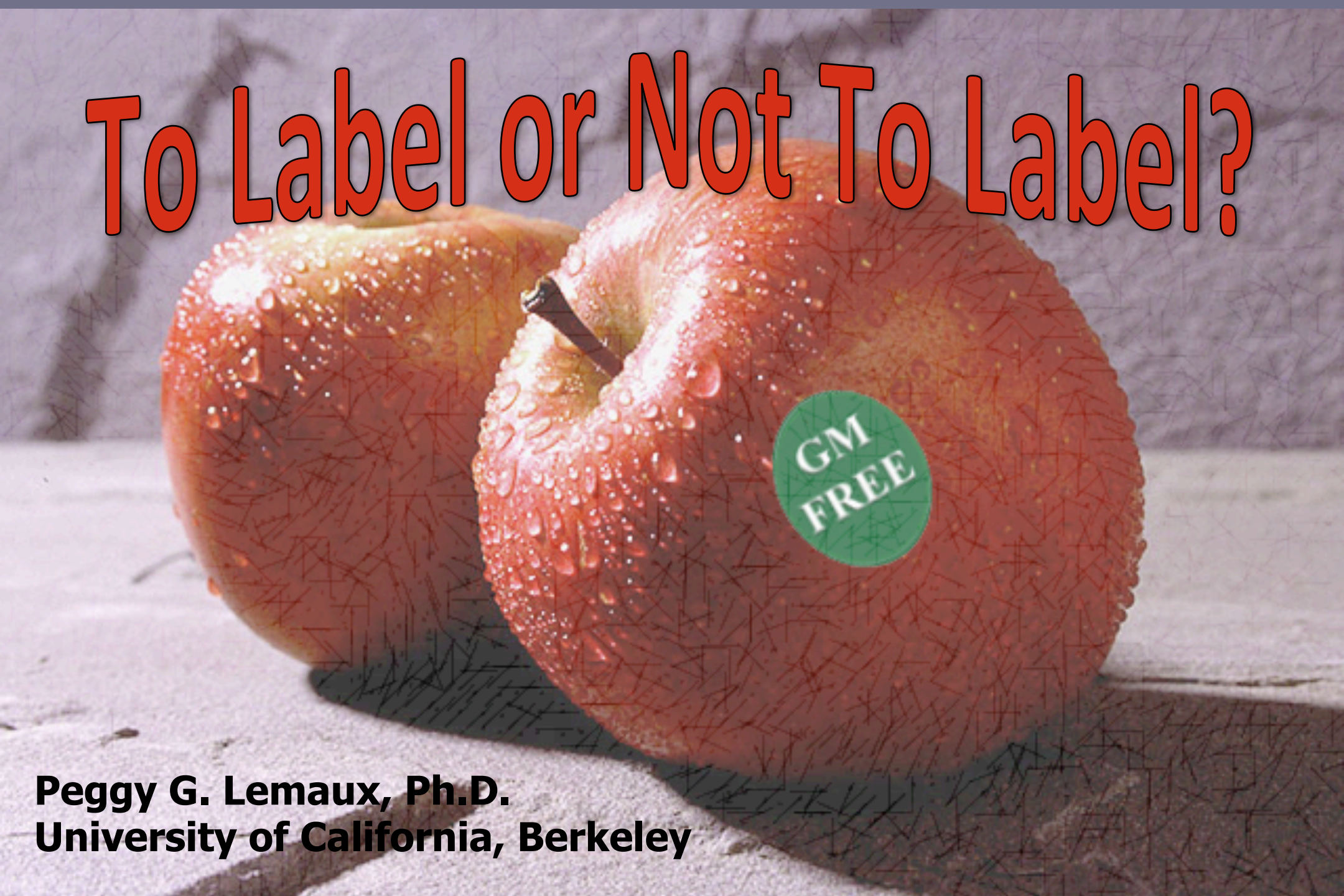
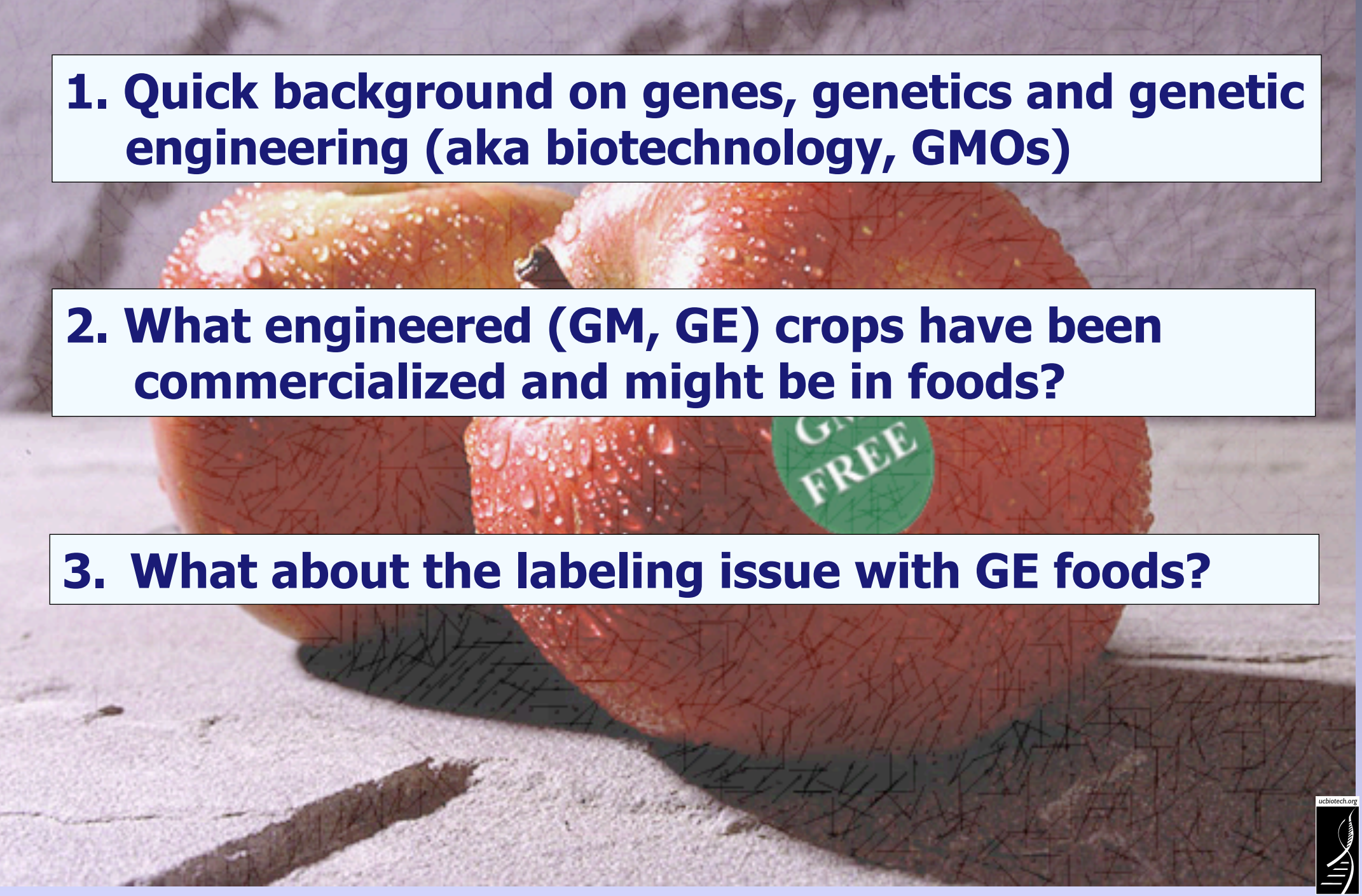
To Label or Not To Label?



Peggy G. Lemaux, Ph.D.
