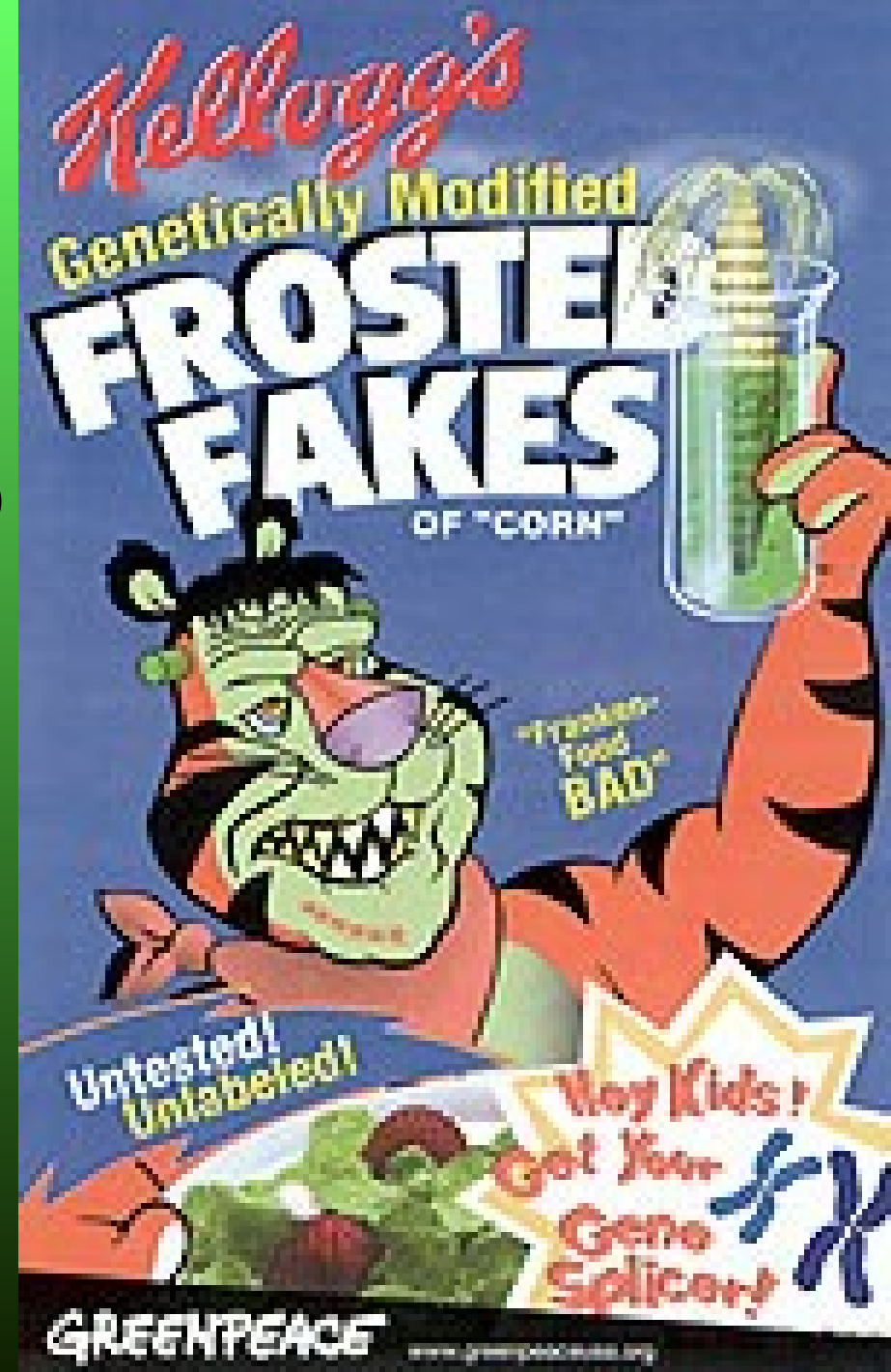


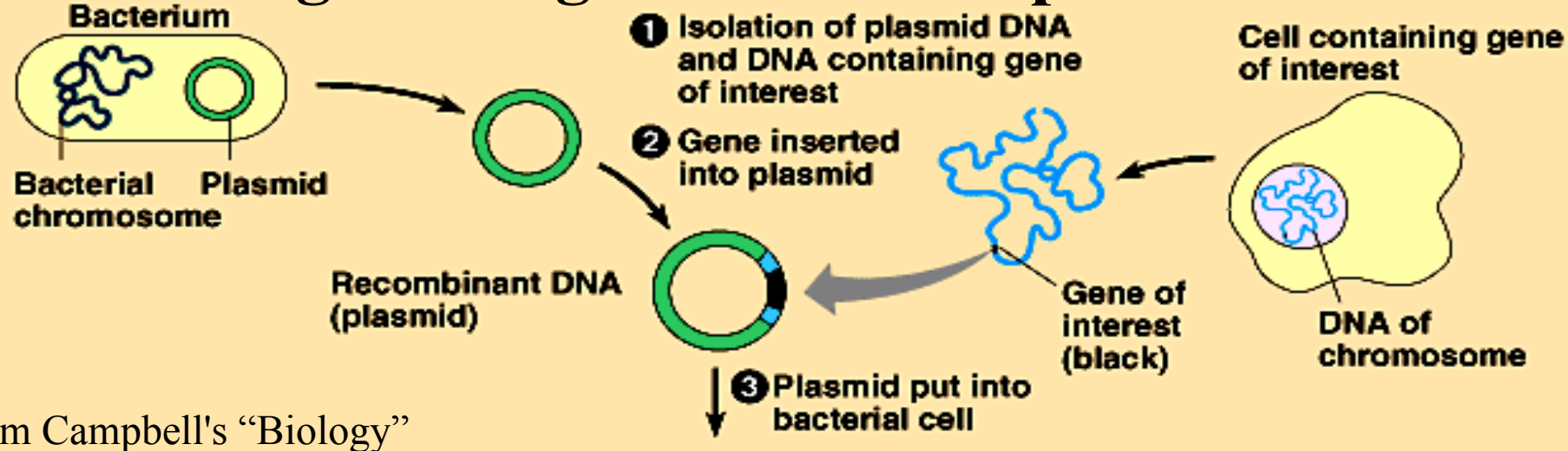
# GM crops: Battlefield

Can criticism of an article go too far?

