

Research, Advocacy, and Engagement: Exploring the Roles of Experts in Democracy

*2016 Research-to-Policy Conference:
Pathways to Successful Engagement in Agricultural,
Natural Resources and Food Issues*

University of California, Davis | October 12, 2016



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Department of Forestry and Environmental Resources
Genetic Engineering and Society Center
North Carolina State University



Project is being led by Kevin Esvelt, an assistant biology professor at MIT. *Mark Lovewell*

Genetically-Engineered Mice Explored as New Tool in Fight Against Lyme Disease

Alex Elvin Wednesday, July 27, 2016 - 5:50pm

Scientists at MIT are hoping to prevent Lyme disease on the Vineyard by releasing large numbers of genetically engineered mice into the wild.

CTIONS HOME SEARCH

The New York Times

SCIENCE

Fighting Lyme Disease in the Genes of Nantucket's Mice

Trilobites

By AMY HARMON JUNE 7, 2016

The Vineyard Gazette
July 27, 2016



Those who attended generally supported the proposal, but peppered speakers with questions. —



DemocracyExpertise

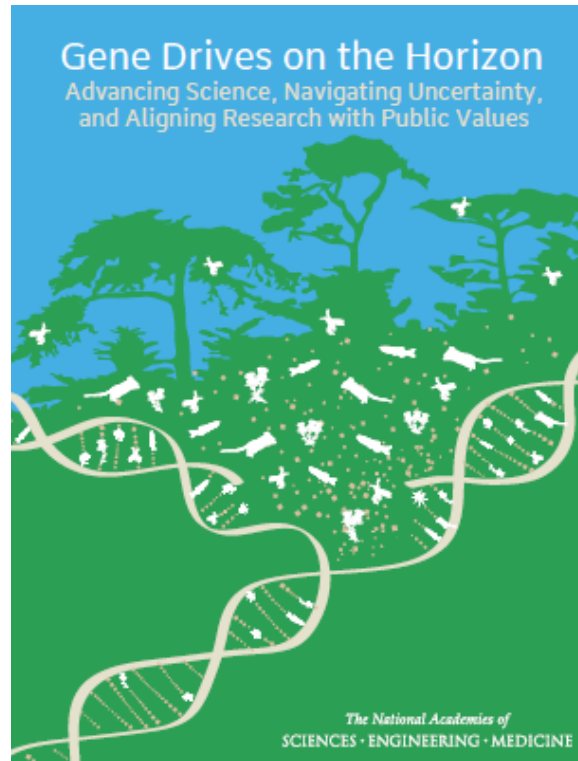
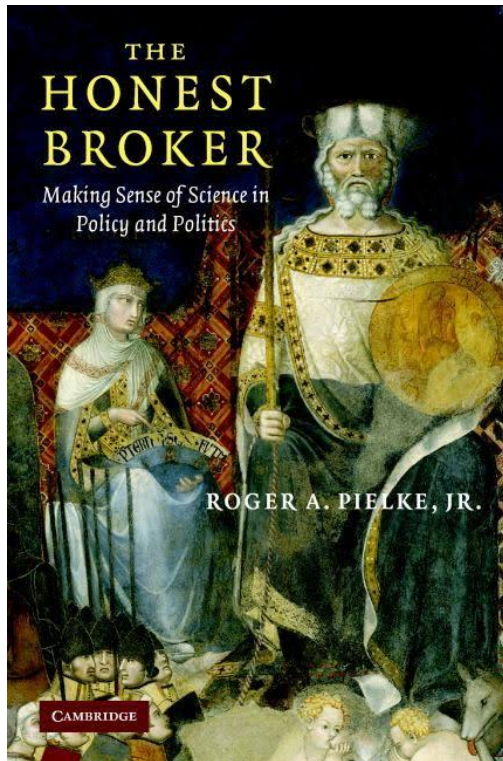
ExpertiseDemocracy

