Food Evolution discussion guide

Welcome, teachers, to the *Food Evolution* discussion guide [a documentary funded by the Institute of Food Technologists to help raise awareness of the science behind GMOs (genetically modified organisms)]. This video will take approximately two class period (70 minutes), and will allow students to enhance and expand their knowledge of the controversy and science behind GMOs. The video is available from Amazon and Hulu currently, but is slated to be released as a DVD later in 2018.

Ideas to use before/after the movie

Look at the following quotes from the movie. Which quote(s) do you most identify with?

"It is easier to fool people than convince them that they have been fooled."
— **Mark Twain**

"You're either going to be GMO or organic. They cannot coexist."
— **Hawaii councilwoman**

"The good thing about science is that it's true whether or not you believe in it."
— **Neil deGrasse Tyson**

"All criticisms against GMOs can be largely rejected on strictly scientific criteria."
— **Institut de France, Academies des sciences**

"This is all about companies controlling our future!"

"Frankly, I trust the social media like blogs by Vana Hari or other moms that even just do a post; I trust what they say more than most medical doctors, more than the CDC, more than the FDA, more than the USDA, and more than the EPA. That's real! I don't need a scientific study for that, I don't need a doctor to tell me that!"
— **Zen Honeycutt**

Further discussion topics

These background pieces may be used to help students frame the movie while watching (or as follow-ups to) the movie. Have students create a one-page description of each of these topics.

1. Hawaii county ban of GMOs (2013)
2. Giles Eric Seralini published a study "Long term toxicity of a Roundup herbicide and a Roundup-tolerant genetically modified maize" *Food and Chemical Toxicology,* November, 2012.
3. Banana Xanthamonas Wilt (BXW)
4. Look up the rules for organic certification. What is required to label something as "organic"? What pesticides/herbicides can be used? Which cannot?
5. Some additional events have happened since the video was filmed:
   - Dannon yogurt decisions for sourcing dairy
   - Chipotle decisions for sourcing meat
   - Citrus greening disease threatens orange trees

How do these events impact the discussion?

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People who are highlighted in the film

As students watch the movie, have them identify these people featured as *pro/con* in regards to genetic modification.

P/C	Name
	Neil deGrasse Tyson, Astrophysicist, Harvard and Columbia; Science Communicator
	Margaret Wille, M.Ed Education, JD Law, Hawaii Council member
	Jeffrey Smith, Leading GMO Activist; Author/Filmmaker; Institute of Responsible Technology
	Charles Benbrook, PhD Ag Economics; Washington State University
	Stephanie Seneff, PhD Computer Science, MIT
	Michael Shintaku, PhD Plant Pathologist, University of Hawaii
	Dennis Gonsalves, PhD Plant Pathologist; Cornell University
	Vandana Shiva, PhD Philosophy of Physics; Environmental/Anti-Globalization Activist
	Marian Nestle, PhD
	Lena Tripathi, PhD Plant Biotechnologist; International Institute of Tropical Agriculture
	Mark Lynas, MA Modern History/Politics; Environmental Activist, Author
	Raoul Adamchuck, Academic Coordinator, UC Davis; Organic farmer
	Vani Hari, BS Computer Science; Food Babe
	Rob Fraley, PhD Microbiology/Biotechnology; Chief Technology Officer, Monsanto
	Zen Honeycutt, BA Fashion Design, Anti-GMO Activist, Moms Across America
	Tamar Haspel, Science Journalist

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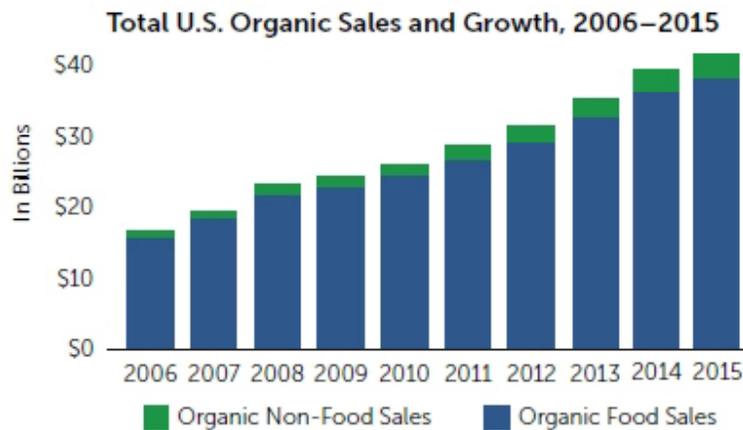
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Key topics discussed in the film