from Nature 461, 27-32 (2009)



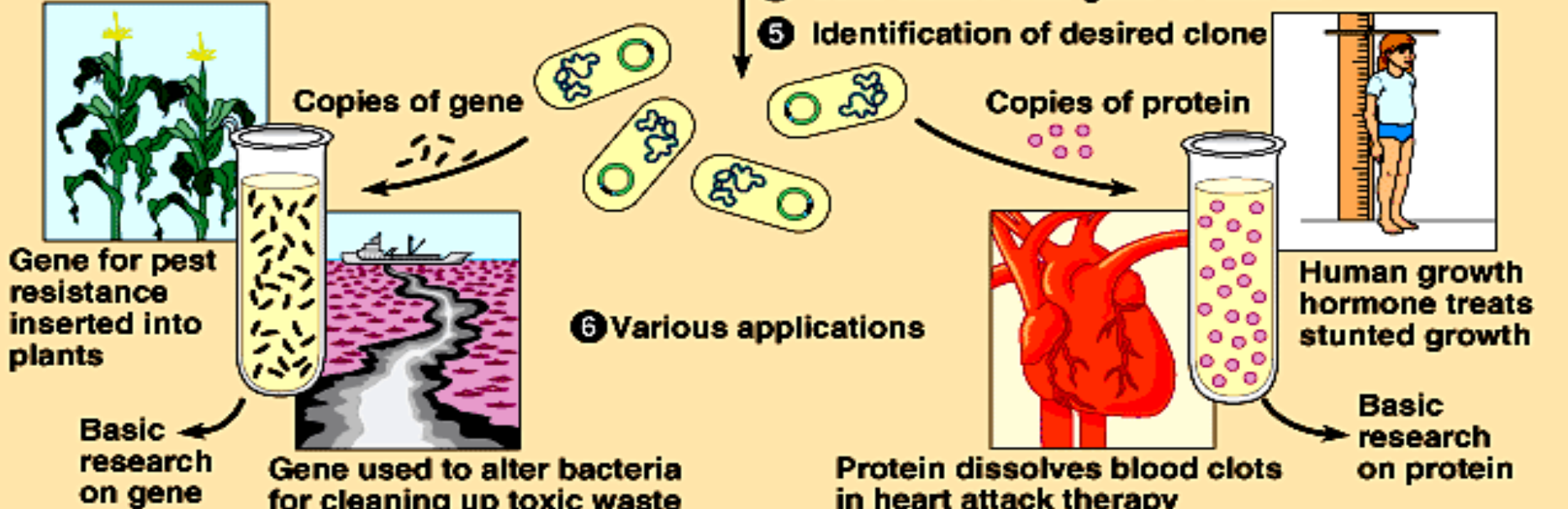
# Genetic Engineering: Direct manipulation of DNA



