadalajara, Mexico.

**2016**- January 11<sup>th</sup> “New Genome Editing Techniques: What Do They Mean for Applied Entomology Beyond Transgenic Crops -- Bayer RTP Seminar –

February 18<sup>th</sup> Zika: Biological and Epidemiological Basics RTI

April 18<sup>th</sup> Presentation on Gene drive for mosquitoes to Bill Gates, Francis Collins and others –Bethesda, MD

June 22nd Can genetic pest management save biodiversity, and improve pest control and health- University of Amsterdam

September 16th “Environmental effects of GE crops” --- Turkish visitors to CALS

September 26th Organizer and Discussion leader- Symposium: “What Constitutes Responsible Field Release of Transgenic Insects?”. International Congress of Entomology. Orlando FL

September 27th “Entomological Solutions to World Problems” Grand Challenges Entomology Leadership Summit held at ICE Orlando, FL

September 30th Keynote Address “Will genetically engineered pests protect health, biodiversity, and crop production?” International Congress of Entomology. Orlando FL.

October 12th Dean’s Big Ideas Forum – Report on “Genetic Engineering Research at NCSU”.

October 27th AACCI annual meeting Savannah, GA “Future of Food Sustainability and Safety” “Report on findings of NASEM study”

November 2nd Nuts and bolts of gene drive in mosquitoes WHO Geneva, Switzerland (via Skype) -----

November 16th “Are GMOs safe to eat?” Interra International, LLC, Chapel Hill, NC

November 16th “GE Crops: Activities of GES Center and NASEM” NC Biotech Center, RTP, NC

November 20th “Report on the NASEM study of GE Crops” Harvard Kennedy School, Cambridge, MA

November 29th Brigham Young University Radio Show –GE Crops Report.

December 2nd “Can genes drive safely” Keck Faculty symposium, NCSU

December 5th “GMO Science & Uncertainty” Environmental Law Institute workshop on “Communicating Uncertainty in Science, Law, and Journalism”. Wash. DC.

December 7th “GE Crops Report Study Process” Forum of Society Leaders on Genetically Engineered Crops: Experiences and Prospects. NASEM Wash, DC

December 8th Presentation "Living in a Genetically Engineered World" OLLI, McKimmon Center, Raleigh, NC -

December 13th "The biological basis of gene drive technologies: Beyond the hype" Society for Risk Analysis, San Diego, CA

**2015**---January 21<sup>st</sup> Presentation to NCSU Association of Retired Faculty “Genetic Engineering and Society: Where are we headed?”, March 27<sup>th</sup>. North Carolina School of Science and Math –Keynote address for the North Carolina Student Academy of Science, “Living in a Genetically Engineered World: With great Power Comes Great Responsibility”. April 7<sup>th</sup>. Revive and Restore workshop on “New Genomic Solutions for Conservation Problems Workshop” presentation on “Introduction to new RNAi technologies”. April 16<sup>th</sup> Univ. of Wisconsin Entomology, "New genome editing techniques: What they mean for applied entomology". April 17<sup>th</sup> Univ. of Wisconsin – C. C. Doane Lecture “Genetics and Society: From Vavilov to the Green Bunny”. April 24<sup>th</sup> Annual meeting of Association for the Study of Chemical Senses-- Fort Meyers, Florida –“The paradox of evolutionary diversification in the Lepidoptera”. April 28<sup>th</sup> NCSU Symposium “Genetic Engineering at NCSU” presentation on “Genetic engineering for suppressing pests and human diseases”. May 8<sup>th</sup> Council of Colleges of Arts and Sciences. Webinar presentation on Interdisciplinarity in graduate education: challenges and benefits. Sept 1<sup>st</sup> Penn State “What have we learned from insect resistance management efforts?”. Sept 14<sup>th</sup> NIH Bethesda MD. “Public Perception of Novel Vector Management Approaches”. November 12<sup>th</sup> Fearington Village November 18<sup>th</sup> Wake Tech Comm College ““Living in a Genetically Engineered World”.

**2014**—March 13<sup>th</sup> Colegio de Postgraduados Campus Montecillo, Mexico. Transicion de cultivos geneticamente modificados a insectos geneticamente modificados?; March 19<sup>th</sup> NCSU Park Scholars. Ecological, Health and Social Issues related to GMOs; April 1<sup>st</sup>. Texas A&M Entomology, Genetic engineering of plants, animals and microbes: Biological and social challenges?; April 2<sup>nd</sup> Texas A&M, NSF sponsored lecture on Genomics and Society; April 8<sup>th</sup>, Osher Lifelong Learning Institute at Duke, Genetic Engineering of Our Food and Pests; April 16<sup>th</sup>. Ag Biotech Forum (NC Biotech Center) History of the NCSU-GES Program; June 5<sup>th</sup> USDA BRAG Meeting, Genomic approach for monitoring Bt resistance evolution; July 24 CIMMYT, Mexico, Second generation crop genetic engineering; November 16 Entomological Society of America, Keynote – Founders’ Memorial Award Presentation; November 19<sup>th</sup>, Entomological Society of America, Making Pests Nicer;

**2013**-- April 1<sup>st</sup> University of California Riverside—Boyce Distinguished lecture –“Why I love two-locus models”. May 3<sup>rd</sup> NAMRU Iquitos Peru Empirical Approach for testing a detailed Aedes aegypti population dynamics model. May 29<sup>th</sup> Symposium at NCSU—“The paradox of evolutionary diversification in moth sexual signals”. June 3<sup>rd</sup> NAS committee on Public Interfaces in the Life Sciences “What makes a hot button issue?”, Sept 24<sup>th</sup> Talk on GMOs Irregardless Restaurant. Oct. 23<sup>rd</sup> Ohio State University “Can genetic pest



management protect crops, human health, and biodiversity?” . Nov. 11<sup>th</sup> Gates Foundation sponsored meeting Wash DC “New tools in the pipeline for suppressing dengue: Transgenics”.

**2012**--- January 6 Dartmouth College, Can Genetically Engineered Pests Decrease Human Diseases and Increase Biodiversity?; February 10th, NCSU honors program –Genetic Engineering and Society; March 1st Friends of the Library—Faculty Excellence talk on Genetics and Society: From Vavilov to the Green Bunny; March 6-8 talks in Lima Peru; April 15th Smithsonian Tropical Research Institute, Panama, Can Genetically Engineered Pests Decrease Human Diseases and Increase Biodiversity?; April 16th Panama City, Comparison of safety, efficacy, and transparency of different genetic approaches for control of dengue; June 25th Short talk on IGERT at the NC Museum of Natural Sciences; July 19th Lima Peru, Potential for genetic pest management through transgenic crops and transgenic pests; October 4th Purdue Univ. Entomol. Can genetic pest management protect human health and biodiversity?

**2011**---Feb 1 NC Biotechnology One Health forum –GPM Feb 24 Triangle Global Health Consortium –GPM April 1 --Shaping the Future of Global Health and Development FHI-TGHC at UNC—GPM. April 15 –Virginia Tech—Future of Genetic Pest Management, Aug 27—Gates project Annual Meeting—Progress on Reduce and Replace Strategy. Aug 29 NCSU Forestry and Environmental Resources Dept –Genetic Pest Management. Sept 19—NCSU Entomology Dept Seminar. Oct. 12 Fayetteville State Univ. –Genetic Pest Management. Oct 20 Univ of Minnesota –What studies of GM insects in containment contribute to our knowledge. Nov. 16th ESA meeting –GPM as Biocontrol.

**2010**---CRISP Tapachula, Mexico February 17th Modeling Aedes and dengue dynamics; NCSU Plant Biology seminar April 4th Genetic Pest Management; Univ of Minnesota, Fish genetic management symposium. June 22nd lessons from insect genetic pest management. Gates project meeting Sept 1st Update on modeling Aedes/dengue; NCSU Biochemistry dept. October 7th, Molecular biology of moth sexual communication. Gates Grand Challenges Meeting October 22, Models as aids in the development and deployment of transgenic mosquitoes. ESA meeting. December 14th. Introduction to the graduate student debate.

**2009**--- January Sigma Xi Darwin Day talk on Applied evolutionary biology; July 2009 Entomological Society of Columbia – Key Note Address; Sept. 2009 Duke Univ. lecture--Can Genetically Engineered Pests Decrease Human Diseases and Increase Biodiversity?; Sept. 2009 Swarthmore College—Lecture on transgenic mosquitoes for disease control; Sept 2009 Talk at NIH/Homeand Security meeting on modeling vector-borne diseases; Oct 2009 Michigan State Univ. Pheromone talk; Kellogg Biological station—talk on GPM; November 2009 State University of NY at Stony Brook Darwin Symposium—talk on applied evolutionary biology; Dec. 2009 James Cook University Gates Group- Talk on modeling Aedes/dengue and gene drive.

**2008**--January 22<sup>nd</sup>, Seminar on Genetic Pest Management –CRISP Tapachula, Mexico. March 3rd University of RI, seminar on genetic pest management. April 11th Univ of Wisconsin seminar on Genetic Pest Management. April 21st and 22nd Cornell University—talks on Genetic pest management and on sexual signal evolution in moths. June 5th American Genetics Association Conference-seminar on evolution of moth sexual communication. June 17th Asilomar meeting on transgenic insects and genomics—Models for risk assessment.

**2007**---May, U. C. Riverside - Evolution of sexual communication in moths. Annual Gates Foundation meeting September 2007 –Capetown, South Africa The utility of simple and complex models of gene drive and population dynamics, September 2007. Sigma Xi Talk on Genetic Pest Mangement Nov 2007. National Evolutionary Synthesis Center—ran workshop and gave talk on Alternative gene drive mechanisms December 2007, ESA annual meeting—student symposium –talk on new careers in genetic pest management December 2007.

**2006**---University of Iowa April 3, "The paradox of evolutionary diversification in moth sexual communication" USDA-SIFAS June 6, 2006. “Transgenic insects for autocidal control and strain replacement: theoretical analysis”. Gates Grand Challenges Annual Meeting October 6, 2006. Modeling approaches for assessing feasibility of gene drive strategies. ESA annual meeting student sponsored symposium December 2006 “Transgenic insects for autocidal control and strain replacement: Dreams, Nightmares, Reality.”

**2005**---Penn. State Univ. Entomology Dept. "The paradox of evolutionary diversification in moth sexual

communication" March 4, University of Alberta—Strickland lecture March 18, 2005. Mississippi State Univ. April 8, 2005 “Transgenic insects for autocidal control and strain replacement.” Univ. of Kentucky, Entomology Dept.- Graduate Student Speaker April 29, 2005. University of Georgia Dept. of Entomology Student invited speaker October 17, 2005. Univ. of Maryland Entomology Dept. The paradox of evolutionary diversification in moth sexual communication November 21, 2005. Australian Society of Invertebrate Ecology and Systematics Keynote address “The potential of transgenic insects in pest control” December 6, 2005. CSIRO Entomology Division—Evolution of Sexual Communication in moths December 7, 2005.

**2004**---Keystone Symposium on genetic manipulation of insects “Can simulation models improve approaches to mosquito strain replacement” Feb 4, 2004.

NCSU Animal Genetics Program “Genetics of insect host range and pheromone production” Feb. 19, 2004.

University of Toronto. “Ecology and genetics of host range in Heliothine moths” March 15, 2004.

University of Wisconsin "Engineering Insects for Disease and Pest Suppression: Ecological and Population Genetic Perspectives" March 30, 2004.

