

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 (2016-2020):

GES 506/ENT791- Genetic Pest Management (with Scott, Lorenzen)
GES 591-002- Genetic Engineering for Sustainable Crop Production (with Sederoff)
GES 591-501- Impacts of Biotechnology in North Carolina Agricultural Systems (with Brown, Reisig 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
2002-2015- Adjunct Professor, Dept. of Genetics, N.C. State Univ., Raleigh
2011-Present- University Distinguished Professor
2013-Present- Co-Director NCSU Genetic Engineering and Society Center.

PROFESSIONAL SOCIETIES

Entomological Society of America
Society for the Study of Evolution
Sigma Xi
AAAS

HONORS, AWARDS, CONSULTANTSHIPS, ADVISORY PANELS

Keynote address: Gordon Research Conference on Plant-Herbivore Interactions. 2017
Plenary Address: International Congress of Entomology 2016

Gates Foundation Target Malaria program, Ethics Committee 2015-Present.

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 (with	\$222,000	2003-2005	Evolution of insect sexual communications systems C. Schal)
USDA	\$210,000	2003-2005	Genetics of host range in the polyphagous pest, <i>Heliothis virescens</i>
North Carolina Biotechnology Center	\$120,000	2004-2007	Upgrading the capabilities of the CALS facility for DNA marker 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

- Joyner, Kimberly M.S. 1982 Scientific writer
Thesis: "Developmental consequences of cannibalism in *Heliothis zea* 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, *Diabrotica undecimpunctata howardi* 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 *Heliothis virescens* (F.) (Lepidoptera: Noctuidae)."
- Nalepa, Christine Ph.D.* 1987 N.C. Dept. Agric., Research Sci.
Thesis: "Life history studies of the woodroach *Cryptocercus punctulatus* 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 *Heliothis zea* (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 Director of Global IDEAS at Mich. State University
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 Chief Operating Officer at AgBiome
Thesis: "Effects of *Bacillus thuringiensis* on population dynamics and oviposition behavior of the diamondback moth"
- Klepetka, 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, Bayer Plant Sciences
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

Deitz, Lewis L*. State Univ., Raleigh	1979-80	Professor Emeritus, Dept. of Entomology, N.C.
Sims, Steven* 1981-82		Research Scientist, Whitmire Assoc., St. Louis, MO
Landis, Douglas Michigan State Univ.	1987-88	Professor, Department of Entomology,
Hertz, Paul 1987-88		Chairperson, Biology Department, Barnard Coll.
Simons, Andrew 1999-2000		Associate Professor, Carlton University, Ottawa, Canada
Demayo, Cesar Banos	1990-93	Lecturer, University of the Philippines, Los
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 * University, PR China	2005-2009	Faculty, Dept. of Mathematics, Hubei
Legros Mathieu *	2006-2011	Senior Researcher, ETH Zürich, Switzerland
Vasquez Gissella * director Peru	2006-2010	US Naval Medical Research unit-Ent. Deputy
Fong Hongqiang* Agricultural .Science	2007-2008	Visiting scholar from Chinese Academy of
Xu Chonggang* Walsh, Rachael 2011-2012	2009-2010	Research Scientist Los Alamos National Lab 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)

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.

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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.
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- 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.

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- Gould, F. 1994. *Bacillus thuringiensis*: an environmental biopesticide. *Quart. Rev. Biol.* 69: 545-546.
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- 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

INVITED LECTURES

- 2019- January 25th High Point University, NC -- Agricultural Biotechnology In Our Evolving Food, Energy, and Water Systems
 January 31st Clemson University, SC. “Responsible Innovation in Genetic Sciences: Past, Present and Future”
 May 15th European Food Safety Agency workshop on gene drives. Keynote address
 Sept 26th 2019 NSF National Research Traineeship Program Annual Meeting Evanston, IL—
 "Immersive experiences to kick start integrative NRT student training"
 October 10th University of Minnesota “Recent advances in gene drive research”
 October 17th Gregg Museum of Art and Design “The meaning of 4-leaf clovers”
- 2018--February 23rd Emory University Forum on Community Engagement
 February 24th Emory University Seminar on Genetic Pest Management
 March 15th University of Arizona Seminar on GE crops
 March 16th University of Arizona Seminar on genetic pest Management
 March 22nd Meredith College –screening and panel on “Food Evolution”
 March 23rd UNC Charlotte Seminar of Genetic Pest Management
 April 3rd Iowa State Univ Seminar on Genetic Pest Management
 April 25th NCSU CHASS presentation on Interdisciplinary research
 May 7th NIH-NIAD meeting on Clinical trials for disease vectors—presentation
 June 5th NCSU Symposium speaker--Forging Integrated Expertise in Graduate Education
 October 9th SynBio Panel at SESYNC at Annapolis—Gene drive promises and risks
 November 9th UC San Diego –Gene drives: Long road from the lab to the field
- 2017**—February 13th Keynote Address Gordon Research Conference on Plant-Herbivore Interactions. Ventura, California.
 April 7th Introduction—Art’s work in the age of biotechnology: determining our genetic futures—NCSU workshop.
 April 11th Elevating the discussion of genetically engineered crops. Hopkins Lecture. Kansas State Univ.
 May 30th Future tiered approaches to regulation of new crop varieties. CropLife conference on Future of Plant Breeding Oversight in Canada—Ottawa