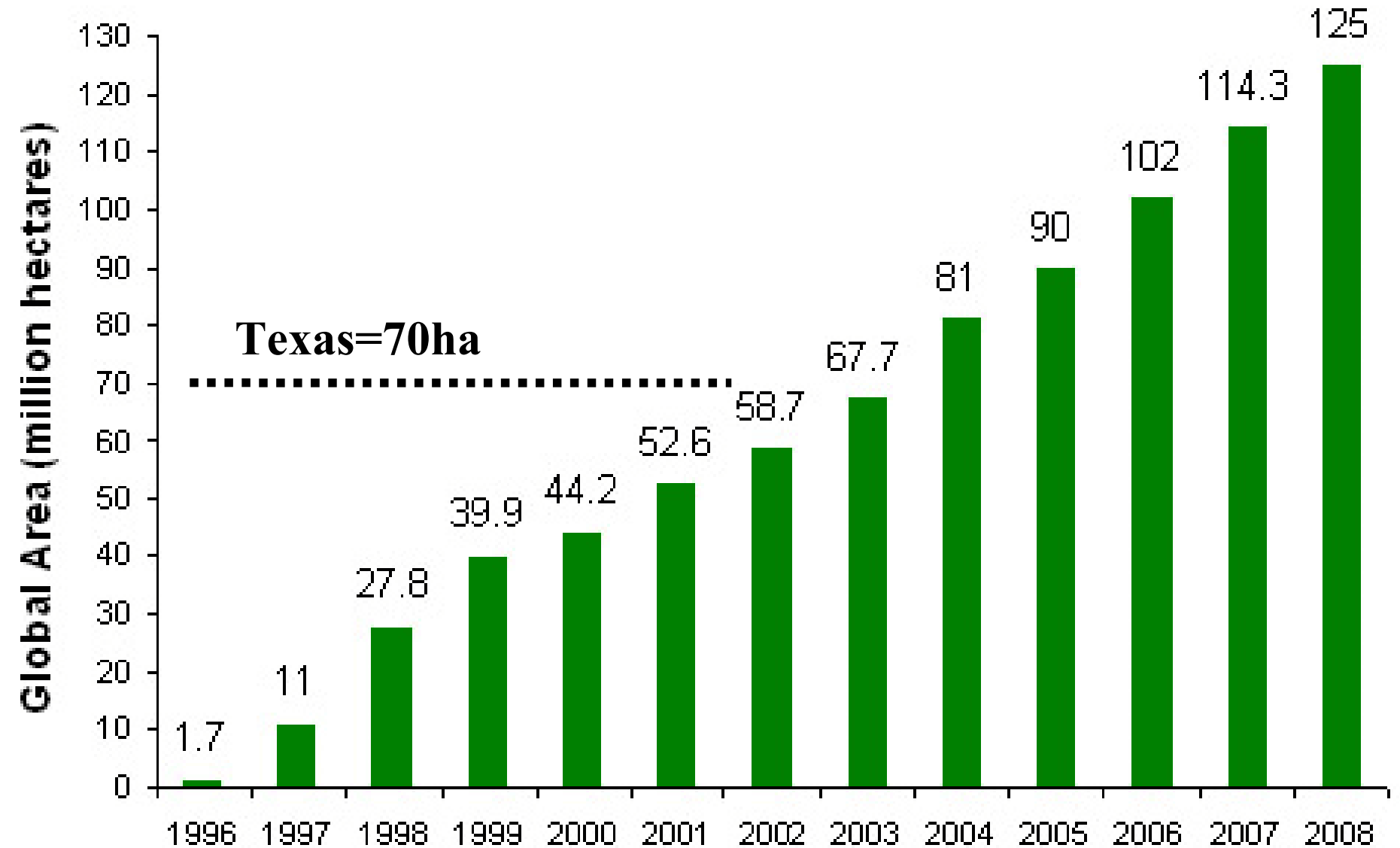
From Campbell's "Biology"