Pew Initiative Symposium on transgenic insects- Keynote- “Transgenic insect control strategies: Lessons from the past” Sept. 20, 2004

**2003**--USDA, Kansas, “Population genetics of Bt resistance management for the corn rootworm”, Jan, 28, 2003

University of Utah, “Evolution of insect sexual communication systems”, Feb. 20, 2003

N.C. School of Science and Math, “Evolution of complex traits” March 7, 2003

USDA, Texas, “Use of stable isotopes in establishing host use and migration patterns of bollworm”, March 26, 2003

Durham Community College, “Time to think harder about biotechnology”, April 16, 2003

NCSU—IFAS “Bt resistance management and genetics of host use”, May 9, 2003

Asilomar meeting on transgenic insects “Population genetics of strain replacement”. May 14, 2003

FAO—Rome Resistance management for developing countries, June 16, 2003

Clemson University, “Population genetics of autocidal control and strain replacement” Sept. 29, 2003

University of Florida- , “Population genetics of autocidal control and strain replacement” November 13, 2003

**2002**---NCSU Zoology Dept., “The evolution of complex characters,” Jan. 31, 2002

Duke Univ. Environ. Sciences, “Pest resistance as an environmental risk for transgenic crops,” Feb. 1, 2002

Microbial Control Regional Project, “Ecological and genetic interactions between Bt crops and natural enemies,” Feb. 24, 2002

Univ. Arizona, “Evolution of insect sexual communication systems, Feb. 29, 2002

NCSU Genetics, “The evolution of complex traits,” March 4, 2002

Univ. California, Davis, “Evolution of insect sexual communication systems,” April 10, 2002

Vassar College, “Engineered crops: Who gets the benefits and who takes the risks?”, April 24, 2002

Vassar College, “Ecological and genetic risk assessment for transgenic crops,” April 25, 2002

Society for the Study of Evolution, “Population genetics of autocidal control,” Univ. Illinois, Urbana, June 29, 2002

**2000**--- India (5 presentations), “Resistance management for transgenic crops”, Feb. 4-23, 2000

United States, Senate briefing on NRC report on transgenic pesticidal plants, April 4, 2000

Administration briefings on NRC report, April 5, 2000

Board of Directors, Union of Concerned Scientists, “Resistance management for transgenic crops”, May 24, 2000

Society for the Study of Evolution, “Using evolutionary biology to build more efficient transgenic crops and insects,” June 27, 2000

APHIS, Brief on NRC report, July 11, 2000

Congressional Black Caucus, “The potential and problems associated with transgenic crops in developing countries”, Sept. 15, 2000

U.S. Bishop’s Conference, “The environmental and health safety of genetically engineered plants,” Sept. 16-17, 2000

Texas A&M Univ., “Approaches for sustainable use of Bt crops,” Sept. 28, 2000

**1999**--- Penn State Univ., Dept. Entomology Seminar, Jan. 19, 1999

Conference on Emerging Technologies for Integrated Pest Management, Raleigh, NC, March 9, 1999

NCSU Dept. Genetics Seminar, April 12, 1999

U.S. State Dept. Briefing on Biotechnology, July 16, 1999

EPA/USDA Bt Cotton Resistance Management Workshop, Memphis, TN, Aug. 26, 1999

- Appalachian State Univ., Dept. Biology Seminar, Sept. 27, 1999  
 World Bank Conference on Environmental and Health Effects of Biotechnology, Oct. 21, 1999  
 Michigan State Univ., Ecology & Evolutionary Biology Program, Oct. 27, 1999  
 Georgetown Univ., Conference on Genetically Engineered Crops, Nov. 10, 1999  
 ESA Annual Meeting, Atlanta, GA, Dec. 13, 14, 15, 1999 (3 invited presentations)
- 1998--** University of Maryland, Dept. Entomology, "Sustainability of insecticidal cultivars: Integrating pest ecology genetics," February 11, 1998  
 National Agricultural Biotechnology Council, "Resistance Management for Bt-crops," June 1, 1998  
 Council on Agricultural Science and Technology, Washington, DC, "Resistance Management for Bt-crops," June 24, 1998  
 ESA National Meeting, Las Vegas, "Impact of natural enemies on pest adaptation to engineered crops," November 11, 1998  
 Agricultural Pest Management School, North Carolina State University, "Resistance of the bollworm complex to pyrethroids and Bt," December 15, 1998
- 1997--**University of Wisconsin, College of Agriculture Biotechnology Seminar Series, January 31, 1997  
 Laval University, Quebec, Biology Department, March 11, 1997  
 World Bank, Washington, DC, July 1, 1997  
 FMC Corporation, Princeton, NJ, July 15, 1997  
 Montana State University, Bozeman, MT, July 29, 1997  
 University of British Columbia, Vancouver, Canada (MacCarthy Lecture), September 25, 1997  
 Duke University, Population Biology, Durham, NC, October 14, 1997  
 North Carolina State University, Horticulture Department, Raleigh, NC, October 20, 1997  
 CGIAR Centers Week, Washington, DC, October 20, 1997  
 Entomological Society of America Annual National Meeting, Nashville, TN, December 16, 1997
- 1996--**N.C. State University, Agricultural Biotechnology Program, "Use of QT1s for host range analysis in two epidopteran species,"  
 University of Delaware, Department of Entomology, "Integrating genetically engineered plants into existing IPM systems," March 13, 1996  
 USDA National Forum on Bt, "Scientific approaches to resistance management," April 15, 1996  
 University of Missouri, Riley Memorial Lecture, "Ecological and evolutionary aspects of Bt transgenic crops," April 26, 1996  
 University of California, Davis, "Deployment of genetically engineered crops," May 2, 1996  
 University of California, Davis, "Genetics of host range in polyphagous arthropods," May 3, 1996  
 Zamorano University, Honduras, Central America, "Developing and deploying genetically engineered crops in Mesoamerica," May 20, 1996  
 Zamorano University, Honduras, S.A., "Potential and problems with high dose approaches," May 21, 1996  
 University of the Philippines, Los Banos, "Recent developments in the development and commercialization of transgenic plants," June 27, 1996  
 University of North Carolina, Greensboro, "Evolutionary aspects of commercializing genetically engineered plants," October 23, 1996
- 1995--**N.C. State University, Department of Toxicology, "Genetics and molecular biology of insect resistance to *Bacillus thuringiensis*," February 7, 1995  
 N.C. State University, Plant Breeding, "Approaches for delaying resistance to Bt-expressing crops," February 8, 1995  
 University of Kentucky, Lexington, Department of Entomology, Graduate Student invited speaker, February 14, 1995  
 University of Minnesota, Ecology, "Evolution and Behavior Department, Community evolution in multispecies plant/herbivore systems," 10 May 1995  
 University of Arkansas, Graduate Student invited speaker, September 22, 1995  
 Mississippi State University, "Integrating engineered pesticidal plants into IPM systems," September 25, 1995  
 Louisiana State University, Department of Entomology, "Integrating engineered pesticidal plants into IPM systems," November 17, 1995
- 1994--**Queenstown, New Zealand, OECD, "Potential and problems with high dose approaches to managing resistance to engineered plants," January 11, 1994  
 IRRI, Philippines, "Progress in analyzing and monitoring *Bt*-resistance genes in *Heliothis virescens*," January 14,

1994

- Weed Science Society, St. Louis, Missouri, "Comparing and contrasting approaches to weed and insect resistance management," February 9, 1994
- University of Georgia, Entomology, "Is resistance management feasible with *Bt*-expressing plants," March 10, 1994
- Duke University, Continuing Education, "Developing and deploying genetically engineered crops," March 22, 1994
- N.C. State Univ., Genetics Dept., "Using two locus genetic models in pest management," April 5, 1994
- N.C. State Univ., Plant Breeding, "Design and deployment of *Bt*-expressing crops for sustainable use," April 6, 1994
- Ciba Geigy, RTP, "Progress in assessing strategies for deploying *Bt*-expressing Corn," April 18, 1994
- IRRI, Philippines, "Impact of larval dispersal and natural enemies on the rate of pest adaptation to *Bt*-expressing crops," June 29, 1994
- ESA Annual Meeting, December 1994
- Dallas, Texas, "Movement and survival of *Heliothis* larvae on *Bt*-expressing cotton," December 12 1994.
- 1993--**Clemson University, Biotechnology program. "Strategies for deploying engineered pest resistant crops," January 1993
- N.C. State Univ., Plant Pathology. "Ecological-genetic approaches for increasing durability of insect resistant crops," January 1993
- International Rice Research Institute, Entomology. "Recent advances in the genetics of insect adaptation to *Bt* toxins," February 1993
- Duke University, Institute for Learning in Retirement. "Engineering crops for insect resistance," March 1993
- University of Illinois, Entomology. "Genetic assessment of multispecies coevolution between plants and insects," March 1993
- University of Illinois, Entomology. "Strategies for deploying engineered crops with pest resistance," March 1993
- Second International Conference on Insect Molecular Biology. "Can we develop resistance proof insect control strategies?" July 1993
- CSIRO Second Canberra Conference on *Bacillus thuringiensis*. "Resistance management for *Bt*-expressing crops," September 1993
- Rockefeller Bellagio Conference on Biotechnology and IPM. "Strategies for deploying engineered corn, cotton and rice in poor and developing countries," October 1993
- N.C. State Univ., Crop Science. "Managing resistance to transgenic pesticidal crops," November 1993
- University of Arizona, Entomology. "Pest management in the era of biotechnology: will it be sledgehammers or jewelers tools?" November 1993
- 1992---**Interactions between natural enemies and engineered pesticidal crops. NCSU Biocontrol Working Group, "Using genetically engineered plants to test hypotheses regarding plant-insect interactions." Gordon Research Conference on Plant-Herbivore Interactions, Oxnard, CA. January 1992
- "Ecological perspectives on release of genetically engineered organisms." Univ. Maryland, Dept. Entomol., February 1992
- "Ecological and evolutionary approaches for engineering pesticidal crops." Penn. State Univ., Dept. Entomol., April 1992
- "Potential strategies for engineering stemborer-resistant rice." IRRI, Philippines, June 1992
- "Can synergism between plant toxins and natural enemies influence herbivore evolution?" (with T. Johnson and G. Kennedy). International Congress of Entomology, Beijing, China, July 1992
- "Strategies for deploying cotton and rice varieties that express *Bt*-toxins." International Congress of Entomology, Beijing, China, (with D. Bottrell, R. Aguda, C. Demayo, G. Roderick), July 1992
- "Genetics and mechanisms of *Heliothis* adaptation to *Bt*-toxins." Ecogen, Pennsylvania, August 1992
- "Molecular tools for understanding plant/herbivore interactions." NCSU Ecology Seminar, October 1992
- "Assessing the potential for yield compensation in mixtures of normal and *Bt*-potatoes." USDA Meeting on Pests and Diseases of Potato, October 1992
- 1991---**"Plant-herbivore interactions and genetically engineered crops." Botany Department, N.C. State University.
- "Progress in analyzing interaction of *Bt*-crops, pest and natural enemies." Ciba-Geigy, Greensboro, NC. 1991.
- "Managing resistance to genetically engineered plants." AAAS, Washington, D.C. 1991.
- "Engineering plants with pest resistance." Duke University, Durham, NC. 1991.
- "Genetics of plant-herbivore coevolution." Department of Entomology, Colorado State University, Ft. Collins. 1991.
- "Ecological-genetic approaches to developing pest-resistant engineered plants." Department of Entomology, Colorado State University, Ft. Collins. 1991.