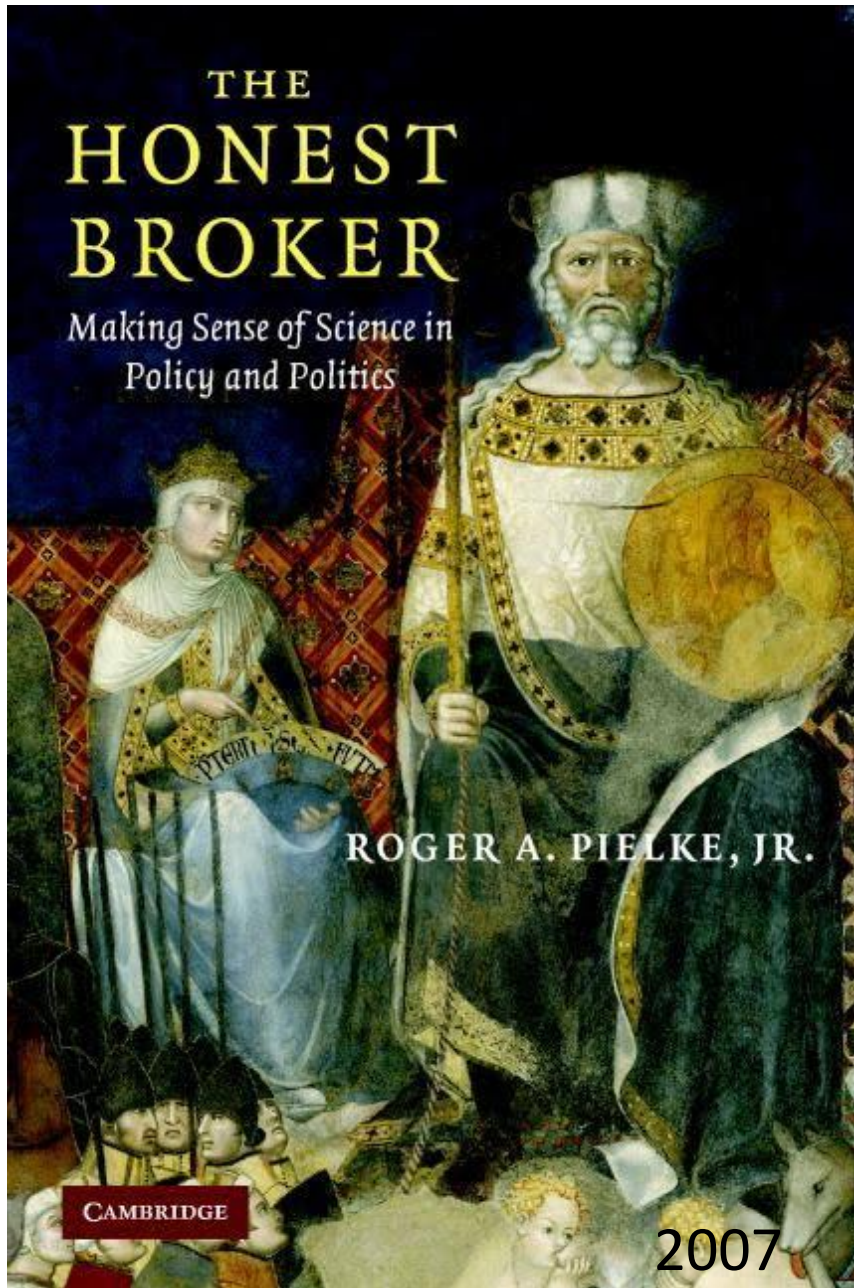
DemocracyExpertise

ExpertiseDemocracy

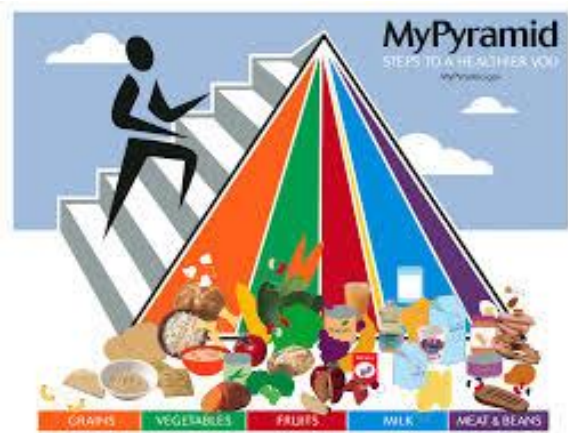
DemocracyExpertise

1. Framework for Scientists and Policymaking
2. Case study: gene drive research
3. Lessons from engagement





Roles for Science Advice

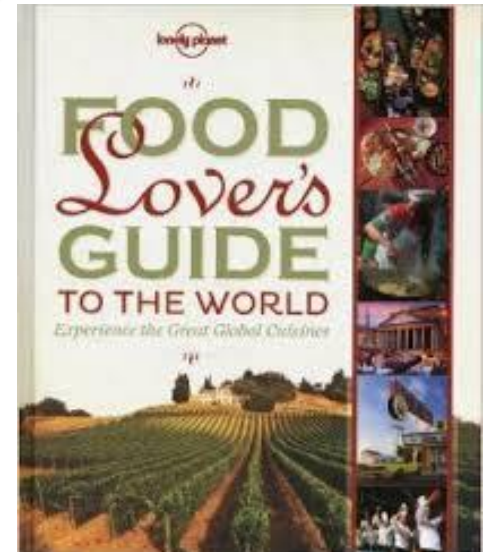


Pure
Scientist

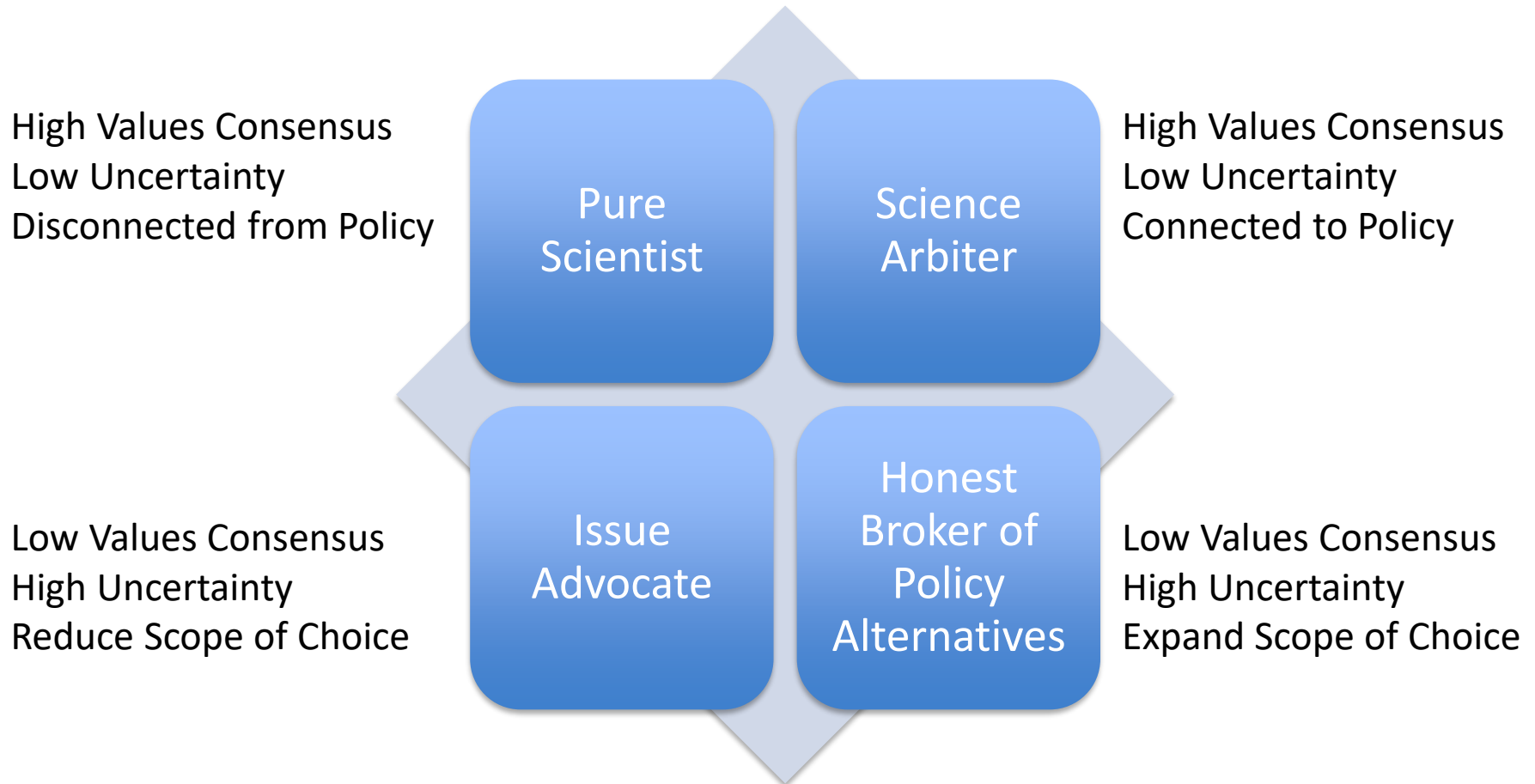
Science
Arbiter

Issue
Advocate

Honest
Broker

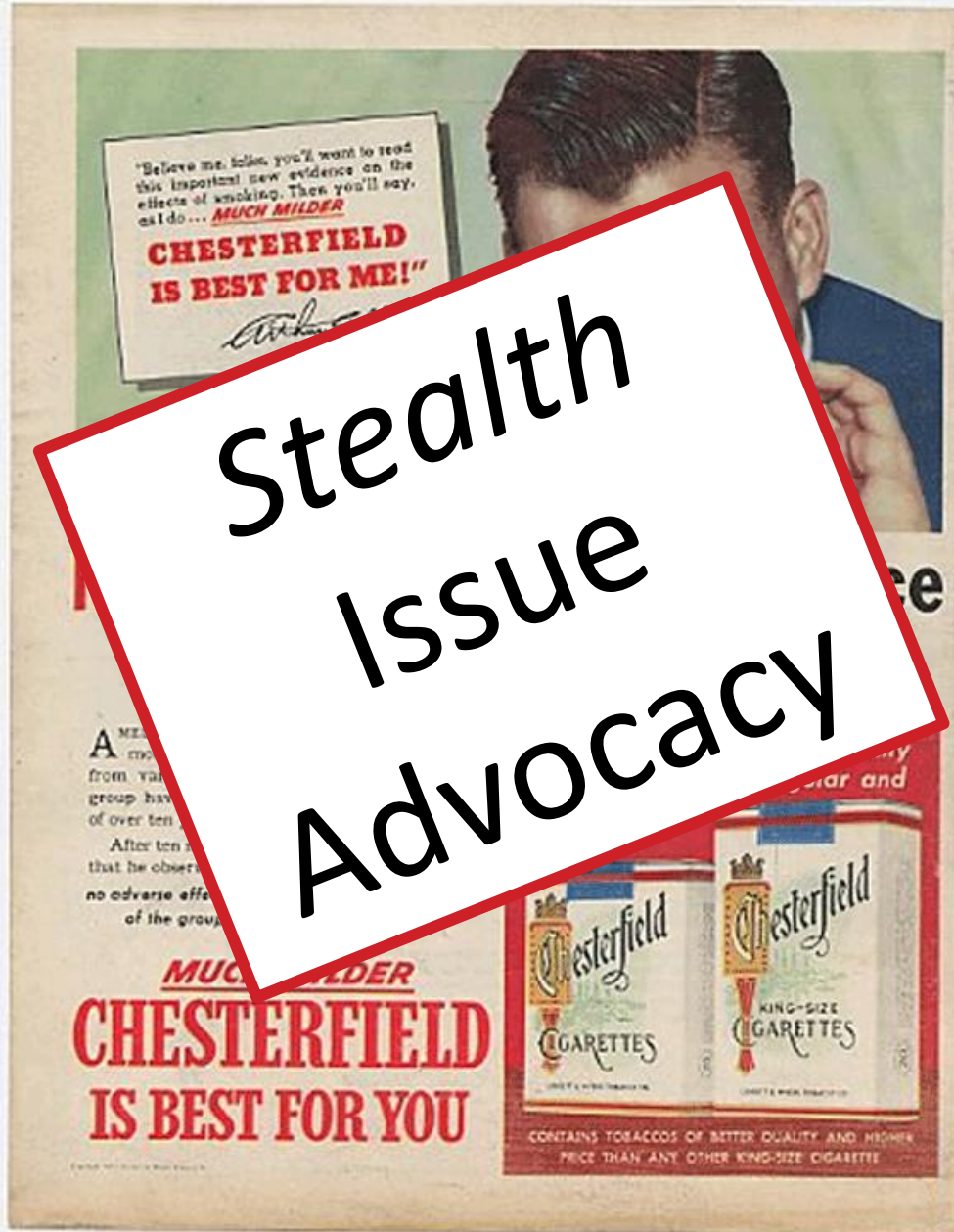


Roles for Science Advice



Stealth Issue Advocacy

“A medical specialist is making regular bi-monthly examinations of a group of people from various walks of life. 45 percent of this group have smoked Chesterfield for an average of over ten years. After ten months, the medical specialist reports that he observed...no adverse effects on the nose, throat and sinuses of the group from Smoking Chesterfield.”



Honest Broker of Policy Alternatives

- Difficult to accomplish alone, interdisciplinary groups needed
- Acknowledges the role of values and politics in decision-making.
- Seeks to clarify and expand scope of choices
- High demand, low supply

Gene Drives on the Horizon

Advancing Science, Navigating Uncertainty,
and Aligning Research with Public Values



The National Academies of
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The National Academies of
SCIENCES • ENGINEERING • MEDICINE