- 4** Cells cloned with gene of interest
- 5** Identification of desired clone



# Global area planted with GM crops



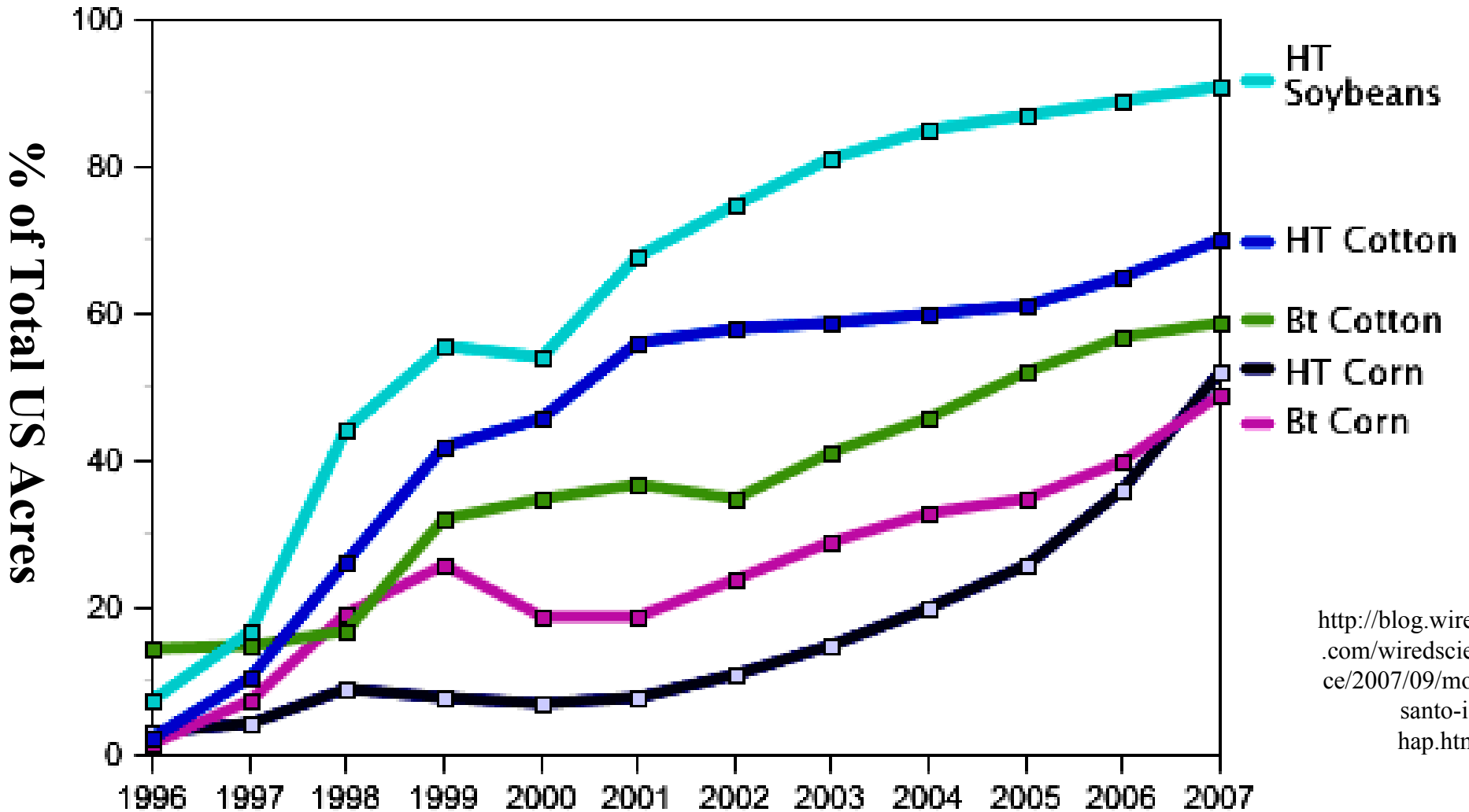
[http://www.gmo-compass.org/eng/agri\\_biotechnology/gmo\\_planting/257.global\\_gm\\_planting\\_2006.html](http://www.gmo-compass.org/eng/agri_biotechnology/gmo_planting/257.global_gm_planting_2006.html)

And [http://www.monsanto.com.au/\\_images/global\\_area\\_chart.gif](http://www.monsanto.com.au/_images/global_area_chart.gif)

**The agricultural release of genetically modified organisms is the largest scale experiment that has ever been performed.**