- “Ecological-genetic approaches to engineering pest-resistant crops.” Department of Entomology, Oregon State University. 1991.
- Sigma Xi Lecture, “Crop pests: the quintessential masters of evolutionary acrobatics?” Department of Entomology, Kansas State University, Manhattan. 1991.
- “Genetics of insect-herbivore host range.” Department of Entomology, Kansas State University, Manhattan. 1991.
- “Ecological and genetic aspects of developing genetically engineered crops.” University of Philippines, Los Banos. 1991.
- Ecological and genetic aspects involved in developing engineered crops. Cornell University, Alexander Lecture, Ithaca, NY. 1991
- Studies of resistance to Bt-producing engineered crops. Entomological Society of America, Eastern Branch, Baltimore, MD. 1991.
- Transgenic rice for yellow stemborer control: strategies and risks. Rockefeller Foundation, Annual Biotechnology Conference, Tucson, AZ. 1991.
- Resistance management for Bt-toxin-producing potatoes. International Conference on Potato Pest Management, Jackson Hole, WY. 1991.
- 1990**---Strategies for the sustainable use of Bt in transgenic plants. Sustainable Agriculture Group, N.C. State University, Raleigh. 1991.
- Ecological-genetic approaches for the design of bioengineered pesticidal plants. Plant Genetic System, Gent, Belgium. 1990
- Developing research priorities in agricultural biotechnology. AAAS, New Orleans, La. 1990.
- Developing ecologically sound approaches for engineering rice with pest resistance. IRRI, Rockefeller Foundation, Los Banos, Philippines. 1990.
- Ecological considerations in engineering insect resistant crops. Keystone Meetings, Atlanta, Ga. 1990.
- Ecological-genetic considerations for engineering cotton and potato with insect resistance. Calgene, Davis, CA. 1990.
- Genetics of plant/aphid interactions (with L. Wilhoit and S. Via). International Symposium on Plant-Aphid Interactions. Stillwater, OK. 1990.
- Results of field and laboratory tests on *Heliothis* interactions with engineered tobacco. Ciba-Geigy, Research Triangle Park, NC. 1990.
- 1989**---Roles for public and private sector scientists in developing pest resistant crops. UCLA Molecular Biology Symposium: New Brunswick, NJ. 1989.
- Ecological-genetic approaches for the design of genetically engineered crops. Rutgers Univ., New Brunswick, NJ. 1989.
- Modeling the interaction of population dynamics and population genetics. Biomathematics Program, N.C. State Univ., Raleigh. 1989.
- Managing pest adaptation to resistant crop varieties, National IPM Meeting, Las Vegas, NV. 1989.
- Ecological-genetic approaches for the design of genetically engineered crops. Also, Student-sponsored forum entitled, Biotechnology, insects and society, University of Wisconsin, Madison. 1989.
- Laboratory and field tests with genetically engineered tobacco. Rohm & Haas Co., Philadelphia, PA. 1989.
- Alexander Lecture: Ecological-genetic approaches for the design of genetically engineered crops, University of Massachusetts, Amherst. 1989.
- Impact of policy decisions on research, development, and incorporation of biotechnology products in agriculture (with G. Kennedy). Entomol. Soc. America National Meeting, San Antonio, TX. 1989.
- 1988**---On the potential for dove-tailing gene expression and pest ecology, Entomol. Soc. America, National Meeting, Symposium, Louisville, KY. 1988.
- Ecological-genetic approaches for the design of genetically engineered pest resistant plants, Michigan State University, E. Lansing. 1988.
- Evaluating the durability of biotechnology products, Economics Department, N.C. State University. 1988.
- Genetically engineered plants and the 1990 Farm Bill. Special USDA-EPA-FDA meeting on transgenic plants. Annapolis, MD. 1988.
- Ecological concerns in agricultural biotechnology, N.C. Biotechnology Center, Research Triangle Park, NC. 1988.
- Ecological-genetic approaches for the design of genetically engineered crops, Boyce-Thompson Institute, New York. 1988.
- Evolutionary biology and the design of bioengineered crops, Crop Genetics International, Hanover, MD. 1988.
- University-industry relations: the impact on research priorities, University of North Carolina, Chapel Hill. 1988.
- Ecological-genetic approaches for the design of genetically engineered crops, University of Arizona, Tucson. 1988.

- Ecological-genetic approaches for the design of genetically engineered crops, University of Nebraska, Lincoln. 1988.
- Insect biotypes and genetically engineered crops. Biennial Insect-Host-Plant Resistance Meeting. Asilomar, CA. 1988
- Roles for entomologists in the design of genetically engineered crops, University of California, Riverside. 1988.
- 1987--** Biotechnology and biotypes, Entomological Society of America, North Central Branch Meeting, Des Moines, IA. 1987.
- Evolutionary theory and the design of genetically engineered crops, Entomological Society of America, Eastern Branch. 1987.
- Multispecies coevolution, University of South Florida, Tamps, FL. 1987.
- Can we predict the outcome of genotype-based plant herbivore interactions? Entomological Society of America National Meeting, Boston, MA. 1987.
- Germplasm deployment strategies for increasing the durability of Hessian fly-resistant wheat, Entomological Society of America National Meeting, Boston, MA. 1987.
- Positive roles for insect ecologists in the development of genetically engineered crops, Monsanto, St. Louis, MO. 1987.
- 1986---** Deployment strategies for increasing durability of insect-resistant germplasm, Department of Entomology, Michigan State University, East Lansing, MI. 1986.
- Genetics of multispecies' coevolution, Department of Zoology, University of Michigan, Ann Arbor. 1986.
- Theoretical and empirical approaches to plant herbivore coevolution, Department of Zoology, University of Washington, Pullman. 1986.
- Genetics of multispecies' coevolution, Gordon Research Conference, Oxnard, CA. 1986.
- Genetic considerations in the deployment of genetically engineered crops, Kellogg Biological Station. Symposium on Ecological Contributions to Agriculture, Battle Creek, MI. 1986.
- Deployment strategies for increasing durability of insect-resistant germplasm. Cornell University, Geneva, NY. 1986.
- Ecological genetics as a predictive tool in agriculture. Ecology and Evolution Department, SUNY, Stony Brook, NY. 1986.
- Population genetics as a predictive tool in agriculture. Biomathematics Program, N.C. State University, Raleigh. 1986.
- Ecological genetics as a predictive tool in agriculture. Sloan Foundation Series in Demography. University of California, Berkeley. 1986.
- Are patterns of habitat-related variations predictable? Symposium, Entomological Society of America. Reno, NV. 1986.
- Roles for entomologists in the deployment of bioengineered crops. Student Affairs Conference, Entomological Society of America. Reno, NV. 1986.
- 1985---**Deployment strategies for increasing durability of insect-resistant germplasm. N.C. State University; University of Maryland.
- Genetic structure of herbivore adaptation to plant defenses. University of Maryland. 1985.
- Ecology and genetics of the Hessian fly. University of Maryland. 1985.
- The Hessian fly: optimal adaptation or freak of nature? Cornell University, Ithaca, NY. 1985.
- Genetic structure of herbivore adaptation to plant defenses. Boyce Thompson Institute, Cornell University, Ithaca, NY. 1985.
- Considerations in the development of practical IPM programs. University of Maryland. 1985.
- Genetics of chemically mediated coevolution. American Institute for Biological Sciences. Washington, DC. 1985.
- Strategies for increasing durability of Hessian fly resistant wheat germplasm. Purdue University, Lafayette, IN. 1985.
- The utility of natural feeding deterrents in crop protection. Monsanto Corp., St. Louis, MO. 1985.
- 1984--** Genetic considerations in the deployment of insect-resistant germplasm. Biennial Host-Plant Resistance Workshop. Charleston, SC. 1984.
- Adaptation and cross-adaptation to secondary plant compounds. Symposium, International Society of Chemical Ecology. Austin, TX. 1984.
- 1983--**The genetic structure of adaptation to host plants by *Heliothis virescens*. Symposium on Insect Adaptations to Plant Defenses. Entomological Society of America, Eastern Branch. University of Massachusetts, Amherst.

1983.

Genetic constraints on the evolution of cannibalism. University of Massachusetts, Amherst. 1983.  
 Evolutionary genetics of behavior. University of Florida, Gainesville. 1983.  
 Gordon Conference on Chemistry of Plant/Insect Interactions, CA. 1983.

**1982**-- Genetic Constraints on the evolution of cannibalism. Wake Forest University; University of Maryland.

**1981**--The detoxification of secondary plant compounds: an ecological perspective. Symposium, Entomological Society of America. San Diego, CA. 1981.

Biology Department, Wake Forest University, NC. 1981.  
 Agricultural Ecology Group, Duke University, Durham, NC. 1981.  
 Genetics Department, N.C. State University, Raleigh. 1981.  
 Biology Department, Florida State University, Tallahassee. 1981.  
 Department of Zoology, Duke University, Durham, NC. 1981.  
 Biology Department, University of North Carolina, Greensboro. 1981.

**1979** -- Lecture. Organization for Tropical Studies. 1979.

**Contributed** presentations at meetings (including those with graduate students) - more than 30

## **PUBLICATIONS**

### **BOOK CHAPTERS:**

Gould, F. 1983. Genetics of plant-herbivore systems: interactions between applied and basic study, pp. 599-653. In R. Denno and B. McClure [eds.], Variable plants and herbivores in natural and managed systems. Academic Press, New York.

Gould, F., and R. E. Stinner. 1984. Insects in heterogeneous habitats. In C. Huffaker and R.L. Rabb (eds.), Ecological entomology. Wiley & Sons, NY.

Gould, F. 1986. Genetic constraints on the evolution of cannibalism in *Heliothis virescens*, pp.55-62. In M. Huettel (ed.), Evolutionary genetics of insect behavior. Plenum Press, NY.

Schneider, J. C., J. H. Benedict, F. Gould, W. R. Meredith, Jr., M. F. Schuster, and G. R. Zummo. 1986. *Heliothis*-host plant interactions. In Theory and tactics of *Heliothis* population management. So. Reg. Coop. Project.

Joyner, K. and F. Gould. 1987. Conspecific tissues and secretions as sources of nutrition, pp. 697-720. In F. Slansky, Jr. and J. G. Rodriguez (eds.), Nutritional ecology of insects, mites, spiders, and related invertebrates. John Wiley, NY.

Gould, F. 1988. Genetics of pairwise and multispecies plant-herbivore coevolution, pp. 13-55. In K. Spencer [ed.], Chemical mediation of coevolution. Academic Press, New York.

Gould, F. 1989. Ecological-genetic approaches for the design of genetically engineered crops, pp. 146-151. In D. W. Roberts and R. R. Granados (eds.), Biotechnology, biological pesticides and novel plant-pest resistance for insect pest management. Proc. Conference Boyce Thompson Inst., Cornell Univ., Ithaca (July 18-20, 1988).

Gould, F. 1990. Ecological genetics and integrated pest management, pp. 441-458. In C. R. Carroll, J. H. Vandermeer, and P. Rosset, Agroecology. McGraw-Hill Publ., New York.

Gould and A. Weissinger. 1990. Roles for public and private sector scientists in developing pest-resistant crops, pp. 641-648. In P. Dunn and R. Baker (eds.), New directions in biocontrol. Proc. Univ. California Los Angeles Molecular Biology Symposium.

Gould, F., L. Wilhoit, and S. Via. 1991. The use of ecological genetics in developing and deploying aphid-resistant crop cultivars, pp. 71-85. In D. C. Peters, J. A. Webster, and C. S. Chlouber [eds.], Proceedings, Aphid-plant interactions: populations to molecules. USDA/Agric. Res. Serv., Oklahoma State Univ. no. MP-132.

- Rose, R. L., F. Gould, P. Levi, T. Konno & E. Hodgson. 1992. Resistance to plant allelochemicals in *Heliothis virescens* (Fabricius), pp. 137-148. In C. A. Mullin & J. G. Scott (Eds.), Molecular mechanisms of insecticide resistance diversity among insects. ACS Symposium Series 505, Washington, D.C.
- Gould, F. 1993. The spatial scale of genetic variation in insect populations, pp. 67-85. In K. C. Kim and B. A. McPherson [eds.], Evolution of insect pests: patterns of variation. John Wiley & Sons, New York. 479 pp.
- Gould, F., P. Follett, B. Nault, and G. Kennedy. 1994. Resistance management strategies for transgenic potato plants, pp. 255-277. In G.W. Zehnder, M.L. Powelson, R.K. Jansson, and K.V. Raman [eds.], Advances in potato pest biology and management. APS Press, St. Paul, MN.
- Gould, F. 1994. Insect resistance to Bt toxins -- can it be delayed?, pp. 37-42. In R.J. Akhurst [ed.], Proceedings of the 2nd Canberra *Bacillus thuringiensis* meeting. CPN Publ. Pty., Ltd., Canberra.
- Gould, F. 1995. The evolutionary potential of crop pests, pp. 190-201. In M. Slatkin [ed.], Exploring evolutionary biology: readings from *American Scientist*. Sinauer Assoc.: Sunderland, Massachusetts, USA.
- Gould, F. 1996. Deploying pesticidal engineered crops in developing countries, pp. 264-293. In G. J. Persley [ed.], Biotechnology and integrated pest management. CAB Int., Oxon, UK.
- Sims, S. B., J. T. Greenplate, T. B. Stone, A. Caprio, and F. L. Gould. 1996. Monitoring strategies for early detection of Lepidoptera resistance to *Bacillus thuringiensis* insecticidal proteins, pp. 229-242. In T. M. Brown [ed.], Molecular genetics and evolution of pesticide resistance. Amer. Chem. Soc., Wash. DC.
- Kendall, H. W., R. Beachy, T. Eisner, F. Gould, R. Herdt, P. H. Raven, J. S. Schell, and M. S. Swaminathan. 1997. Bioengineering of crops. Report of the World Bank Panel on Transgenic Crops. Environmentally & Socially Sustainable Development Studies and Monographs Series 23, The World Bank, Washington, DC.
- Gould, F., B. Tabashnik, W. Hutchison, D. Ferro, D. Andow, and M. Whalon. 1998. Contributor's introduction, pp. 13-18. In M. Melon and J. Rissler [eds.], Now or never: serious new plans to save a natural pest control. UCS Publ. (Union of Concerned Scientists), Boston, MA.
- Gould, F. and B. E. Tabashnik. 1998. Bt-cotton resistance management, pp. 67-105. In Now or Never: Serious New Plans to Save a Natural Pest Control, M. Melon and J. Rissler [eds.]. UCS Publ., Boston, MA.
- Hoy, C. W., J. Feldman, F. Gould, G. G. Kennedy, G. Reed, and J. A. Wyman. 1998. Naturally occurring biological controls in genetically engineered crops, pp. 185-205. In: P. Barbosa (ed.), Conservation Biological Control. Academic Press, New York.
- Gould, F. and P. Schliekelman. 2000. Reassessing autocidal pest control. In G. G. Kennedy and T. B. Sutton [eds.], Emerging Technologies for Integrated Pest Management: Concepts Research and Implementation, pp. 190-207. APS Press, St. Paul, MN.
- Gould, F. and M. B. Cohen. 2000. Sustainable use of genetically modified crops in developing countries, pp. 139-146. In: G. J. Persley and M. M. Lantin [eds.], Agricultural biotechnology and the poor. Proc. Intl. Conf., Oct. 21-22, 1999, Washington, DC.
- Gould, F. 2002. Can we justify resistance management strategies for conventional pesticides?, pp. 180-183. In: R. Laxminarayan [ed.], Battling resistance to antibiotics and pesticides: an economic approach. Washington, DC 377 pp.
- Gould, F. 2002. On the need for direct collaboration between economists and biologists, pp. 113-116. In: R. Laxminarayan [ed.], Battling resistance to antibiotics and pesticides: an economic approach. Washington, DC.
- Scott TW, Rasgon JL, Black WCIV and Gould F, 2005. Fitness studies: developing a consensus methodology, in Bridging laboratory and field research for genetic control of disease vectors, eds. Knols BGJ and Louis C.