June 5th Keynote Address: Environmental effects of GM crops: Findings of a National Academies of Sciences, Engineering and Medicine (US-NASEM) report. 14th International Symposium on the Biosafety of Genetically Modified Organisms. Guadalajara, Mexico.
 July 12th Gates meeting moderator on strategies for testing gene drives in Africa for malaria control
 June 13th JASON's meeting on gene drive and biosecurity—Realities of Gene Drive
 September 18th Univ of Idaho and Univ of Wash—Public forum on GE Crops
 September 19th University of Idaho--- Seminar on genetic Pest Management
 October 5th Screening of “Food Evolution” at The Carolina Theatre—Panel speaker with film director etc.
 October 11th Hanover Germany—International Academies meeting on biosecurity Speaker
 November 8th –ESA presentation on Fall Armyworm and Bt corn for Africa
 November 17th NASEM Meeting on Communicating Science--presentation

2016- January 11th “New Genome Editing Techniques: What Do They Mean for Applied Entomology Beyond Transgenic Crops -- Bayer RTP Seminar –
 February 18th Zika: Biological and Epidemiological Basics RTI
 April 18th 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 21st Presentation to NCSU Association of Retired Faculty “Genetic Engineering and Society: Where are we headed?”, March 27th. 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 7th. Revive and Restore workshop on “New Genomic Solutions for Conservation Problems Workshop” presentation on “Introduction to new RNAi technologies” . April 16th Univ. of Wisconsin Entomology, "New genome editing techniques: What they mean for applied entomology". April 17th Univ. of Wisconsin – C. C. Doane Lecture “Genetics and Society: From Vavilov to the Green Bunny”. April 24th Annual meeting of Association for the Study of Chemical Senses-- Fort Meyers, Florida –“The paradox of evolutionary diversification in the Lepidoptera”. April 28th NCSU Symposium “Genetic Engineering at NCSU” presentation on “Genetic engineering for suppressing pests and human diseases”. May 8th Council of Colleges of Arts and Sciences. Webinar presentation on Interdisciplinarity in graduate education: challenges and benefits. Sept 1st Penn State “What have we learned from insect resistance management efforts?”. Sept 14th NIH Bethesda MD. “Public Perception of Novel Vector Management Approaches”. November 12th Ferrington Village November 18th Wake Tech Comm College ““Living in a Genetically Engineered World””.

2014—March 13th Colegio de Postgraduados Campus Montecillo, Mexico. Transicion de cultivos geneticamente modificados a insectos geneticamente modificados?; March 19th NCSU Park Scholars. Ecological, Health and Social Issues related to GMOs; April 1st. Texas A&M Entomology, Genetic engineering of plants, animals and microbes: Biological and social challenges?; April 2nd Texas A&M, NSF sponsored lecture on Genomics and Society; April 8th, Osher Lifelong Learning Institute at Duke, Genetic Engineering of Our Food and Pests; April 16th. Ag Biotech Forum (NC Biotech Center) History of the NCSU-GES Program; June 5th 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 19th, Entomological Society of America, Making Pests Nicer;

2013-- April 1st University of California Riverside—Boyce Distinguished lecture –“Why I love two-locus models”. May 3rd NAMRU Iquitos Peru Empirical Approach for testing a detailed *Aedes aegypti* population dynamics model. May 29th Symposium at NCSU—“The paradox of evolutionary diversification in moth sexual signals”. June 3rd NAS committee on Public Interfaces in the Life Sciences “What makes a hot button issue?”, Sept 24th Talk on GMOs Irregardless Restaurant. Oct. 23rd Ohio State University “Can genetic pest management protect crops, human health, and biodiversity?”. Nov. 11th 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 22nd, 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--- Iowa State Univ. 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," February 14, 1996
- 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
- Zamarano University, Honduras, Central America, "Developing and deploying genetically engineered crops in Mesoamerica," May 20, 1996
- Zamarano 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 Giegy, 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 Directions in Biological Control. Los Angeles, CA. 1989.
- Ecological-genetic approaches for the design of genetically engineered crops. Rutgers Univ., New Brunswick, NJ.
- 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. 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.
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 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.
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