# Common GM Crops in the U.S.



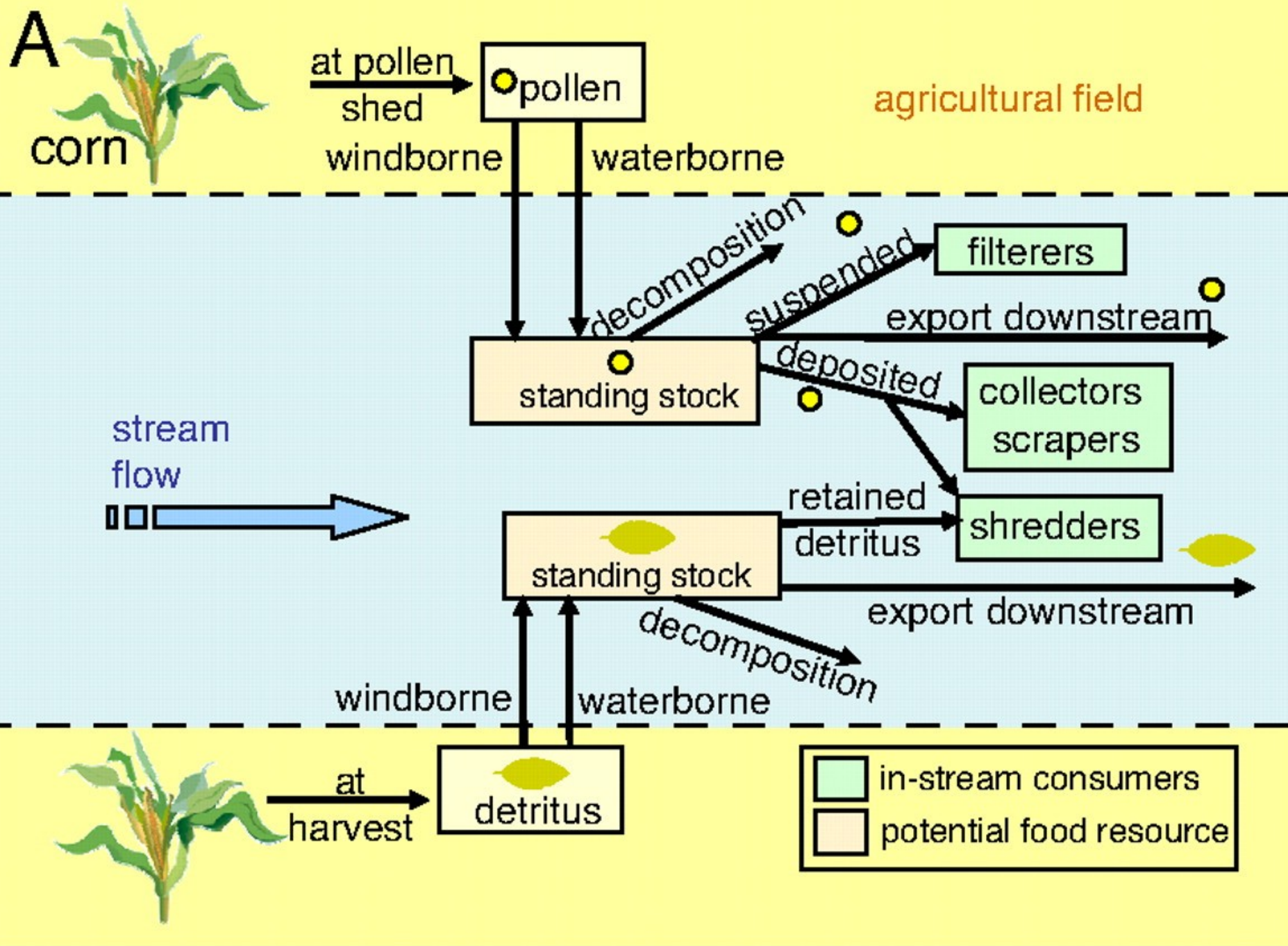
<http://blog.wired.com/wiredscience/2007/09/mon-santo-is-hap.html>

Note: Data for each crop category include varieties with both HT and Bt (stacked) traits.  
Source: 1996-1999 data are from Fernandez-Cornejo and McBride (2002). Data for 2000-07 are available in the ERS data product, Adoption of Genetically Engineered Crops in the U.S., tables 1-3.

# Toxins in transgenic crop byproducts may affect headwater stream ecosystems (2007)

E. J. Rosi-Marshall, J. L. Tank, T. V. Royer, M. R. Whiles, M. Evans-White, C. Chambers, N. A. Griffiths, J. Pokelsek, M. L. Stephen PNAS 104:16204-16208