Frontis, Wageningen, The Netherlands, Ch. 16, 171-181.

Kennedy, G.G. and F. Gould. 2007. Ecology of natural enemies and genetically engineered host plants. pp. 269-300. In/ M. Kogan and P. Jepson (eds). *Perspectives in Ecological Theory and Integrated Pest Management*. Cambridge Univ. Press. Cambridge, UK

Gould, F., A. T. Groot, G. M. Vasquez, and C. Schal. 2009. Sexual communication in Lepidoptera: A need for wedding genetics, biochemistry, and molecular biology. Chapter 10 in (M. Frantisek and M. R. Goldsmith Eds.) *Molecular Biology and Genetics of the Lepidoptera*. Taylor and Francis Group.

Gould, F. 2010. Applying evolutionary biology: From retrospective analysis to direct manipulation. Chapter 21. In M. A. Bell, D. J. Futuyma, W. F. Eanes, and J. S. Levinton (eds.), *Evolution Since Darwin: The First 150 Years*. Sinauer, Sunderland.

Total 29

### **REFEREED ARTICLES:**

Gould, F. 1978a. Predicting the future resistance of crop varieties to pest populations: a case study of mites and cucumbers. *Environ. Entomol.* 7: 622-626.

Gould, F. 1978b. Resistance of cucumber varieties to *Tetranychus urticae*: genetic and environmental determinants. *J. Econ. Entomol.* 71: 680-683.

Gould, F. 1979. Rapid host range evolution in a population of the phytophagous mite, *Tetranychus urticae* Koch. *Evolution* 33: 791-802.

Futuyma, D. J. and F. Gould. 1979. Associations of plants and insects in a deciduous forest. *Ecol. Monogr.* 49: 33-50.

Gould, F. and E. Hodgson. 1980. Mixed function oxidase and glutathione transferase activity in last instar *Heliothis virescens* larvae. *Pestic. Biochem. & Physiol.* 13: 34-40.

Gould, F., G. Holtzman, R. L. Rabb, and M. Smith. 1980. Genetic variation in predatory and cannibalistic tendencies of *Heliothis virescens* strains. *Ann. Entomol. Soc. Am.* 73: 243-250.

Gould, F., C. R. Carroll, and D. J. Futuyma. 1982. Cross resistance to pesticides and plant defenses: a study of the twospotted spider mite. *Entomol. exp. appl.* 31: 175-180.

Gould, F. 1984a. Mixed function oxidases and herbivore polyphagy: the devil's advocate position. *Ecol. Entomol.* 9: 29-34.

Gould, F. 1984b. Role of behavior in the evolution of insect adaptation to insecticides and resistant host plants. *Bull. Entomol. Soc. Am.* 30: 34-41.

Gould, F. and A. Massey. 1984. Cucurbitacins and the biological control of *Diabrotica undecimpunctata howardi*. *Entomol. exp. appl.* 36: 273-278.

Sims, S. R., P. G. Marrone, F. Gould, R. E. Stinner, and R. L. Rabb. 1984. Adult size variation of the bean leaf beetle, *Cerotoma trifurcata* (Forster). *Environ. Entomol.* 13: 300-304.

Joyner, K. and F. Gould. 1985. Developmental consequences of cannibalism in *Heliothis zea*. *Ann. Entomol. Soc. Am.* 78: 24-28.

Meinke, L., F. Gould, and J. Van Duyn. 1985. Soybean: a host for larval southern corn rootworms. *Fla. Entomol.* 68: 496-498.

- Villani, M. and F. Gould. 1985a. Butterfly milkweed extract as a feeding deterrent of the corn wireworm. *Entomol. exp. appl.* 37: 95-100.
- Villani, M. and F. Gould. 1985b. The screening of crude plant extracts as feeding deterrents of the corn wireworm, *Melanotus communis*. *Entomol. exp. appl.* 37: 69-76.
- Villani, M., L. Meinke, and F. Gould. 1985. Laboratory bioassay of crude extracts as anti-feedants for the southern corn rootworm. *Environ. Entomol.* 14: 617-619.
- Gould, F. 1986a. Simulation models for predicting durability of insect-resistant germ plasm: a deterministic diploid, two-locus model. *Environ. Entomol.* 15: 1-10.
- Gould, F. 1986b. Simulation models for predicting durability of insect-resistant germ plasm: Hessian fly (Diptera: Cecidomyiidae)-resistant winter wheat. *Environ. Entomol.* 15: 11-23.
- Koethe, R. W., F. Gould, and J. W. Van Duyn. 1986. Soybean nodule fly, *Rivellia quadrifasciata* (Diptera: Platystomatidae): aspects of overwintering and adult seasonal abundance. *Environ. Entomol.* 15: 349-354.
- Villani, M. and F. Gould. 1986. Use of radiographs for movement analysis and life-history studies of soil insects. *Environ. Entomol.* 15: 462-464.
- Kennedy, G. G., F. Gould, O. M. B. de Ponti, and R. E. Stinner. 1987. Ecological, agricultural, genetic, and commercial consideration in the deployment of insect-resistant germ plasm. *Environ. Entomol.* 16: 327-338.
- Landis, D. A., J. R. Bradley, Jr. and F. Gould. 1987. Behavior and survival of *Heliothis zea* (Lepidoptera: Noctuidae) prepupae in no-tillage and conventional-tillage corn. *Environ. Entomol.* 16: 94-99.
- Meinke, L. and F. Gould. 1987. Thermoregulation by *Diabrotica undecimpunctata howardi* and potential effects on overwintering biology. *Entomol. exp. appl.* 45: 115-121.
- Castillo-Chavez, C., S. A. Levin, and F. Gould. 1988. Physiological and behavioral adaptation to varying environments: a mathematical model. *Evolution* 42: 986-994.
- Gould, F. 1988a. Evolutionary biology and genetically engineered crops. *BioScience* 38: 26-33.
- Gould, F. 1988b. Genetic engineering, integrated pest management and the evolution of pests. *Tree 3/Biotech* 6: S15-19. (*Trends in Ecology & Evolution/Trends in Biotechnology*).
- Gould, F. 1988c. Stress specificity of maternal effects in *Heliothis virescens* (Boddie) (Lepidoptera: Noctuidae) larvae. In: *Paths from a viewpoint: the Wellington festschrift on insect ecology*. *Mem. Ent. Soc. Can.* 146: 191-197.
- Landis, D. A. and F. Gould. 1988. Screening for phyto-protectants to guard corn seeds/seedlings from southern corn rootworm feeding injury. *J. Entomol. Sci.* 23: 201-211.
- Kennedy, G. G. and F. Gould. 1989. Future challenges for entomology and the Entomological Society of America. *Bull. ESA*, Winter 1989.
- Landis, D. A. and F. Gould. 1989. Investigating the modes of action of several feeding deterrents against the southern corn rootworm, using behavioral bioassays and toxicity testing. *Entomol. exp. appl.* 51: 163-174.
- Waldvogel, M. and F. Gould. 1990. Variation in oviposition preference of *Heliothis virescens* in relation to macroevolutionary patterns of Heliothine host range. *Evolution* 44: 1326-1337.
- Gould, F. 1991. Arthropod behavior and the efficacy of plant protectants. *Annu. Rev. Entomol.* 36: 305-330.

- Gould, F. 1991. The evolutionary potential of crop pests. *Amer. Sci.* 79: 496-507.
- Gould, F. and A. Anderson. 1991. Effects of *Bacillus thuringiensis* and HD-73 delta-endotoxin on growth, behavior, and fitness of susceptible and toxin-adapted strains of *Heliothis virescens* (Lepidoptera: Noctuidae). *Environ. Entomol.* 20: 30-38.
- Gould, F., G. G. Kennedy, and M. T. Johnson. 1991. Effects of natural enemies on the rate of herbivore adaptation to resistant host plants. *Entomol. exp. appl.* 58: 1-14
- Gould, F., A. Anderson, D. Landis, and H. Van Mellaert. 1991. Feeding behavior and growth of *Heliothis virescens* larvae on diets containing *Bacillus thuringiensis* formulations or endotoxins. *Entomol. exp. appl.* 58: 199-210.
- Rose, R. L., F. Gould, P. E. Levi, and E. Hodgson. 1991. Differences in cytochrome P450 activities in tobacco budworm larvae as influenced by resistance to host plant allelochemicals and induction. *Comp. Biochem. Physiol.* 99: 535-540.
- Bottrell, D. G., R. M. Aguda, F. L. Gould, W. Theunis, C. G. Demayo, & V. F. Magalit. 1992. Potential strategies for prolonging the usefulness of *Bacillus thuringiensis* in engineered rice. *Korean J. Appl. Entomol.* 31: 247-255.
- Gould, F., A. Martinez-Ramirez, A. Anderson, J. Ferre, F. J. Silva & W. J. Moar. 1992. Broad-spectrum resistance to *Bacillus thuringiensis* toxins in *Heliothis virescens*. *Proc. Natl. Acad. Sci.* 89: 7986-7990.
- Heim, D. C., G. G. Kennedy, F. L. Gould & J. W. Van Duyn. 1992. Inheritance of fenvalerate and carbofuran resistance in Colorado beetles -- *Leptinotarsa decemlineata* (Say) -- from North Carolina. *Pestic. Sci.* 34: 303-311.
- Johnson, M. T. & F. Gould. 1992. Interaction of genetically engineered host plant resistance and natural enemies of *Heliothis virescens* (Lepidoptera: Noctuidae) in tobacco. *Environ. Entomol.* 21: 586-597.
- Suiter, K. A. & F. Gould. 1992. Effects of mating status and age on dispersal behavior in the twospotted spider mite, *Tetranychus urticae* in response to fenvalerate-treated leaf surfaces. *Entomol. exp. appl.* 62: 1-8.
- Follett, P. A., G. G. Kennedy, and F. Gould. 1993. REPO: A simulation model that explores Colorado potato beetle (Coleoptera: Chrysomelidae) adaptation to insecticides. *Environ. Entomol.* 22: 283-296.
- Follett, P. A., F. Gould, and G. G. Kennedy. 1993. Comparative fitness of three strains of Colorado potato beetle (Coleoptera: Chrysomelidae) in the field: spatial and temporal variation in insecticide selection. *J. Econ. Entomol.* 86: 1324-1333.
- Sheck, A. and F. Gould. 1993. The genetic basis of host range in *Heliothis virescens*: larval survival and growth. *Ent. exp. appl.* 69: 157-172.
- Demayo, C. G., F. Gould, D. G. Bottrell, A. M. Romena, and A. T. Angeles. 1994. Geographic variation in larval survival and growth of five *Scirpophaga incertulas* stem borer (Lepidoptera: Pyralidae) strains on different rice hosts. *Environ. Entomol.* 23: 1428-1435.
- Demayo, C. G., F. Gould, D. G. Bottrell, A. M. Romena, and A. T. Angeles. 1994. Geographic variation in larval survival and development of six *Chilo suppressalis* (Lepidoptera: Pyralidae) strains on different rice hosts. *Environ. Entomol.* 23: 1436-1442.
- Follett, P., F. Gould, R. Leidy, and J.R. Bradley Jr. 1994. Deposition of insecticide on glass models of lepidopterous larvae. *J. Econ. Entomol.* 87: 1400-1406.
- Gould, F. 1994. Potential and problems with high-dose strategies for pesticidal engineered crops. *Biol. Sci. & Technol.* 4: 451-461.

