

FRED GOULD

RANGO ACADÉMICO

Profesor Investigador de Entomología

Fecha y Lugar de Nacimiento

19 de Abril de 1949
New York, New York

ESPECIALIZACIÓN Y ÁREAS DE INTERES

INVESTIGACIÓN: Aspectos ecológicos, genéticos y bioquímicos de las interacciones entre plantas y herbívoros; manejo de plagas, y ecología del comportamiento de artrópodos

MAESTRO EN CIENCIAS:

ENT731 – Ecología de los Insectos (lectura y laboratorio)
ENT590 - Ecología de Campo e Historia Natural
ENT599 - Interacciones entre plantas y herbívoros

FORMACIÓN ACADÉMICA

H.S. - Jamaica High School, Queens, N.Y.

B.S. - Queens College, City University of New York, 1971. Biología

Ph.D. - State University of New York at Stony Brook, New York, 1977. Ecología & Biología Evolutiva

EXPERIENCIA PROFESIONAL

1973-77 Maestro Auxiliar, SUNY at Stony Brook

1977-78 Investigador Pensionado, Fundación Nacional de las Ciencias

1978-79 Investigador Auxiliar, Departamento de Entomología, N.C. State Univ., Raleigh

1979-85 Profesor Auxiliar, Departamento de Entomología, N.C. State Univ., Raleigh

1985-89 Profesor Asociado, Departamento de Entomología, N.C. State Univ., Raleigh

1990-93 Profesor, Departamento de Entomología, N.C. State Univ., Raleigh

1993-Actual - Reynolds Profesor, Departamento de Entomología, N.C. State Univ., Raleigh

HONORES, PREMIOS, ASESORÍAS, PANELES DE CONSEJO

Academia Nacional de las Ciencias — Seleccionado como Asociado Nacional 2003

Consejo Nacional de Investigación – Coordinador de Revisión de Reportes 2003

Sociedad Americana de Entomología — Seleccionado como “Fellow” (Socio) 2003

Univ. Arizona, Departamento de Entomología, Evaluador Externo 2002

Academia Nacional de las Ciencias, Coloquio Nacional de Investigadores. Comisión sobre los Efectos Medioambientales de la Comercialización de Plantas Transgénicas, Presidente, 2000-2002

Conferencia de los Obispos Católicos Americanos, Consultor Científico en Cultivos Transgénicos, 2000

Academia Nacional de las Ciencias, Consejo Nacional de Investigación. Comisión para el desarrollo de recomendaciones sobre “Cultivos Modificados Genéticamente Contra las Plagas” 1999-2000

Departamento de Estado de los Estados Unidos, Subsecretaria de Asuntos Globales. Informe sobre la evaluación científica de riesgos asociados con cultivos modificados genéticamente, 1999

Universidad de Wisconsin, Evaluador Externo del Departamento de Entomología, 1999

Sociedad Entomológica de Carolina del Norte. Premio a la Excelencia, 1998

Academia Nacional de las Ciencias, Consejo Nacional de Investigación, Comisión para el desarrollo de recomendaciones sobre “El Rol Futuro de Pesticidas en la Agricultura Americana,” 1998-1999

EPA Subcomisión de Consultoría Científica sobre el Manejo de la Resistencia, 1998, 1999, 2000, 2002

World Bank/CGIAR. Consultor sobre cultivos modificados genéticamente, 1996-97

Annual Review of Entomology. Comisión Editorial, 1996-2002

ASESOR DE ESTUDIANTES DE POSTGRADO:

Nombre	Titulo	Fecha	Ocupación Actual
Joyner, Kimberly	M.S.	1982	Escritora científica Tesis: "Developmental consequences of cannibalism in <i>Heliothis zea</i> Boddie (Lepidoptera: Noctuidae) on suboptimal diet."
Villani, Michael	Ph.D.	1984	Profesor Asoc., Cornell Univ. (Difunto) Tesis: "Feeding and movement patterns of wireworms in response to biotic and abiotic factors."