B. corn growing near a stream and C. corn detritus in/near a stream

B



C





# Jennifer Tank (left) and Emma Rosi-Marshall study human-dominated ecosystems



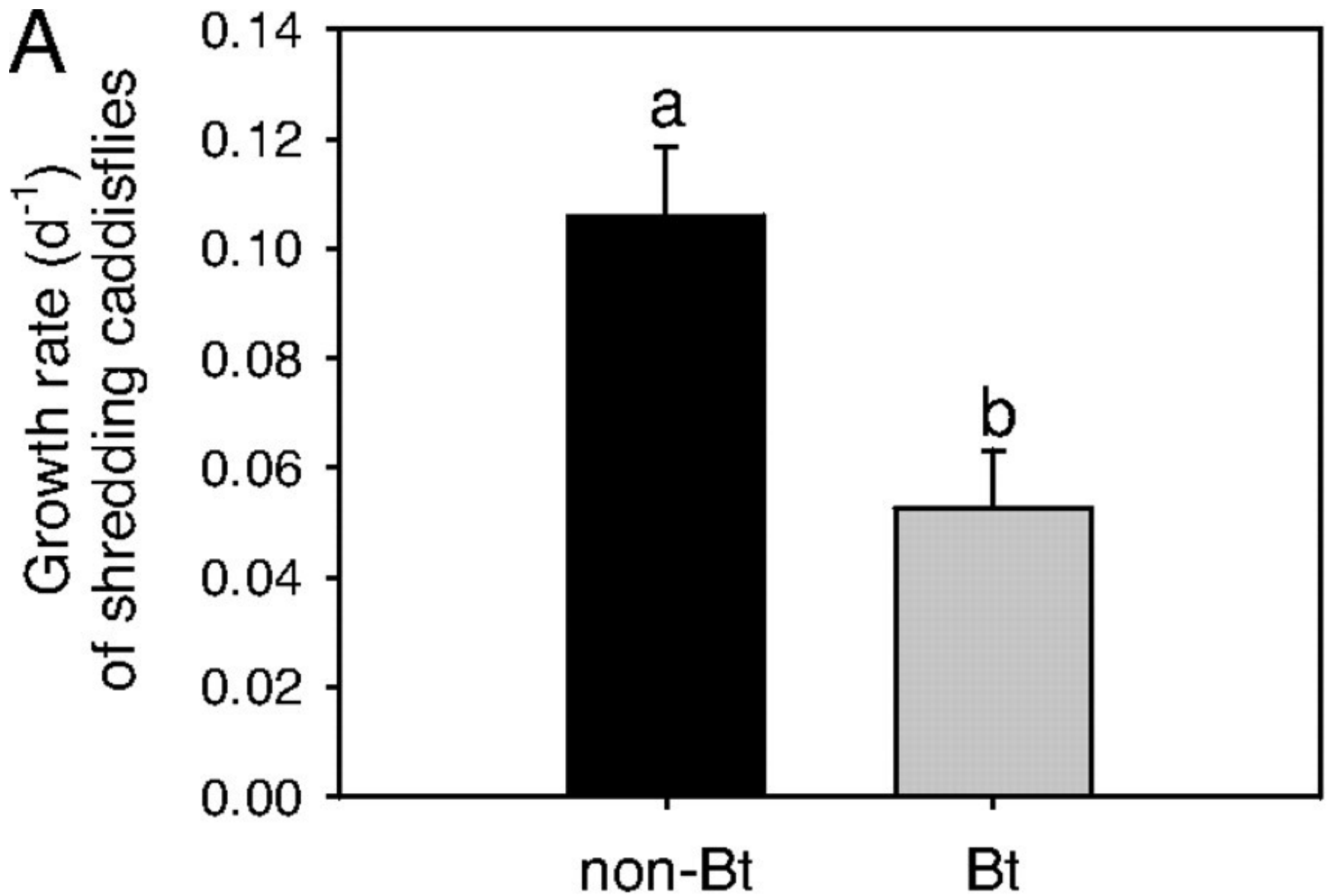
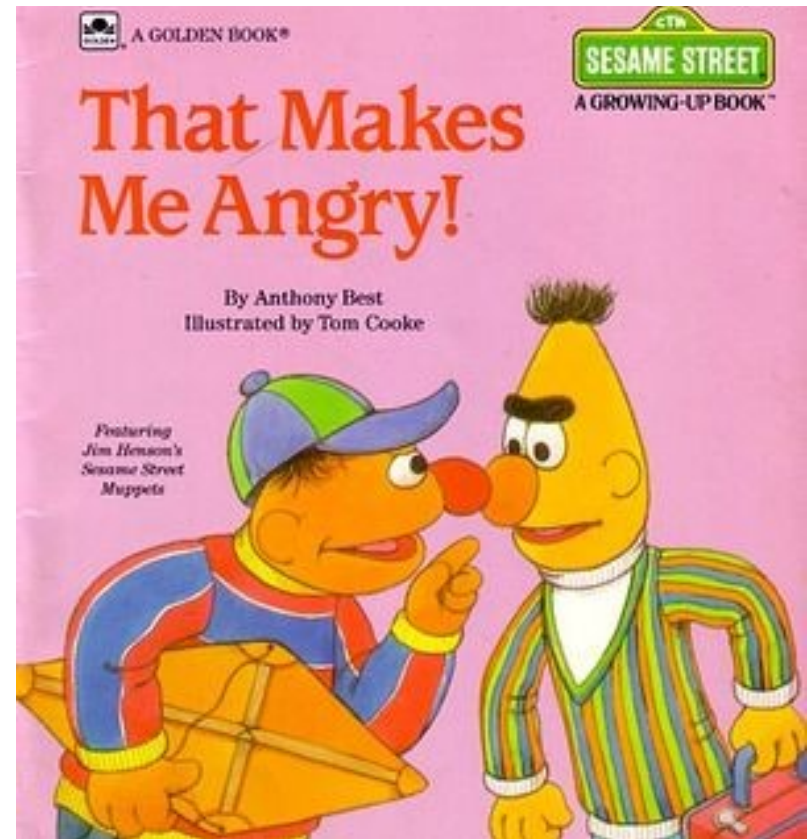


Fig. 3. Growth rates of the shredding caddisfly *L. liba* fed non-Bt and Bt corn leaves ( $P = 0.008$ , Student's t test)

Within two weeks, researchers with vehement objections to the experimental design and conclusions had written to the authors, PNAS, and the US National Science Foundation (NSF), Rosi-Marshall's funder.

The authors were also accused of scientific misconduct.