- Suiter, K. A. and F. Gould. 1994. Physiological resistance and behavioral avoidance responses to residues of four pesticides by six spider mite populations. *Entomol. exp. appl.* 71: 1-14.
- Follett, P., F. Gould, and G.G. Kennedy. 1995. High-realism model of Colorado potato beetle (Coleoptera: Chrysomelidae) adaptation to permethrin. *Environ. Entomol.* 24: 167-178.
- Gould, F. 1995. Comparisons between resistance management strategies for insects and weeds. *Weed Technol.* 9: 830-839.
- Gould, F., A. Anderson, A. Reynolds, L. Bumgarner & W. Moar. 1995. Selection and genetic analysis of a *Heliothis virescens* (Lepidoptera: Noctuidae) strain with high levels of resistance to *Bacillus thuringiensis* toxins. *J. Econ. Entomol.* 88: 1545-1559.
- Lee, M. K., F. Rajamohan, F. Gould, and D. H. Dean. 1995. Resistance to *Bacillus thuringiensis* CryIA endotoxins in a laboratory-selected *Heliothis virescens* strain is related to receptor alteration. *Appl. & Environ. Microbiol.* 61: 3836-3842.
- Nault, B. A., P. A. Follett, F. Gould & G. G. Kennedy. 1995. Assessing compensation for insect damage in mixed plantings of resistant and susceptible potatoes. *Am. Potato J.* 72: 157-176.
- Sheck, A. & F. Gould. 1995. Genetic analysis of differences in oviposition preferences of *Heliothis virescens* and *H. subflexa* (Lepidoptera: Noctuidae). *Environ. Entomol.* 24: 341-347.
- Gould, F., G.G. Kennedy, and R. Kopanic. [Eds.] 1996. Environmental issues associated with enhancing the impact of biological control agents: A student debate. *Am. Entomol.* 42:160.
- Klepetchka, B. and F. Gould. 1996. Effects of age and size on mating in *Heliothis virescens* (Lepidoptera: Noctuidae): implications for resistance management. *Environ. Entomol.* 25:993-1001.
- Lu, W., G. G. Kennedy, and F. Gould. 1996. Differential predation by *Coleomegilla maculata* on Colorado potato beetle strains that vary in growth on tomato. *Ent. Exp. Appl.* 81: 7-14.
- Rajamohan, F., J. A. Cottrill, F. Gould, and D. H. Dean. 1996a. Role of Domain II, loop 2 residues of *Bacillus thuringiensis* endotoxin in reversible and irreversible binding to *Manduca sexta* and *Heliothis virescens*. *J. Biol. Chem.* 271: 2390-2396.
- Rajamohan, F., A. S.-R. Hussain, J. A. Cottrill, F. Gould, and D. H. Dean. 1996b. Mutations at domain II, loop 3, of *Bacillus thuringiensis* CryIAa and CryIAb  $\alpha$ -endotoxins suggest loop 3 is involved in initial binding to lepidopteran midguts. *J. Biol. Chem.* 271: 25220-25226.
- Riggin-Bucci, T.M. and F. Gould. 1996. Effect of surfactants, *Bacillus thuringiensis* formulations, and plant damage on oviposition by diamondback moth (Lepidoptera: Plutellidae). *J. Econ. Entomol.* 89: 891-897.
- Sheck, A. and F. Gould. 1996. The genetic basis of differences in growth and behavior of specialist and generalist herbivore species: Selection on hybrids of *Heliothis virescens* and *Heliothis subflexa* (Lepidoptera). *Evolution* 50: 831-841.
- Sims, S. B., J. T. Greenplate, T. B. Stone, A. Caprio, and F. L. Gould. 1996. Monitoring strategies for early detection of Lepidoptera resistance to *Bacillus thuringiensis* insecticidal proteins, pp. 229-242. In: T. M. Brown [ed.], *Molecular genetics and evolution of pesticide resistance*. Am. Chem. Soc., Washington, DC.
- Arpaia, S., F. Gould, and G. Kennedy. 1997. Potential impact of *Coleomegilla maculata* predation on adaptation of *Leptinotarsa decemlineata* to Bt-transgenic potatoes. *Entomol. Exp. Appl.* 82: 91-100.
- Gould, F., A. Anderson, A. Jones, D. Sumerford, D. G. Heckel, J. Lopez, S. Micinski, R. Leonard, and M. Laster. 1997. Initial frequency of alleles for resistance to *Bacillus thuringiensis* toxins in field populations of *Heliothis virescens*. *Proc. Natl. Acad. Sci. USA* 94: 3519-3523.

- Heckel, D. G., L. C. Gahan, F. Gould, and A. Anderson. 1997. Identification of a linkage group with a major effect on resistance to *Bacillus thuringiensis* CryIAc endotoxin in the tobacco budworm (Lepidoptera: Noctuidae). *J. Econ. Entomol.* 90: 75-86.
- Heckel, D. G., L. C. Gahan, F. Gould, J. C. Daly, and S. Trowell. 1997. Genetics of *Heliothis* and *Helicoverpa* resistance to chemical insecticides and to *Bacillus thuringiensis*. *Pestic. Sci.* 51: 251-258.
- Hruska, A. and F. Gould. 1997. Fall armyworm (Lepidoptera: Noctuidae) and *Diatraea liineolata* (Lepidoptera: Pyralidae): impact of larval population level and temporal occurrence on maize yield in Nicaragua. *J. Econ. Entomol.* 90: 611-622.
- Johnson, M. T., F. Gould, and G. G. Kennedy. 1997a. Effects of natural enemies on relative fitness of *Heliothis virescens* genotypes adapted and not adapted to resistant host plants. *Ent. Exp. Appl.* 82:219-230.
- Johnson, M. T., F. Gould, and G. G. Kennedy. 1997b. Effect of an entomopathogen on adaptation of *Heliothis virescens* populations selected on resistant host plants. *Ent. Exp. Appl.* 83: 121-135.
- Lee, M. K., R. M. Aguda, M. B. Cohen, F. L. Gould, and D. H. Dean. 1997. Determination of binding of *Bacillus thuringiensis*  $\delta$ -endotoxin receptors to rice stem borer midguts. *Appl. Environ. Microbiol.* 63: 1453-1459.
- Riggin-Bucci, T. and F. Gould. 1997. Impact of intraplot mixtures of toxic and nontoxic plants on population dynamics of diamondback moth (Lepidoptera: Plutellidae) and its natural enemies. *J. Econ. Entomol.* 90: 241-251.
- Gould, F. 1998. Sustainability of transgenic insecticidal cultivars: integrating pest genetics and ecology. *Annu. Rev. Entomol.* 43: 701-26.
- Bottrell, D. G., P. Barbosa, and F. Gould. 1998. Manipulating natural enemies by plant variety selection and modification: a realistic strategy? *Annu. Rev. Entomol.* 43: 347-467.
- McGaughey, W. H., F. Gould, and W. Gelernter. 1998. Bt resistance management: A plan for reconciling the needs of the many stakeholders in Bt-based products. *Nature Biotech.* 16: 144-146.
- Riggin-Bucci, T. M., F. Gould, and C. White. 1998. Increased ovipositional attractancy to surfactant-treated broccoli by the diamondback moth (Lepidoptera: Plutellidae): tests of potential mechanisms. *J. Entomol. Sci.* 33: 261-269.
- Onstad, D. W. and F. Gould. 1998. Do dynamics of crop maturation and herbivorous insect life cycle influence the risk of adaptation to toxins in transgenic host plants? *Environ. Entomol.* 27: 517-522.
- Onstad, D. W. and F. Gould. 1998. Modeling the dynamics of adaptation to transgenic maize by European corn borer (Lepidoptera: Pyralidae). *J. Econ. Entomol.* 91: 585-593.
- Bailey, W. D., G. Zhao, L. M. Carter, F. Gould, G. G. Kennedy, and R. M. Roe. 1998. Feeding disruption bioassay for species and *Bacillus thuringiensis* resistance diagnosis for *Heliothis virescens* and *Helicoverpa zea* in cotton (Lepidoptera: Noctuidae). *Crop Protec.* 17: 591-598.
- Theunis, W., R. M. Aguda, W. T. Cruz, C. Decock, M. Peferoen, B. Lambert, D. G. Bottrell, F. L. Gould, J. A. Litsinger, and M. B. Cohen 1998. *Bacillus thuringiensis* isolates from the Philippines: habitat distribution, delta-endotoxin diversity, and toxicity to rice stem borers (Lepidoptera: Pyralidae). *Bull. Ent. Res.* 88: 335-342.
- Peck, S. L., S. P. Ellner, and F. Gould. 1998. A spatially explicit stochastic model demonstrates the feasibility of Wright's shifting balance theory. *Evolution* 52: 1834-1839.
- Peck, S., F. Gould, and S. Ellner. 1999. Spread of resistance in spatially extended regions of transgenic cotton: implications for management of *Heliothis virescens* (Lepidoptera: Noctuidae). *J. Econ. Entomol.* 92:1-16.

- Kota, M., H. Daniell, S. Varma, S. F. Garczynski, F. Gould, and W. J. Moar. 1999. Overexpression of the *Bacillus thuringiensis* Cry2Aa protein in chloroplasts confers resistance to plants against susceptible and Bt-resistant insects. *Proc. Nat'l. Acad. Sci. USA* 96: 1840-1845.
- Sisterson, M. S. and F. Gould. 1999. The inflated calyx of *Physalis angulata*: a refuge from parasitism for *Heliothis subflexa*. *Ecology* 80: 1071-1075.
- Martinez-Ramirez, A. C., F. Gould, and J. Ferre. 1999. Histopathological effects and growth reduction in a susceptible and a resistant strain of *Heliothis virescens* (Lepidoptera: Noctuidae) caused by sublethal doses of pure Cry1A crystal proteins from *Bacillus thuringiensis*. *Biocontrol Sci. & Technol.* 9: 239-246.
- Lee MK, T.H. You, F. Gould, 1999. Identification of residues in domain III of *Bacillus thuringiensis* Cry1Ac toxin that affect binding and toxicity. *Appl. Environ. Microb.* 65:4513-4520
- Alinia, F, M. B. Cohen and F. Gould. 2000. Heritability of tolerance to the Cry1Ab toxin of *Bacillus thuringiensis* in *Chilo suppressalis* (Lepidoptera: Crambidae). *J. Econ. Entomol.* 93:14-17.
- Bernays, E. A., S. Oppenheim, R. F. Chapman, H. Kwon, and F. Gould. 2000. Taste sensitivity of insect herbivores to deterrents is greater in specialists than in generalists: a behavioral test of the hypothesis with two closely related caterpillars. *J. Chem. Ecol.* 26: 547-563.
- Bentur, J. S., D. A. Andow, M. B. Cohen, A. M. Romena, and F. Gould. 2000. Frequency of alleles conferring resistance to a *Bacillus thuringiensis* toxin in a Philippine population of *Scirpophaga incertulas* (Lepidoptera: Pyralidae). *J. Econ. Entomol.* 93: 1515-1521.
- Bentur, J. S., M. B. Cohen, and F. Gould. 2000. Variation in performance on Cry1Ab-transformed and nontransgenic rice varieties among populations of *Scirpophaga incertulas* (Lepidoptera: Pyralidae) from Luzon Island, Philippines. *J. Econ. Entomol.* 93: 1773-1778.
- Peck, S. L., S. P. Ellner, and F. Gould. 2000. Varying migration and deme size and the feasibility of the shifting balance. *Evolution* 54: 324-327.
- Schliekelman, P. and F. Gould. 2000. Pest control by the release of insects carrying a female-killing allele on multiple loci. *J. Econ. Entomol.* 93: 1566-1579
- Schliekelman, P. and F. Gould. 2000. Pest control by the introduction of a conditional lethal trait on multiple loci: potential, limitations, and optimal strategies. *J. Econ. Entomol.* 93: 1543-1565.
- Cohen, M. B., A. M. Romena, and F. Gould. 2000. Dispersal by larvae of the stem borers *Scirpophaga incertulas* (Lepidoptera: Pyralidae) and *Chilo suppressalis* (Lepidoptera: Crambidae) in plots of transplanted rice. *Environ. Entomol.* 29: 958-971.
- Dirie, A. M., M. B. Cohen, and F. Gould. 2000. Larval dispersal and survival of *Scirpophaga incertulas* (Lepidoptera: Pyralidae) and *Chilo suppressalis* (Lepidoptera: Crambridae) on CryIAb-transformed and non-transgenic rice. *Entiron. Entomol.* 29: 972-978.
- Gould, F. 2000. Testing Bt refuge strategies in the field. *Nature Biotech.* 18: 266-267.
- Lu, W., G. G. Kennedy, and F. Gould. 2001. Genetic analysis of larval survival and larval growth of two populations of *Leptinotarsa decemlineata* on tomato. *Ent. Exp. Appl.* 99: 143-155.
- Gahan, L. J., F. Gould, and D. G. Heckel. 2001. Identification of a gene associated with Bt resistance in *Heliothis virescens*. *Science* 293: 857-860.
- Bailey, W. D., C. Brownie, J. S. Bacheler, F. Gould, G. G. Kennedy, C. E. Sorenson, and R. M. Roe. 2001. Species diagnosis and *Bacillus thuringiensis* resistance monitoring of *Heliothis virescens* and *Helicoverpa zea* (Lepidoptera: Noctuidae) field strains from the southern United States using feeding disruption bioassays. *J. Econ. Entomol.* 94: 76-85.