- Meinke, Lance Ph.D. 1984 Profesor Asoc., Univ. Nebraska
Tesis: "Phenology and ovipositional ecology of the southern corn rootworm, *Diabrotica undecimpunctata howardi* Barber, in eastern North Carolina."
- Waldvogel, Mike Ph.D. 1986 N.C. State Univ., Especialista de Extensión
Tesis: "Genetic variation in oviposition preference in *Heliothis virescens* (F.) (Lepidoptera: Noctuidae)."
- Nalepa, Christine Ph.D.* 1987 N.C. Departamento de Agricultura,
Investigadora Científica
Tesis: "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
Tesis: "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. Asoc., Michigan State
Tesis: "Assessing the utility of the feeding deterrent approach to crop protection."
- Suiter, Karl Ph.D. 1991 Conferencista, N.C. Central Univ.,
Tesis: "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 Investigador Científico, USDA
Tesis: "Insecticide resistance management in the Colorado potato beetle."
- Sheck, Amy Ph.D. 1995 Post-Doc, N.C. State Univ.
Tesis: "The genetic basis for the evolution of host range in *Heliothis virescens* (F.)."
- Hruska, Allan Ph.D. 1995 Jefe del Departamento de Protección de Cultivos,
Zamarano University, Honduras.
Tesis: "Ecology and economics of insect pest management in maize in Nicaragua."
- Johnson, Tracy M.S. 1990
Tesis: "Combined effects of genetically engineered host plant resistance and natural enemies on *Heliothis* populations in tobacco."
- Johnson, Tracy Ph.D. 1995 Post-Doc, Universidad de Hawaii
Tesis: "Influence of natural enemies on the rate of pest adaptation to host plants."
- Riggin Bucci, Toni Ph.D. 1995 Científica de Investigación, BASF Corp.
Tesis: "Effects of *Bacillus thuringiensis* on population dynamics and oviposition behavior of the diamondback moth, *Plutella xylostella* (L.)."
- Klepetka, Brad M.S. 1995 Estudiante Doctoral, Universidad de Washington
Tesis: "Assortative mating in *Heliothis virescens*: impact on resistance management."
- Sumerford, Doug Ph.D. 1997 Científico de Investigación, USDA
Tesis: "Genetic analysis of adaptation to secondary plant compounds by *Heliothis virescens* (Lepidoptera: Noctuidae)."
- Sisterson, Mark MS. 1997 Estudiante de Doctorado, University de Mass.
Tesis "Natural history of *Heliothis subflexa* in the Southeastern US"
- Peck, Steve Ph.D. 1997 Profesor Auxiliar, Brigham Young University
Tesis: "Spatial aspects of the evolution of pesticide resistance: models and recommendations."
- Schliekelman, Paul Ph.D. 2000 Post-Doc, University de California, San Francisco
Tesis: "Population genetic considerations in the development and release of transgenic insect pests".
- Oppenheim, Sara M.S. 2000 Estudiante de Doctorado, North Carolina State University
Tesis: "The role of enemy-free space in the evolution of specialized herbivores"
- Oppenheim, Sara PhD 2003
Tesis: "The genetic basis for the evolution of specialization in a lepidopteran species".
- Cabrera, Juan PhD 2002
Tesis: "Tritrophic interactions of Bt-corn, *Spodoptera exigua*, and natural enemies."
- Bateman, Melanie PhD 2005
Tesis "Geographic, physiological, and ecological factors influencing the host range of *Heliothis subflexa* (Lepidoptera: Noctuidae)"
- Benda, Nicole PhD
- Puente, Molly PhD
- Rennie, Traci M.S.

Miembro de Comité de Estudiantes Graduados – Participación en mas de 40 comités de estudiantes de Maestría y Doctorado en N.C. State University, University of North Carolina at Chapel Hill, y Duke University

CONSULTORÍA DE POSTDOCTORADO Y PREPARACION DE SABATICOS

<u>NOMBRE</u>	<u>OCUPACIÓN</u>
Deitz, Lewis L. 1979-80	Profesor, Departamento de Entomología, N.C. State Univ., Raleigh
Sims, Steven 1981-82	Científico de Investigación, Whitmire Assoc., St. Louis, MO
Landis, Douglas 1987-88	Profesor Asociado, Departamento de Entomología, Michigan State Univ., E. Lansing, MI
Hertz, Paul 1987-88	Jefe, Departamento de Biología, Barnard Coll.
Simons, Andrew 1999-2000	Profesor Auxiliar, Carlton University, Ottawa, Canada
Demayo, Cesar 1990-93	Conferenciante, University de los Filipinos, Los Banos
Sheck, Amy 1998-2001	Maestra, Escuela de las Ciencias y Matemáticas de N.C., Durham, NC
Groot, Astrid 2001-presente	Post-Doc, Departamento de Entomología, NCSU

PRODUCCIÓN CIENTÍFICA**PUBLICACIONES (ULTIMOS 5 AÑOS)**

- Gould, F. 1998. Sustainability of transgenic insecticidal cultivars: integrating pest genetics and ecology. *Annu. Rev. Entomol.* 43: 701-26.
- Bottrell, D. G., P. Barbosa, y 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, y 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, y 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. y 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. y 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, y 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, y 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, y 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, y 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, y 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. y 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, y 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.
- Alinia, F, M. B. Cohen y 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, y 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, y 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, y 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, y F. Gould. 2000. Varying migration and deme size and the feasibility of the shifting balance. *Evolution* 54: 324-327.
- Schliekelman, P. y 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. y F. Gould. 2000. Pest control by the introduction of a conditional lethal trait on multiple loci: potential, limitations, y optimal strategies. *J. Econ. Entomol.* 93: 1543-1565.
- Cohen, M. B., A. M. Romena, y 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, y F. Gould. 2000. Larval dispersal and survival of *Scirpophaga incertulas* (Lepidoptera: Pyralidae) and *Chilo suppressalis* (Lepidoptera: Crambridae) on Cry1Ab-transformed and non-transgenic rice. *Environ. Entomol.* 29: 972-978.
- Gould, F. 2000. Testing Bt refuge strategies in the field. *Nature Biotech.* 18: 266-267.
- Lu, W., G. G. Kennedy, y 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, y 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, y 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, y 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, y 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. y 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. y 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, y 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, y 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, y 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, y 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.

ARTÍCULOS (NON-REFEREED) (ULTIMOS 5 AÑOS)

- Lambert, A. L., J.R. Bradley, F. Gould, y 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, y 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, y G. G. Kennedy. 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: *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, y 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. Riggin Bucci, y 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, y F. Gould. 1999. Evaluation of resistance management strategies for Bt rice. In: *Proceedings of the 2nd Pacific Rim Conference on Biotechnology of Bt and its Impacts on the Environment*. Pages 496-505
- Storer, N. P., F. Gould, G. G. Kennedy, y 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, y 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
- Gould, F. 2000. Testing Bt refuge strategies in the field. *Nat. Biotechnol.* 18: 266-267.

Gould, F. y J. Kuzma. 2002. The academy responds. *The Scientist* 99: 1681-1686.

Jackson, R. E., J. R. Bradley Jr., F. Gould, J. W. Van Duyn, y 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, y 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