Comment by Klaus Ammann:

The points above illustrate sloppy experimental design and interpretation that should have been detected by even a cursory peer review... We are at a loss to explain how qualified reviewers and editors could be unaware of flaws of this magnitude.

**Publication of this flawed paper has seriously jeopardized the credibility of PNAS as a high quality, scientific forum.**

(emphasis not in original comment)

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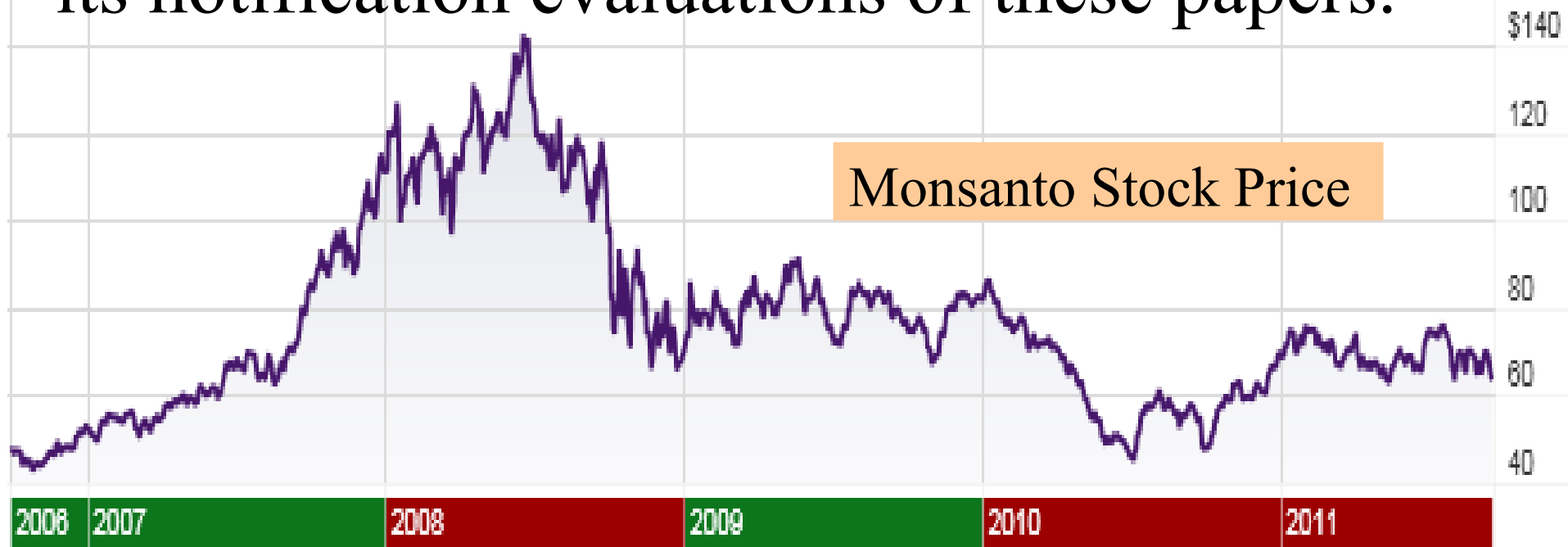
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**"The science is fine as far as I'm concerned," says Arthur Benke, an aquatic ecologist at the University of Alabama in Tuscaloosa (and who was not involved in the study)**



Monsanto, a maker of Bt maize based in St Louis, Missouri, sent the EPA a six-page critical response to the paper.

Monsanto, says that regulators ask seed companies to notify them of papers that relate to crop safety, so Monsanto often includes with its notification evaluations of these papers.