- Gould, F., N. Blair, M. Reid, T. L. Rennie, J. Lopez, and S. Micinski. 2002. *Bacillus thuringiensis* -toxin resistance management: stable isotope assessment of alternate host use by *Helicoverpa zea*. Proc. Natl. Acad. Sci. USA 99: 16581-16586.
- Jurat-Fuentes, J. L., F. L. Gould, and M. J. Adang. (2002) "Altered glycosylation of 63- and 68-kilodalton microvillar proteins in *Heliothis virescens* correlates with reduced Cry1 toxin binding, decreased pore formation, and increased resistance to *Bacillus thuringiensis* Cry1 toxins". Appl. Environ. Microbiol., 68(11), pp. 5711-5717.
- Oppenheim, S. J. and F. Gould. 2002. Behavioral adaptations increase the value of enemy-free space for *Heliothis subflexa*, a specialist herbivore. Evolution 56: 679-689.
- Oppenheim, S. J. and F. Gould. 2002. Is attraction fatal? The effects of herbivore-induced plant volatiles on parasitism of a specialist and generalist herbivore. Ecology 83: 3416-3425.
- Jurat-Fuentes, J. L., F. L. Gould, and M. J. Adang (2003). "Dual resistance to *Bacillus thuringiensis* Cry1Ac and Cry2Aa toxins in *Heliothis virescens* suggests multiple mechanisms of resistance". Appl. Environ. Microbiol., 69(10), pp. 5898-5906.
- Burd, A. D., J. R. Bradley, J. W. Van Duyn, F. Gould, and W. Moar. 2003. Estimated frequency of non-recessive Bt resistance genes in bollworm, *Helicoverpa zea* (Lepidoptera: Noctuidae) to Bt transgenic corn and cotton. J. Econ. Entomol. 96: 137-142.
- Storer, N. P., S. L. Peck, F. Gould, J. Van Duyn, and G. G. Kennedy. 2003. Spatial processes in the evolution of resistance in *Helicoverpa zea* (Lepidoptera: Noctuidae) to Bt transgenic corn and cotton in a mixed agroecosystem: a biology-rich stochastic simulation model. J. Econ. Entomol. 96: 156-172.
- Storer, N. P., S. L. Peck, F. Gould, J. Van Duyn, and G. G. Kennedy. 2003. Sensitivity analysis of a spatially-explicit stochastic simulation model of the evolution of resistance in *Helicoverpa zea* (Lepidoptera: Noctuidae) to Bt transgenic corn and cotton. J. Econ. Entomol. 96: 173-187.
- Gould, F., and P. Schliekelman. 2004. Population genetics of autocidal control and strain replacement. Ann. Rev. Entomol. 49: 193-217.
- Groot, A.T., C. Ward, J. Wang, A. Pokrzywa, J. O'Brien, J. Bennett, J. Kelly, R.G. Santangelo, C. Schal & F. Gould. 2004. Introgressing pheromone QTL between species: towards and evolutionary understanding of differentiation in sexual communication. Journal of Chemical Ecology 30: 2497-2516.
- Jackson, R.E., J. R. Bradley, J. W. Van Duyn JW, and F. Gould. 2004. Comparative production of *Helicoverpa zea* (Lepidoptera : Noctuidae) from transgenic cotton expressing either one or two *Bacillus thuringiensis* proteins with and without insecticide oversprays J. Econ. Entomol. 97:1719-1725.
- Li, G.P., K. M.Wu , F. Gould, H. Q. Feng, Y. Z. He, Y. Y. Guo. 2004. Frequency of Bt resistance genes in *Helicoverpa armigera* populations from the Yellow River cotton-farming region of China Entomol. Exper. Appl. 112:135-143.
- Tabashnik, B.E., F. Gould, Y. Carriere. 2004. Delaying evolution of insect resistance to transgenic crops by decreasing dominance and heritability. J. Evol. Biol. 17:904-912.
- Jurat-Fuentes, J. L., L. J. Gahan, F. L. Gould, D. G. Heckel, M. J. Adang. 2004. The HevCaLP protein mediates binding specificity of the Cry1A class of *Bacillus thuringiensis* toxins in *Heliothis virescens*. Biochemistry 43:14299-14305.
- Groot, A.T., Y. Fan, C. Brownie, R. A. Jurenka, F. Gould, and C. Schal. (2005). Effect of PBAN on the sex pheromone gland profile in mated *Heliothis virescens* and *Heliothis subflexa* females. J. Chem. Ecol. 31:15-28.

- Groot, A.T., C. Gemeno, C. Brownie, F. Gould & C. Schal. 2005. Male and female antennal responses in *Heliothis virescens* and *H. subflexa* to conspecific and heterospecific sex pheromone compounds. *Environmental Entomology*. 34:256-263.
- Mallampalli N, F. Gould, and P. Barbosa. 2005. Predation of Colorado potato beetle eggs by a polyphagous ladybeetle in the presence of alternate prey: potential impact on resistance evolution. *Entomol. Exp. Appl.* 114:47-54.
- Gahan, L. J., Y. T. Ma, M. L. M. Coble, F. Gould F, W. J. Moar, D. G. Heckel. 2005. Genetic basis of resistance to Cry1Ac and Cry2Aa in *Heliothis virescens* (Lepidoptera : Noctuidae). *J. Econ. Entomol.*98:1357-1368.
- Sheck, A. L., A. T. Groot, C. M. Ward, C. Gemeno, J. Wang, C. Schal, & F. Gould. 2006. Genetics of sex pheromone blend differences between *Heliothis virescens* and *Heliothis subflexa*: A chromosome mapping approach. *J. Evol. Biol.* 19:600-617.
- Schliekelman, P., S. Ellner, and F. Gould. 2005. Pest control by genetic manipulation of sex ratio. *J. Econ. Entomol.* 98: 18-34.
- Rasgon, J. L., F. Gould. 2005. Transposable element insertion location bias and the dynamics of gene drive in mosquito populations. *Insect. Mol. Biol.* 14:493-500.
- Magori, K., and F. Gould. 2006. Genetically engineered underdominance for manipulation of pest populations: A deterministic model. *Genetics* 172 (4): 2613-2620
- Groot,, A. T., Bennett J., J. Hamilton, R. G. Santangelo, C. Schal, and F. Gould. (2006) Experimental evidence for interspecific directional selection on moth pheromone communication. *Proc. Nat. Acad. Sci.* 103 (15): 5858-5863
- Sinkins, S. P., and F. Gould. 2006. Gene drive systems for insect disease vectors. *Nature Reviews Genetics*. 7:427-435.
- Gould, F., K. Magori, Y. X. Huang 2006 Genetic strategies for controlling mosquito-borne diseases. *American Scientist*. 94 (3): 238-246.
- Gould, F., Cohen M. B., J. S. Bentur, G. G. Kennedy, J. W. Van Duyn. 2006. Impact of small fitness costs on pest adaptation to crop varieties with multiple toxins: A heuristic model. *J. Econ. Entomol.* 99:2091-2099.
- Jackson, R.E., F. Gould, J. R. Bradley, J. W. Van Duyn. 2006. Genetic variation for resistance to *Bacillus thuringiensis* toxins in *Helicoverpa zea* (Lepidoptera : Noctuidae) in eastern North Carolina. *J. Econ. Entomol.* 99:1790-1797.
- Jackson, R. E., M. A. Marcus, F. Gould, J. R. Bradley, J. W. Van Duyn. 2007. Cross-resistance responses of Cry1Ac-selected *Heliothis virescens* (Lepidoptera : Noctuidae) to the *Bacillus thuringiensis* protein Vip3A. *J. Econ. Entomol.* 100:180-186.
- Gahan, L. J., F. Gould, J. D. Lopez, S. Micinski, D. G. Heckel . 2007. A polymerase chain reaction screen of field populations of *Heliothis virescens* for a retrotransposon insertion conferring resistance to *Bacillus thuringiensis* toxin. *J. Econ. Entomol.* 100:187-194.
- Groot, A. T., R. G. Santangelo, E. Ricci, C. Brownie, F. Gould, C. Schal. 2007. Differential attraction of *Heliothis subflexa* males to synthetic pheromone lures in eastern US and western Mexico. *J. Chem Ecol.* 33:353-368.
- Huang, Y., K. Magori, A. L. Lloyd, F. Gould. 2007. Introducing desirable transgenes into insect populations using Y-linked meiotic drive—a theoretical assessment. *Evolution* 61:717-726.
- Li, G. P., K. M. Wu, F. Gould, J. K. Wang, J. Miaoi, X. W. Gao, Y. Y. Guo. 2007. Increasing tolerance to Cry1Ac cotton from cotton bollworm, *Helicoverpa armigera*, was confirmed in Bt cotton farming area of China. *Ecological Entomology* 32:366-375.