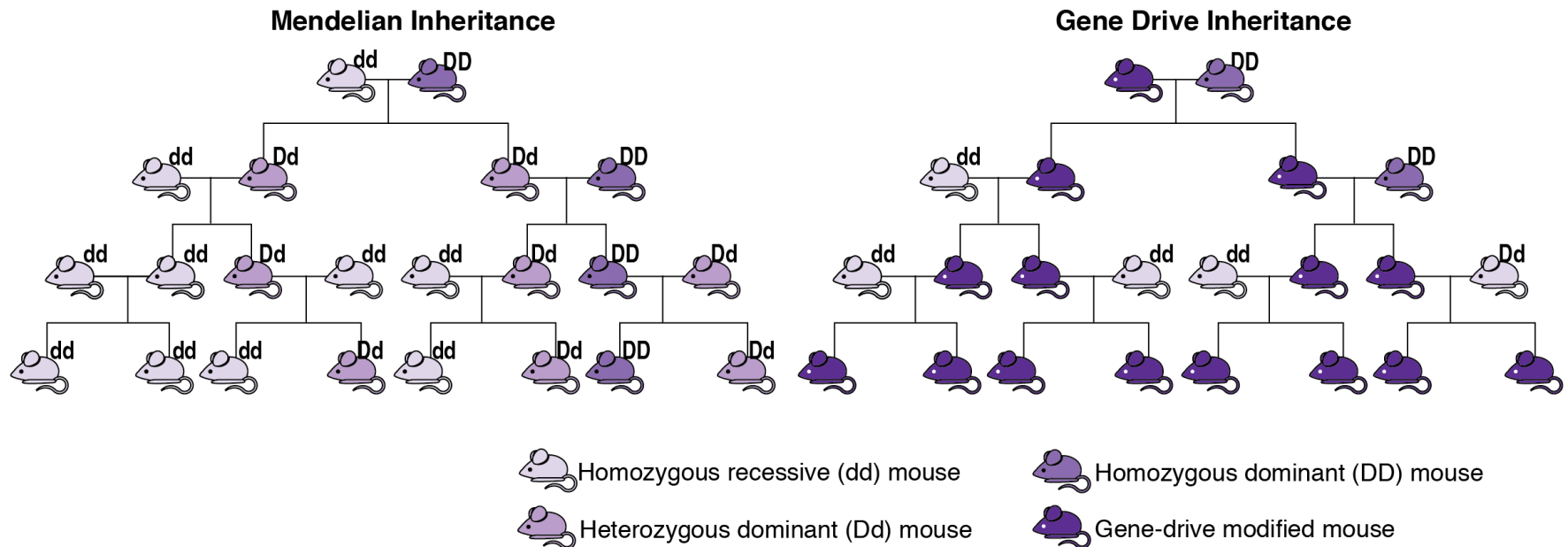
Released June 2016

nas-sites.org/gene-drives

- PDF of the full report
- Report in Brief
- Archived webcast of public release and slide presentation

What are gene drives?

Gene drives are systems of biased inheritance in which the ability of a genetic element to pass from a parent organism to its offspring through sexual reproduction is enhanced.



Key Features and Potential Uses of Gene Drives

- Defining features:
 - Spread and persistence
 - Potential to cause irreversible ecological change
- Two potential uses:
 - Population suppression: Decrease numbers
 - Population replacement: Change genetic characteristic(s)

Potential applications of gene drives

Public Health



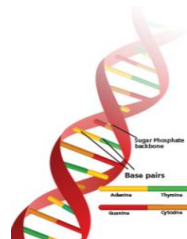
Conservation



Agriculture



Basic Research



An Interdisciplinary Committee

Biosafety and Biosecurity

Stephen Higgs, Kansas State University

Developmental Biology

Lisa A. Taneyhill, University of Maryland

Ecological Risk Assessment

Wayne Landis, Western Washington
University

Entomology and Vector-Borne Diseases

Nicole L. Achee, University of Notre Dame
Lynn Riddiford, Howard Hughes Medical
Institute

Ethics and Scientific Integrity in Research

Elizabeth Heitman, *Co-Chair*, Vanderbilt
University Medical Center
Gregory E. Kaebnick, The Hastings Center

Plant Biology and Ecology

Vicki Chandler, Minerva Schools at Keck Graduate
Institute

Brandon S. Gaut, University of California, Irvine

Population Ecology

James P. Collins, *Co-Chair*, Arizona State University
Joseph Travis, Florida State University
Paul E. Turner, Yale University

Public Interfaces with Controversial Science

Jason A. Delborne, North Carolina State University

Science and Technology Policy and Law

Ann Kingiri, African Centre for Technology Studies
Joyce Tait, University of Edinburgh
David E. Winickoff, University of California,
Berkeley

Responsible Science to Develop Gene Drive Technologies



A responsible science approach calls for continuous evaluation and assessment of the social, environmental, regulatory, and ethical considerations of gene drives.