Monsanto Stock Price



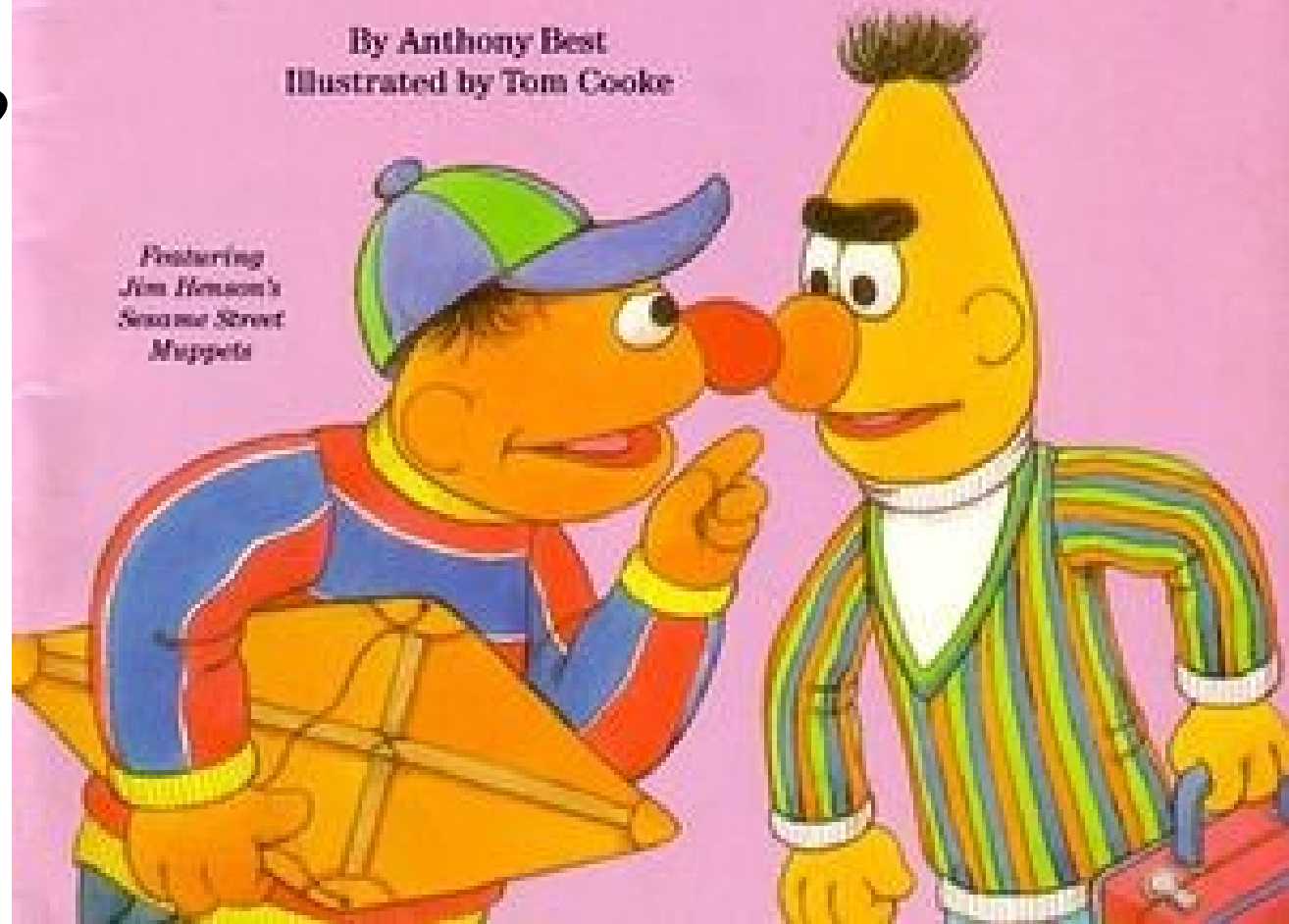
A GOLDEN BOOK®



# That Makes Me Angry!

By Anthony Best  
Illustrated by Tom Cooke

Featuring  
Jim Henson's  
Sesame Street  
Muppets



Why are the critics so angry/nervous?

- Losey et al reported in Nature 399, 214 (1999) that butterfly caterpillars fed Bt corn pollen had high mortality.

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- Six PNAS papers in 2001 concluded that the most common types of Bt maize pollen are not toxic to butterfly larvae in concentrations the insects would encounter in the field.
- "The Losey paper resulted in a lot of good work and brought to a close that particular question," says Alison Power, who studies ecology and evolutionary biology at Cornell University.
- Yet some scientists were dismayed that a single paper with preliminary data gave so much ammunition to anti-GMO activists and caused an expensive diversion of resources to calm the scare.

"When bad science is used to justify bad public policies, we all lose," says McHughen, who says he is on a "campaign to make academic scientists a little less politically naive and a bit more careful in their scientific work".

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The emotional and sometimes harsh quality of some of the attacks strikes some scientists as strange and unlike the constructive criticism to which they are accustomed. Benke points out that none of the criticisms on the caddis-fly paper, for example, **called for further study on the insects.** (emphasis not in original article)



Don Huber, a emeritus professor of plant pathology at Purdue University says, "When scientists become afraid to even ask the questions ... that's a serious impediment to our progress."

Who is right? The researchers or their critics?

How do we balance progress with caution?

Who has the responsibility of ensuring product safety?

What is an appropriate response to “bad” research?

Would you prefer to do controversial or non-controversial research?

How can reporting about science in the popular media be improved? In other words, how can we make the popular perception about science and research more accurate?

Assignment #6, due now...

You are offered a research position in two different labs. One studies cutting edge science that is not controversial. The other studies equally cutting edge research, but their research is highly controversial.

Which lab do you choose to join, and why?

**Lab this week:  
Inquiry 2 Proposals due**

**Safety Homework due**

**Upcoming:  
Sunday 10/9, Research  
Methods Lecture**

**Updated Syllabus**

**Ongoing: Stream Sort**