- Heckel, D. G., L. J. Gahan, S.W. Baxter, J. Z. Zhou, A. M. Shelton, F. Gould, B. E. Tabashnik. 2007. The diversity of Bt resistance genes in species of Lepidoptera. *J. Invert. Pathol.* 95:192-197 Sp. Iss.
- Huang, Y., K. Magori, A. L. Lloyd, F. Gould. 2007. Introducing transgenes into insect populations using combined gene-drive strategies: Modeling and analysis. *Insect biochem. Mol. Biol.* 37:1054-63.
- Blanco, C. A., O. P. Perera, F. Gould, D. V. Sumerford, G. Hernandez, C. A. Abel, D. A. Andow. 2008. An empirical test of the F-2 screen for detection of *Bacillus thuringiensis*-resistance alleles in tobacco budworm (Lepidoptera : Noctuidae). *J. Econ. Entomol.* 101:1406-1414.
- Abney, M. R., C. E. Sorenson, F. Gould, J. R. Bradley. 2008. Limitations of stable carbon isotope analysis for determining natal host origins of tobacco budworm, *Heliothis virescens*. *F. Entomol. Exp. Appl.* 126:46-52.
- Puente, M. E., G. G. Kennedy, F. Gould. 2008. The impact of herbivore-induced plant volatiles on parasitoid foraging success: A general deterministic model. *J. Chem. Ecol.* 34:945-958.
- Puente, M. E., K. Magori, G. G. Kennedy, F. Gould. 2008. Impact of herbivore-induced plant volatiles on parasitoid foraging success: A spatial simulation of the *Cotesia rubecula*, *pieris rapae*, and Brassica oleracea system. *J. Chem Ecol.* 34:959-970.
- Gould, F. 2008. Broadening the application of evolutionarily based genetic pest management. *Evolution* 62: 500–510.
- Gould, F., Huang, Y., Legros, M., Lloyd, A. L. 2008. A killer-rescue system for self-limiting gene drive of anti-pathogen constructs. *Proc. Royal. Soc. Lond. B.* 275:2823-2829.
- Benda, N. D., C. Brownie, C. Schal, F. Gould 2009. Fruit abscission by *Physalis* species as defense against frugivory. *Entom. Exp. Appl.* 130:21-27.
- Huang, Y., A. Lloyd, M. Legros and F. Gould. (2009) Gene-drive in age-structured insect populations. *Evolutionary Applications* 2:143-159.
- Legros, M., Lloyd, A. L., Y. Huang, F. Gould. 2009. Density-Dependent Intraspecific Competition in the Larval Stage of *Aedes aegypti* (Diptera: Culicidae): Revisiting the Current Paradigm. *J. Med. Entomol.* 46:409-419.
- Groot AT, Estock ML, Horovitz JL, Santangelo RG, Schal C.,Gould F. 2009. QTL analysis of sex pheromone blend differences between two closely related moths: Insights into divergence in biosynthetic pathways. *Insect Biochem Mol. Biol.* 39:568-577
- Groot AT, Inglis O, Bowdridge S Santangelo RG, Blanco C, Lopez JD, Vargas AT, Gould F, Schal C 2009. Geographic and temporal variation in moth chemical communication. *Evolution.* 63:1987-2003
- Blanco CA, Gould F, Vega-Aquino P, Jurat-Fuentes JL, Perera OP, Abel CA. 2009. Response of *Heliothis virescens* (Lepidoptera: Noctuidae) Strains to *Bacillus thuringiensis* Cry1Ac Incorporated Into Different Insect Artificial Diets *J. Econ Entomol.* 102:1599-1606
- Gao YL, Wu KM, Gould F, Shen ZC 2009. Cry2Ab Tolerance Response of *Helicoverpa armigera* (Lepidoptera: Noctuidae) Populations From Cry1Ac Cotton Planting Region. *J. Econ. Entomol.*102:1217-1223
- Gao YL, Wu KM, Gould F. 2009. Frequency of Bt Resistance Alleles in *H-armigera* During 2006-2008 in Northern China *Environ. Entomol.* 38:1336-1342
- Magori\*K., M. Legros\*, M. Puente, D. A. Focks, T. W. Scott, A. Lloyd, F. Gould. 2009. Skeeter Buster: a stochastic, spatially-explicit modeling tool for studying *Aedes aegypti* population replacement and population suppression strategies. *PLoS Negl Trop Dis* 3(9): e508. doi:10.1371/journal.pntd.0000508
- Petzold, J., C. Brownie, F. Gould. 2009. Effect of *Heliothis subflexa* herbivory on fruit abscission by *Physalis* species: the roles of mechanical damage and chemical factors. *Ecol. Entomol.* 34:603-613.
- Gould, F., M. Estock, N. K. Hillier, B. Powell, A. T. Groot, C. M. Ward, J. L. Emerson, C. Schal, N. J. Vickers. 2010. Sexual isolation of male moths explained by a single pheromone response QTL containing four odorant receptor genes. *Proc. Nat. Acad. Sci.* 107:8660–8665.

- Blanco, C. A., F. Gould, A. T. Groot, C. A. Abel, G. Hernandez, O. P. Perera, A. P. Teran-Vargas. 2010. Offspring from sequential matings between *Bacillus thuringiensis*-resistant and *Bacillus thuringiensis*-susceptible *Heliothis virescens* moths (Lepidoptera: Noctuidae). *J. Econ. Entomol.* 103:861-868.
- Jongsma, M. A., F. Gould, M. Legros, Y. M. Yang, J. J. A. van Loon, M. Dicke. 2010. Insect oviposition behavior affects the evolution of adaptation to Bt crops: consequences for refuge policies. *Evol. Ecol.* 24:1017-1030.
- Feng, H. Q., F. Gould, Y. X. Huang, Y. Y. Jiang, K. M. Wu. 2010. Modeling the population dynamics of cotton bollworm *Helicoverpa armigera* (Hubner) (Lepidoptera: Ecol. Modelling 221:1819-1830.
- Xu, C., Legros, M., Gould, F., Lloyd, A. L. 2010. Understanding Uncertainties in Model-Based Predictions of *Aedes aegypti* Population Dynamics. *PLoS Negl. Trop. Dis.* 4(9): e830. doi:10.1371/journal.pntd.0000830
- An, J. J., Y. L. Gao, K. M. Wu, F. Gould, J. H. Gao, Z. C. Shen, C. L. Lei. 2010. Vip3Aa Tolerance Response of *Helicoverpa armigera* Populations From a Cry1Ac Cotton Planting Region. *J. Econ. Entomol.* 103:2169-2173.
- Soques, S., G. M. Vásquez, C. M. Grozinger, and F. Gould. 2010. Age and Mating Status Do Not Affect Transcript Levels of Odorant Receptor Genes in Male Antennae of *Heliothis virescens* and *Heliothis subflexa*. *J. Chem. Ecol.* 36:1226-1233.
- Vasquez, G. M., P. Fischer, C. M. Grozinger and F. Gould. 2011. Differential expression of odorant receptor genes involved in the sexual isolation of two *Heliothis* moths. *Insect. Mol. Biol.* 20:115-124
- Wang, G., G. M. Vasquez, C. Schal, L. J. Zwiebel, and F. Gould. 2011. Functional characterization of pheromone receptors in the tobacco budworm *Heliothis virescens*. *Insect. Mol. Biol.* 20:125-133.
- Jurat-Fuentes, J. L., Karumbaiah, L., Jakka, S.R.K., Ning, C., Liu, C., Wu, K., Jackson, J., Gould, F., Blanco, C., Portilla, M., Perera, O. P., and M. J. Adang. 2011. Reduced levels of membrane-bound alkaline phosphatase are common to lepidopteran strains resistant to Cry toxins from *Bacillus thuringiensis*. *PLoS ONE* 6(3): e17606. doi:10.1371/journal.pone.0017606
- Ward, C. M., J. T. Su, Y. Huang, A. L. Lloyd, F. Gould, and B. A. Hay. 2011. *Medea* selfish genetic elements as tools for altering traits of wild populations: A theoretical analysis. *Evolution* 65-4: 1149–1162
- Petzold-Maxwell J., S. Wong, C. Arellano, F. Gould. 2011. Host plant direct defence against eggs of its specialist herbivore, *Heliothis subflexa*. *Ecol. Entomol.* 36:700–708. DOI: 10.1111/j.1365-2311.2011.01315.x.
- Gao, Y., J. An, F. Gould, C. A. Blanco, K. M. Wu, 2011. Susceptibility of *Helicoverpa armigera* from different host plants in northern China to *Bacillus thuringiensis* toxin Cry1Ac. *Crop. Prot.* 30:1421-1424.
- Legros M., K. Magori, A. C. Morrison Amy C., C. G. Xu, T. W. Scott, A. L. Lloyd, F. Gould. 2011. Evaluation of Location-Specific Predictions by a Detailed Simulation Model of *Aedes aegypti* Populations *PLoS ONE* 6 Issue: 7 Article Number:10.1371/journal.pone.0022701.
- Huang, Y., Lloyd, A.L., Legros, M., Gould, F. 2011. Gene-drive into insect populations with age and spatial structure: a theoretical assessment. *Evol. Appl.* 4:415-428 DOI: 10.1111/j.1752-4571.2010.00153.x
- Benda, N. D., C. Brownie, C. Schal, F. Gould. 2011. Field Observations of Oviposition by a Specialist Herbivore on Plant Parts and Plant Species Unsuitable as Larval Food. *Environ. Entomol.* 40:1478-1486.
- Walsh, R. K., L. Facchinelli, J. M. Ramsey, J. G. Bond, F. Gould. 2011. Assessing the impact of density dependence in field populations of *Aedes aegypti*. *J. Vector Ecol.* 36:300-307 DOI: 10.1111/j.1948-7134.2011.00170.x
- Walsh RK, C. Bradley, C. S. Apperson, F. Gould. 2012. An Experimental Field Study of Delayed Density Dependence in Natural Populations of *Aedes albopictus*. *PLoS ONE* 7(4): e35959. doi:10.1371/journal.pone.0035959.
- Bergen, E. L., Rowell, J. T., Gould, F., & Servedio, M. R. (2012). Stochasticity in Sexual Selection Enables Divergence: Implications for Moth Pheromone Evolution. *Evolutionary Biology.* 39:271-

281.

- Tabashnik, B. E., & F. Gould. 2012. Delaying Corn Rootworm Resistance to Bt Corn. *Journal of economic entomology*, 105(3), 767-776.
- Oppenheim, S. J., F. Gould, & K. R. Hopper. 2012. The genetic architecture of a complex ecological trait: host plant use in the specialist moth, *Heliothis subflexa*. *Evolution*. 66:3336-3351
- Robert, M. A., Legros, M., Facchinelli, L., Valerio, L., Ramsey, J. M., Scott, T. W., Gould, F. & Lloyd, A. L. 2012. Mathematical Models as Aids for Design and Development of Experiments: The Case of Transgenic Mosquitoes. *Journal of Medical Entomology*, 49(6), 1177-1188.
- Legros M, Xu C, Okamoto K, Scott TW, Morrison AC, Lloyd, AL, Gould, F. 2012. Assessing the Feasibility of Controlling *Aedes aegypti* with Transgenic Methods: A Model-Based Evaluation. *PLoS ONE* 7(12): e52235. doi:10.1371/journal.pone.0052235.
- Facchinelli, L., L. Valerio, J.M. Ramsey, F. Gould, R. K. Walsh, G. Bond, M. A. Robert, A. L. Lloyd, A. A. James, L. Alphey, and T. W. Scott. 2013. Field Cage Studies and Progressive Evaluation of Genetically-Engineered Mosquitoes. *PLoS NTD*. 7(1): e2001. doi:10.1371/journal.pntd.0002001
- Gatton, M.L., N. Chitnis, T. Churcher, M. J. Donnelly, A. C. Ghani, H. C. J. Godfray, F. Gould, I. Hastings, J. Marshall, H. Ranson, M. Rowland, J. Shaman, S. W. Lindsay. 2013. The Importance of Mosquito Behavioural Adaptations to Malaria Control in Africa. *Evolution*. 67:1218-1230.
- Walsh, R.K., C.L. Aguilar, L. Facchinelli, L. Valerio, J.M. Ramsey, T.W. Scott, A. L. Lloyd and F. Gould. 2013. Assessing the Impact of Direct and Delayed Density Dependence in Natural Larval Populations of *Aedes aegypti*. *Amer. J. Trop. Med. Hyg.* 89:68-77.
- Groot, A. T., H. Staudacher, A. Barthel, O. Inglis, G. Schofl, R. G. Santangelo, S. Gebauer-Jung, H. Vogel, J. Emerson, C. Schal, D. G. Heckel, F. Gould. 2013. One quantitative trait locus for intra- and interspecific variation in a sex pheromone. *Molecular Ecology*. 22:1065-1080 DOI: 10.1111/mec.12171
- Robert, M. A., K. Okamoto, A. L. Lloyd, F. Gould. 2013. Reduce and replace strategy for suppressing vector-borne diseases: Insights from a deterministic model. *PLoS ONE* 8(9) e73233. DOI: 10.1371/journal.pone.0073233.
- Huang, Y., P. Wan, H. N. Zhang, M. S. Huang, Z. H. Li, F. Gould. 2013. Diminishing returns from increased percent Bt cotton: The case of pink bollworm. *PLoS ONE* 8(7): e68573. DOI: 10.1371/journal.pone.0068573.
- Legros M, C. Xu, A. Morrison, T. W. Scott, A. L. Lloyd, F. Gould. 2013. Modeling the dynamics of a non-limited and a self-limited gene drive system in structured *Aedes aegypti* populations. *PLoS ONE* 8(12): e83354. doi:10.1371/journal.pone.0083354
- Okamoto K. W., M. A. Robert, A. L. Lloyd, F. Gould. 2013. A reduce and replace strategy for suppressing vector-borne diseases: Insights from a stochastic, spatial model. *PLoS ONE* 8(12): e81860. doi:10.1371/journal.pone.0081860
- Vásquez GM, Syed Z, Estes PA, Leal WS, Gould F. 2013. Specificity of the receptor for the major sex pheromone component in *Heliothis virescens*. *Journal of Insect Science* 13:160. Available online: <http://www.insectscience.org/13.160>
- Thresher, R. E., K. Hayes, N. J. Bax, J. Teem, T. J. Benfey, F. Gould. 2014. Genetic control of invasive fish: technological options and its role in Integrated Pest Management. *Biological Invasions*. Volume: 16 Issue: 6 Special Issue: SI Pages: 1201-1216. DOI 10.1007/s10530-013-0477-0
- Groot, A. T., G. Schofl, O. Inglis, S. Donnerhacke, A. Classen, A. Schmalz, R. G. Santangelo, J. Emerson, F. Gould, C. Schal, and D. G. Heckel. 2014. Within-population variability in a moth sex pheromone blend: genetic basis and behavioural consequences. *Proc. R. Soc. B* 281:20133054. <http://dx.doi.org/10.1098/rspb.2013.3054>
- Okamoto KW, Robert MA, Gould F, Lloyd AL (2014) Feasible Introgression of an Anti-pathogen Transgene into an Urban Mosquito Population without Using Gene-Drive. *PLoS Negl Trop Dis* 8(7): e2827. doi:10.1371/journal.pntd.0002827
- Robert, M. A., K. W. Okamoto, F. Gould and A. L. Lloyd. 2014. Antipathogen genes and the replacement of disease-vectoring mosquito populations: a model-based evaluation *Evol. Appl.* 7:1238-1251. DOI: 10.1111/eva.12219.
- Campbell, K. J., J. Beek, C. T. Eason, A. S. Glen, J. Godwin, F. Gould, N. D. Holmes, G. R. Howald, F. M. Madden, J. B. Ponder, D. W. Threadgill, A. Wegmann, and G. S. Baxter. 2015. The next generation of rodent eradications: Innovative technologies and tools to improve species specificity and increase their feasibility on islands. *Biological Conservation* 185:47-58.
- Achee NL, Gould F, Perkins TA, Reiner RC Jr., Morrison AC, Ritchie SA, Gubler, DJ, Teyssou, R, Scott, TW. 2015.