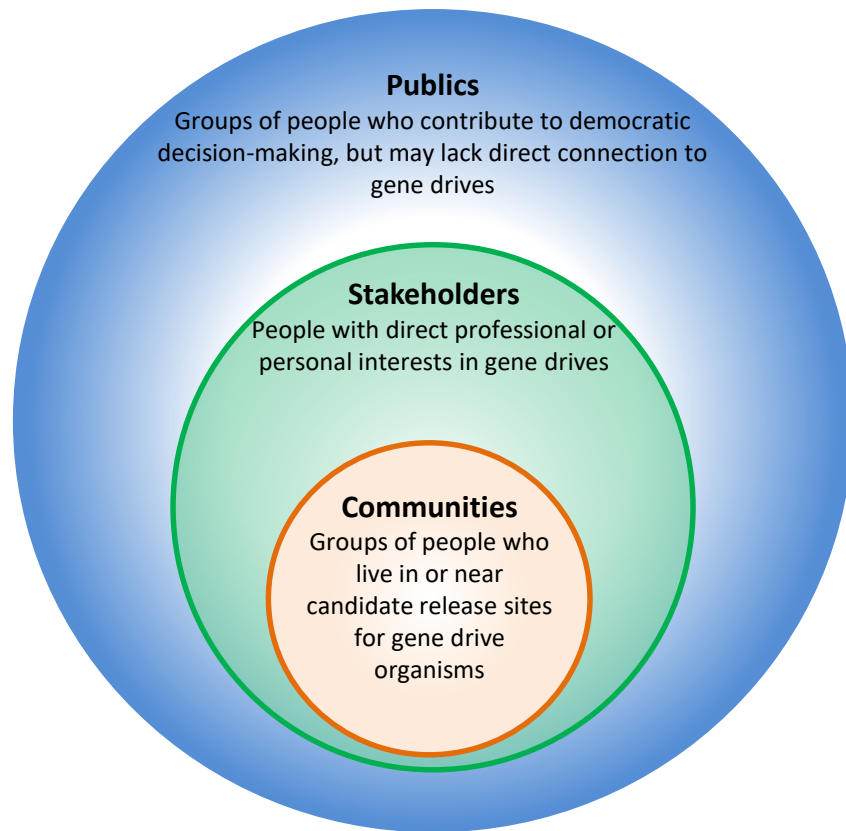
Values Are Important at Every Step



Questions about responsible science, from why and how research should be conducted to whether, when, and where a gene-drive modified organism could be released into the environment rest on values at every step.

Widely-shared commitments to protecting human welfare and the environment call for **public policy guidelines that may constrain research on gene drives or the release of gene-drive modified organisms**. Integrating precautionary measures into the research process can help to balance potentially conflicting commitments.

Public Engagement is needed in research, risk assessment, and governance



Public engagement cannot be an afterthought.

The outcomes of engagement may be as crucial as the scientific outcomes to decisions about whether to release a gene-drive modified organism into the environment.

Challenges to Governance of Gene Drive Research and Development



Existing mechanisms of governance may be inadequate to address potential immediate and long-term environmental and public health consequences because they:

- Do not consider gene drives' intentional spread and potential irreversible effects on ecosystems
- Lack clarity in their jurisdiction of oversight
- Provide insufficient structures for public engagement
- Do not address the potential for misuse
- Lack policies for collaborating with other countries with divergent systems of governance

Expert & Citizen Assessment of Science & Technology

A Distributed Network of Institutions for Peer to Peer Public Deliberation

<https://ecastnetwork.org/>

ABOUT

EVENTS

PARTNERS

PROJECTS

PUBLICATIONS

VIDEOS



CATEGORIES

Event (15)

USING PUBLIC ENGAGEMENT TO INFORM
POLICY DECISIONS

Constructing “the Public”



Genetically Modified (GM) Mosquito Use to Reduce Mosquito-Transmitted Disease in the US: A Community Opinion Survey

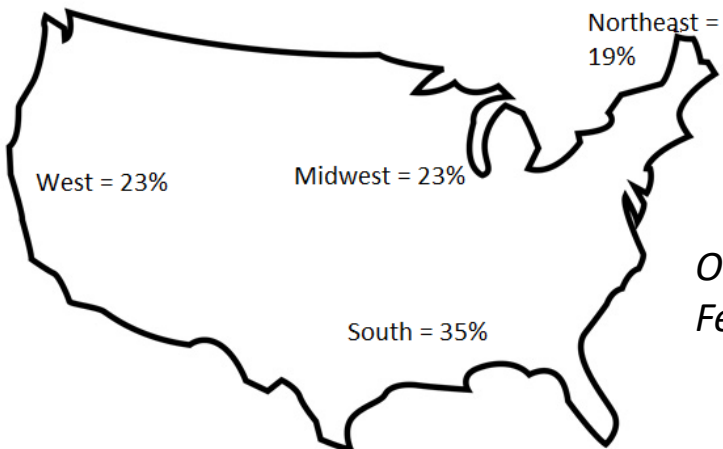
May 25, 2016 · Research Article

Survey mailed in July 2015 to all households in the identified Key West, Florida neighborhood where a GM mosquito trial has been proposed

THE ANNENBERG
PUBLIC POLICY CENTER
OF THE UNIVERSITY OF PENNSYLVANIA

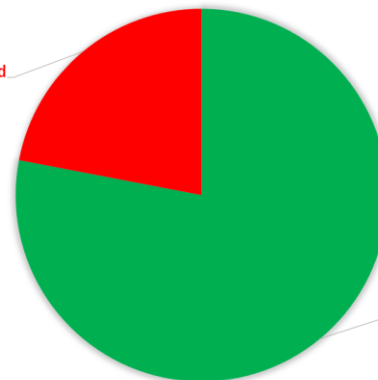
“The ASK phone survey was conducted August 18-22, 2016 among a total of 1,472 U.S. adults, including an oversample of 509 Florida respondents.”