Correlation vs. causation

Here is a correlational chart used in the movie to link increased glyphosate use with autism.
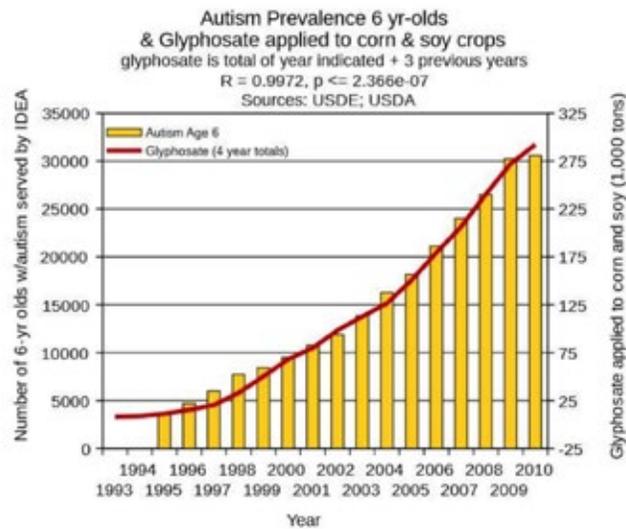
- What is the difference between *correlation* and *causation?*

Consider the following graph and correlate it to the growth of autism.

- Can it be said that because something has a high correlation it is the cause?

Corporate entities and food

What is the general public's problem with Monsanto?

Information about GMOs from Monsanto:

- An Overview of the Safety and Advantages of GM Foods
- GMO Facts: 10 Common GMO claims debunked

Scientific report on safety of GMOs:

- National Academy of Sciences: Genetically Engineered Crops: Experiences and Prospects

And these opposing views:

- Five Things Monsanto Doesn't Want You to Know About GMOs
- Seeds of Evil: Monsanto and Genetic Engineering

Are there other corporations that are doing genetic modification? Which ones?

Globalization issues

These are some of the issues cited as reasons to limit GMOs availability to developing nations.

- Farmer suicide in India: debating the role of biotechnology
- Suppressing Growth: How GMO Opposition Hurts Developing Nations
- Twelve reasons for Africa to reject GM crops
- Why GMOs matter — especially for the developing world

What is the perspective of the South African farmer?

Confirmation bias

Mark Lynas talks about "confirmation bias" (1:10). What is confirmation bias?

How does it play out in our lives?

Conclusion

Supporters of GMOs and organic methods of farming have the same goals. Explain how each method attempts to fulfill the goals.

Goals	GMOs	Organic
Safe, abundant nutritious food for all		
Fewer toxic chemicals used on farms around the world		
A more sustainable food system		

GMO applications

IA **rennet** industrial application	**IA** **yeast** industrial application				
RFW **potato** reduce food waste	**RFW** **apple** reduce food waste				
HB **insulin** health benefit	**HB** **soy** **(high-oleic oil)** health benefit	**HB** **golden rice** health benefit	**HB** **peanut** health benefit		
IR **potato** insect-resistant	**IR** **soy** insect-resistant	**IR** **corn** insect-resistant	**IR** **cotton** insect-resistant		
HT **canola** herbicide-tolerant	**HT** **soy** herbicide-tolerant	**HT** **corn** herbicide-tolerant	**HT** **cotton** herbicide-tolerant	**HT** **alfalfa** herbicide-tolerant	**HT** **beets** herbicide-tolerant
DR **potato** disease-resistant	**DR** **papaya** disease-resistant	**DR** **squash** disease-resistant	**DR** **banana** disease-resistant	**DR** **orange** disease-resistant	**DR** **cassava** disease-resistant
DT **rice** drought-tolerant	**DT** **soy** drought-tolerant	**DT** **corn** drought-tolerant	**DT** **cotton** drought-tolerant	**DT** **wheat** drought-tolerant	

green = forthcoming

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