- A Critical Assessment of Vector Control for Dengue Prevention. *PLoS Negl Trop Dis* 9(5): e0003655. doi:10.1371/journal.pntd.0003655.
- Perera OP, Shelby KS, Popham HJR, Gould F, Adang MJ, Jurat-Fuentes JL. 2015. Generation of a Transcriptome in a Model Lepidopteran Pest, *Heliothis virescens*, Using Multiple Sequencing Strategies for Profiling Midgut Gene Expression. *PLoS ONE* 10(6): e0128563. doi:10.1371/journal.pone.0128563
- An J, Gao Y, Lei C, Gould F, Wu K. 2015. Monitoring cotton bollworm resistance to Cry1Ac in two counties of northern China during 2009–2013. *Pest Manag. Sci.* 71:377-382 doi:10.1002/ps.3807.
- Okamoto, K. W., F. Gould, A. L. Lloyd. 2016. Integrating Transgenic Vector Manipulation with Clinical Interventions to Manage Vector-Borne Diseases. *PLoS Computational Biology*. Published: March 10, 2016 <http://dx.doi.org/10.1371/journal.pcbi.1004695>
- Fritz, M. L., S. Paa, J. Baltzegar, F. Gould. 2016. Application of a dense genetic map for assessment of genomic responses to selection and inbreeding in *Heliothis virescens*. *Insect Mol. Biol.* 25:385-400. DOI: 10.1111/imb.12234
- Li G, Reisig D, Miao J, Gould F, Huang F, Feng H. 2016. Frequency of Cry1F Non-Recessive Resistance Alleles in North Carolina Field Populations of *Spodoptera frugiperda* (Lepidoptera: Noctuidae). *PLoS ONE* 11(4): e0154492. doi:10.1371/journal.pone.0154492
- Legros, M., Otero, M., Romeo Aznar, V., Solari, H., Gould, F., & Lloyd, A. L. 2016. Comparison of two detailed models of *Aedes aegypti* population dynamics. *Ecosphere* 7, no. 10. 193 total—December 2016

#### **NON-REFEREED ARTICLES:**

- de Ponti, O. M. B., G. G. Kennedy, and F. Gould. 1983. Different resistance of nonbitter cucumbers to *Tetranychus urticae* in the Netherlands and the United States. *Cucurbit Genet. Coop.* 6: 27-28.
- Leonard, K. and F. Gould. 1983. Breeding for resistance. *Res. Perspec.* 2: 6-8.
- Gould, F. 1989. Integrating biotechnology into agricultural systems: the need for more experimental agriculture at the farm level. Brief for U.S. Senate Committee on Agriculture, Nutrition and Forestry. U.S. Govt. Print. Office, Washington, D.C., S.Prt. no. 101-61.
- Gould, F. 1989. Pesticidal transgenic plants and the 1990 Farm Bill. Proceedings of Annapolis Conference on Transgenic Plants. USDA, EPA, and FDA. 7-9 September 1988.
- Gould, F. 1991. Evolution of resistance to toxic compounds by arthropods, weeds and pathogens. Report for the Office of Technology Assessment, U.S. Congress, Washington, DC.
- Gould, F. 1995. The empirical and theoretical basis for Bt-resistance management. ISB News Report, National Biological Impact Assessment Program.
- Lambert, A. L., J.R. Bradley, F. Gould, and J.W. VanDuyn. 1998. Bollworm (*Helicoverpa zea*) adaptation to Bt toxin? In: *Proceedings of the Beltwide Cotton Production and Research Conference*, National Cotton Council, Memphis, TN. Pages 1033-1037.
- Storer, N. P., J. VanDuyn, F. Gould, and G. G. Kennedy. 1999. Ecology and biology of cotton bollworm in reference to Bt resistance development in a Bt cotton/Bt corn system. In: *Proceedings of the Beltwide Cotton Production and Research Conference*, National Cotton Council, Memphis, TN.
- Storer, N. P., S. L. Peck, J. VanDuyn, F. Gould, and G. G. Kennedy. 1999. Evolution of region-wide resistance in cotton bollworm to Bt cotton as influenced by Bt cotton: identification of key factors through computer simulation. In: *Proceedings of the Beltwide Cotton Production and Research Conference*, National Cotton Council, Memphis, TN.
- Roe, R. M., W. D. Bailey, G. Zhao, H. P. Young, L. M. Carter, F. Gould, C. E. Sorenson, G. G. Kennedy, and J. S. Bachelier. 1999. Assay kit for species and insecticide resistance diagnosis for tobacco budworm and bollworm in cotton. Beltwide Cotton Conference, Cotton Insect Research and Control.

- Gould, F., G. G. Kennedy, T. Johnson, T. Riggini Bucci, and S. Arpaia. 1999. Impact of natural enemies on the evolution of pest resistance to engineered crops. *IOBC/OILB Newsl.* 1: 16-17.
- Cohen, M.B., A.M. Romena, R.M. Aguda, A. Dirie, and F. Gould. 1999. Evaluation of resistance management strategies for Bt rice. In: *Proceedings of the 2<sup>nd</sup> Pacific Rim Conference on Biotechnology of Bt and its Impacts on the Environment*. Pages 496-505
- Storer, N. P., F. Gould, G. G. Kennedy, and J. W. Van Duyn. 1999. Ecology and biology of cotton bollworm in reference to modeling Bt resistance development in a Bt cotton/Bt corn system. **In:** *Cotton Insect Research and Control Conference, 1999 Beltwide Cotton Conference, Memphis, TN*, pp. 949, 952.
- Storer, N. P., F. Gould, G. G. Kennedy, S. L. Peck, and J. W. Van Duyn. 1999. Evolution of region-wide resistance in cotton bollworm to Bt cotton as influenced by Bt corn: identification of key factors through computer simulation. **In:** *Cotton Insect Research and Cotton Conference, 1999 Beltwide Cotton Conference, Memphis, TN*, pp. 952-956
- Cohen, M. B., F. Gould, and J. S. Bentur. 2000. Bt rice: Practical steps to sustainable use. *International Rice Research Newsletter* 25.2
- Gould, F. 2000. Testing Bt refuge strategies in the field. *Nat. Biotechnol.* 18: 266-267.
- Gould, F. and J. Kuzma. 2002. The academy responds. *The Scientist* 99: 1681-1686.
- Jackson, R. E., J. R. Bradley Jr., F. Gould, J. W. Van Duyn, and A. D. Burd. 2003. Bt resistance evolution in the *Helicoverpa zea* population in eastern North Carolina. *Proc. Beltwide Cotton Conf., Natl. Cotton Council, Memphis, TN*.
- Jurat-Fuentes, J. L., F. L. Gould, and M. J. Adang (2003). "Evidence for multiple mechanisms of resistance to Cry1Ac and Cry2A toxins from *Bacillus thuringiensis* in *Heliothis virescens*". Submitted after invitation from the editor to *Resistant Pest Management Newsletter*. Vol. 12, No. 2, Spring 2003.
- Gould, F. 2003. Bt-resistance management - theory meets data . *NAT BIOTECHNOL* 21: 1450-1451
- Abney, M. R., C. E. Sorenson, F. Gould, and J. R. Bradley, Jr. 2005. Assessing the Utility of Stable Carbon Isotopes for Determining Natal Host Origins of Tobacco Budworm, *Heliothis virescens*, in a Host Species Rich Agro-ecosystem. Pp 1511-1516 /In/ *Proceedings, 2005 Beltwide Cotton Conferences, New Orleans, LA. National Cotton Council, Memphis, TN*.
- Kurtz, R. W., F. Gould, J. R. Bradley, Jr., J. W. Van Duyn, and C.E. Sorenson. 2006. Evaluating Bt IRM requirements in North Carolina through computer modeling. Pp 1484-1492 /In/ *Proceedings, 2006 Beltwide Cotton Conferences, San Antonio, TX. National Cotton Council, Memphis, TN*.

Total 22

### **Book Reviews**

- Gould, F. 1978. Chemical control of insect behavior: theory and application. H. H. Shorey and J. J. McKelvey [eds.]. *Quart. Rev. Biol.* 53: 77-78.
- Gould, F. 1979. Pest control strategies. E. H. Smith and D. Pimentel [eds.]. *Quart. Rev. Biol.* 54: 110.
- Gould, F. 1981. Sampling methods in soybean entomology. M. Kogan and D. C. Herzog [eds.]. *Quart. Rev. Biol.* 56: 214-215.
- Gould, F. 1983. Bark beetles in North American conifers. J. Mitton and K. Sturgeon [eds.]. *Science* 220:
- Gould, F. 1993. The black-capped chickadee: behavioral ecology and natural history, by Susan M. Smith. *American Scientist*.

- Gould, F. 1994. *Bacillus thuringiensis*: an environmental biopesticide. *Quart. Rev. Biol.* 69: 545-546.
- Gould, F. 1996. Regulatory mechanisms in insect feeding. R. F. Chapman and G. deBoer [eds.]. *Crop Protection* 15: 321.
- Gould, F. 1997. Review of dynamics of weed populations. R. Cousens and M. Mortimer. *American Scientist*.
- Gould, F. 1998. Rethinking pesticide use. Review of M. L. Winston, *Nature Wars. Issues in Science & Technol.* 14: 86-90.
- Gould, F. 2006 The dark side of DNA. *American Scientist* 94:552-554

Total 10

#### Collaborators (Past 4 Years)

Adang, Michael	Univ. GA
Apperson, Charles	NCSU
Facchinelli, Luca	Univ Perugia, Italy
Fritz, Megan	Post-doc
Gatton, Michelle	CSIRO, Australia
Griffiths, Emily	Post-doc (with Alun Lloyd)
Groot, Astrid	Univ. of Amsterdam
Gunning, Christian	Post-doc (with Alun Lloyd)
Haddad, Nick	NCSU
Haenn, Nora	NCSU
Heckel, David	Max Plank, Jena Germany
Hopper, Keith	Univ. Delaware
Huang, Yunxin,	Hubei University, Wuhan, Hubei, China
Jurat-Fuentes, Juan L.	Univ. of TN
Kinsella, Bill	NCSU
Kuzma, Jennifer	NCSU
Leal, Walter	UC Davis, CA
Morrison, Amy	UC Davis, CA
Okamoto, Kenichi	Post-doc Yale Univ.
Oppenheim, Sara	Museum of natural History, NYC
Perera, O. P.	USDA Stoneville, MS
Petzold-Maxwell, Jen	Wartburg College, Iowa
Schal, Coby	NCSU
Scott, Tom	UC Davis, CA
Servedio, Maria	UNC, NC
Vasquez Gissella	US Naval Medical Research unit- Ent. Deputy director Peru
Xu Chonggang	Research Scientist Los Alamos National Lab
Walsh, Rachael	Faculty, Wake Technical Community College
Wu, Kongming	Chinese Academy of Agricultural Science
Tabashnik, Bruce	Univ. of Arizona
Thresher, Ron	CSIRO, Australia