Region of Residence of Respondents



WOULD YOU SUPPORT THE INTRODUCTION OF GENETICALLY MODIFIED MOSQUITOES IN THE UNITED STATES? (N=964)

No, I would NOT support the introduction of genetically modified mosquitoes
22%



Yes, I would support the introduction of genetically modified mosquitoes
78%

Online survey,
February 2016

PURDUE
EXTENSION

Designing Information Flow



Rowe, G., & Frewer, L. J. (2005). A Typology of Public Engagement Mechanisms. *Science, Technology and Human Values*, 30(2), p. 255.

Consensus Conferences

- Developed by the Danish Board of Technology
- Interaction of lay persons and experts
- Integration of facts and values
- Goals
 - Promote learning through deliberation
 - Access *thoughtful* public opinion
 - Generate new ideas or policy alternatives
 - Impact governance decisions



National Citizens' Technology Forum

March 2008

Tempe, Arizona
Madison, Wisconsin

Atlanta, Georgia

Boulder, Colorado

Durham, New Hampshire

Berkeley, California



THE UNIVERSITY
of
WISCONSIN
MADISON

Robert F. & Jean E.

HOLTZ Center



The Center for
Nanotechnology in Society
ARIZONA STATE UNIVERSITY

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WORLD WIDE VIEWS ON Global Warming



World Wide Views on Global Warming

FROM THE WORLD'S CITIZENS TO THE
CLIMATE POLICY-MAKERS



High quality facilitation



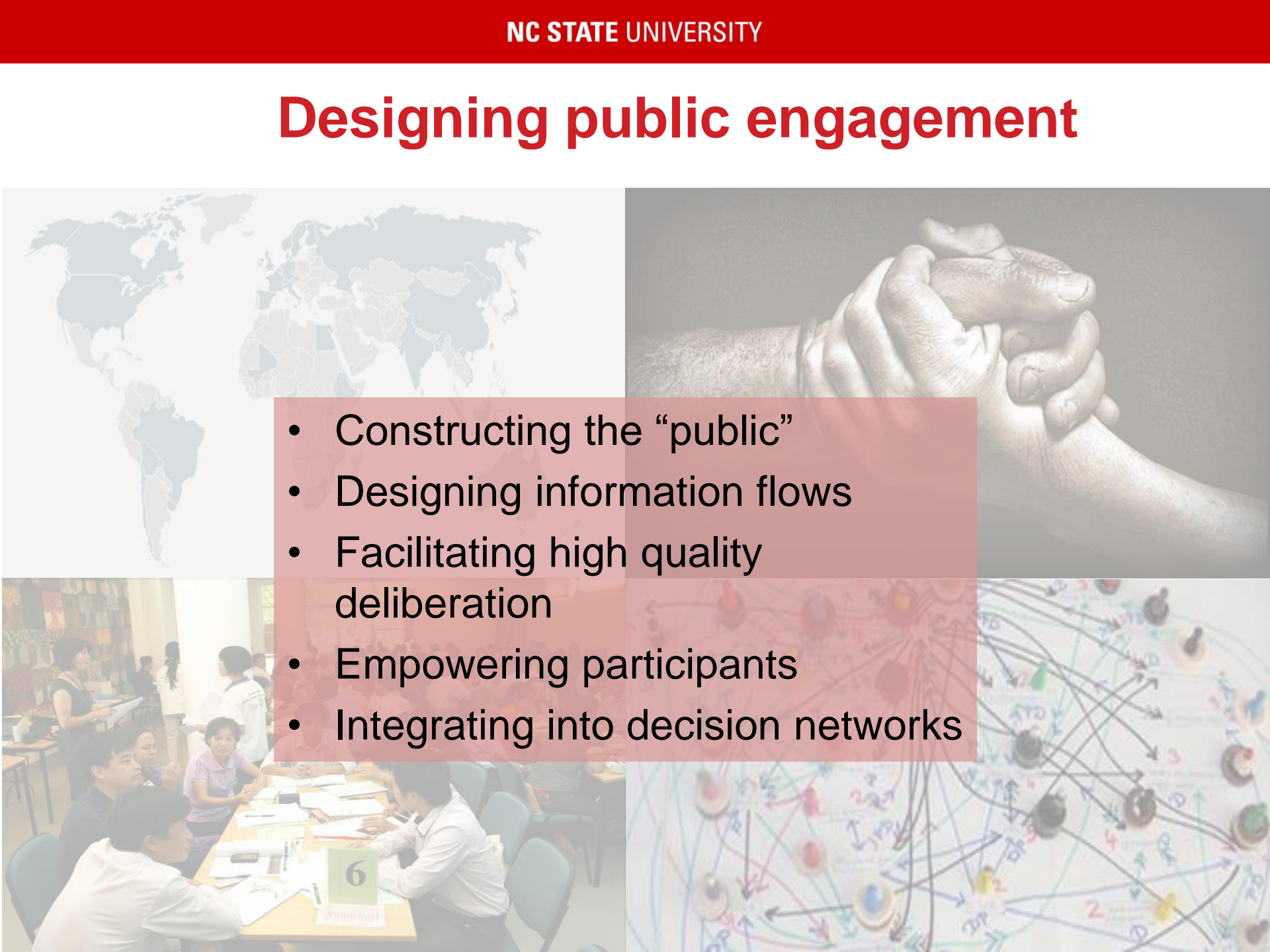
Empowering participants



Integration in Decision Networks



Designing public engagement

- 
- Constructing the “public”
 - Designing information flows
 - Facilitating high quality deliberation
 - Empowering participants
 - Integrating into decision networks

Research-Engagement-Policy



Very small stem blight resistance assay showing significant blight resistance enhancement using the Oxo gene.



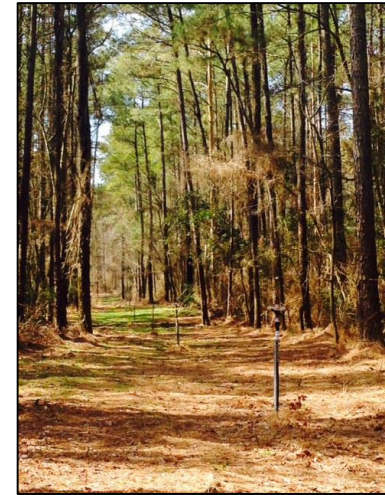
Darling 215 and Darling 311, Oxo transgenic American chestnut

Chinese chestnut
control
(Qing)

American chestnut
control
(Ellis1)



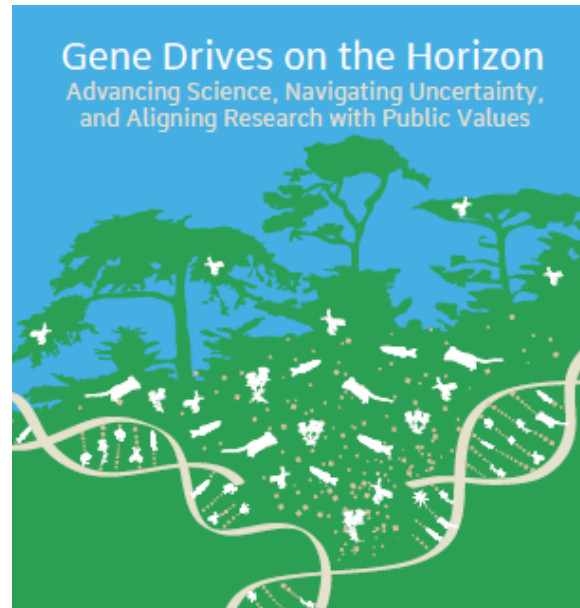
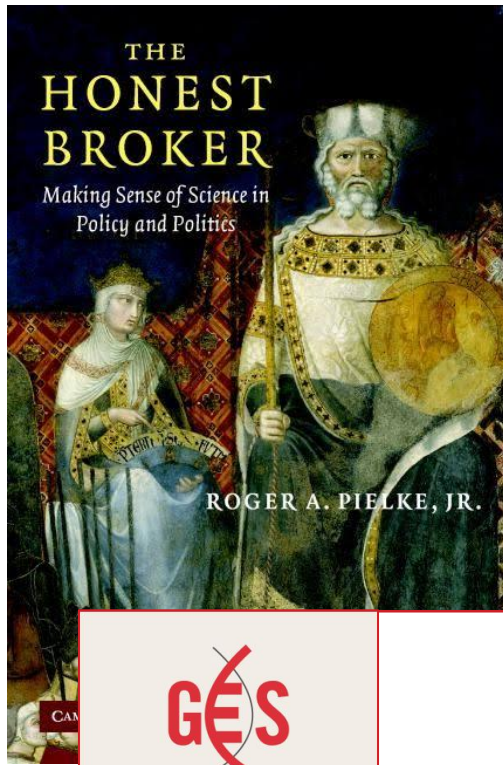
All plants were produced from tissue culture. Non-transgenic & transgenic Americans are clonal (Ellis 1 cell line). Pictured 8 days post inoculation with *C.parasitica* strain EP155. American stem diameters were ~1.5mm, Chinese ~2.0mm. Darling 215 Oxo expression level is the threshold for high resistance in leaf assays and Darling 311 has higher expression levels than 215.



ALGAE INDUSTRY, ALGAL SCIENCE

EPA POSTS INFORMATION ON
GM/SYNBIO ALGAE PROJECT

1. Multiple roles for scientists to interface with policy processes
2. NASEM gene drive committee as honest brokers
3. Challenges and opportunities of public engagement



NC STATE UNIVERSITY

Thank you!

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