University of California, Berkeley



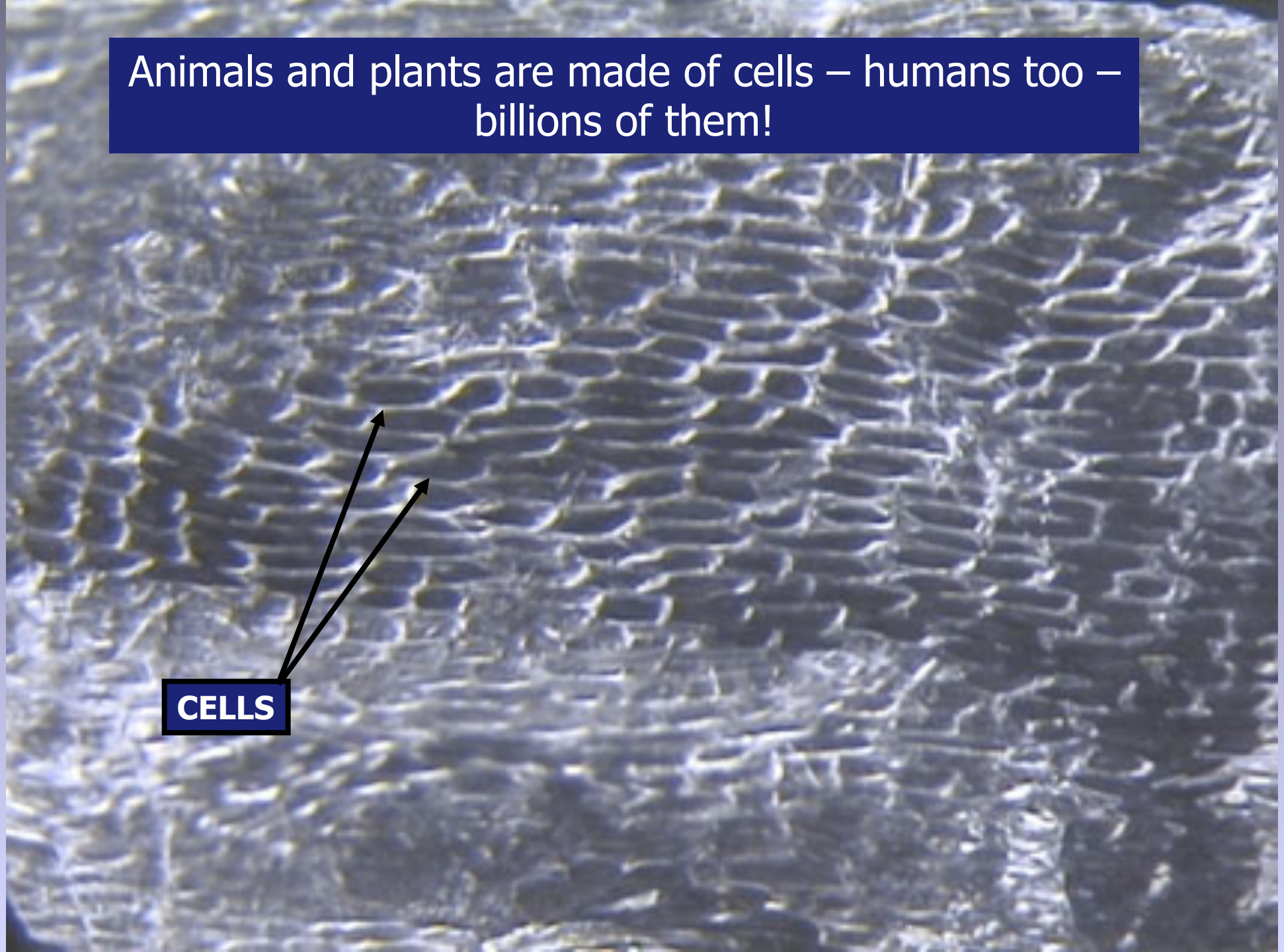
1. Quick background on genes, genetics and genetic engineering (aka biotechnology, GMOs)

2. What engineered (GM, GE) crops have been commercialized and might be in foods?

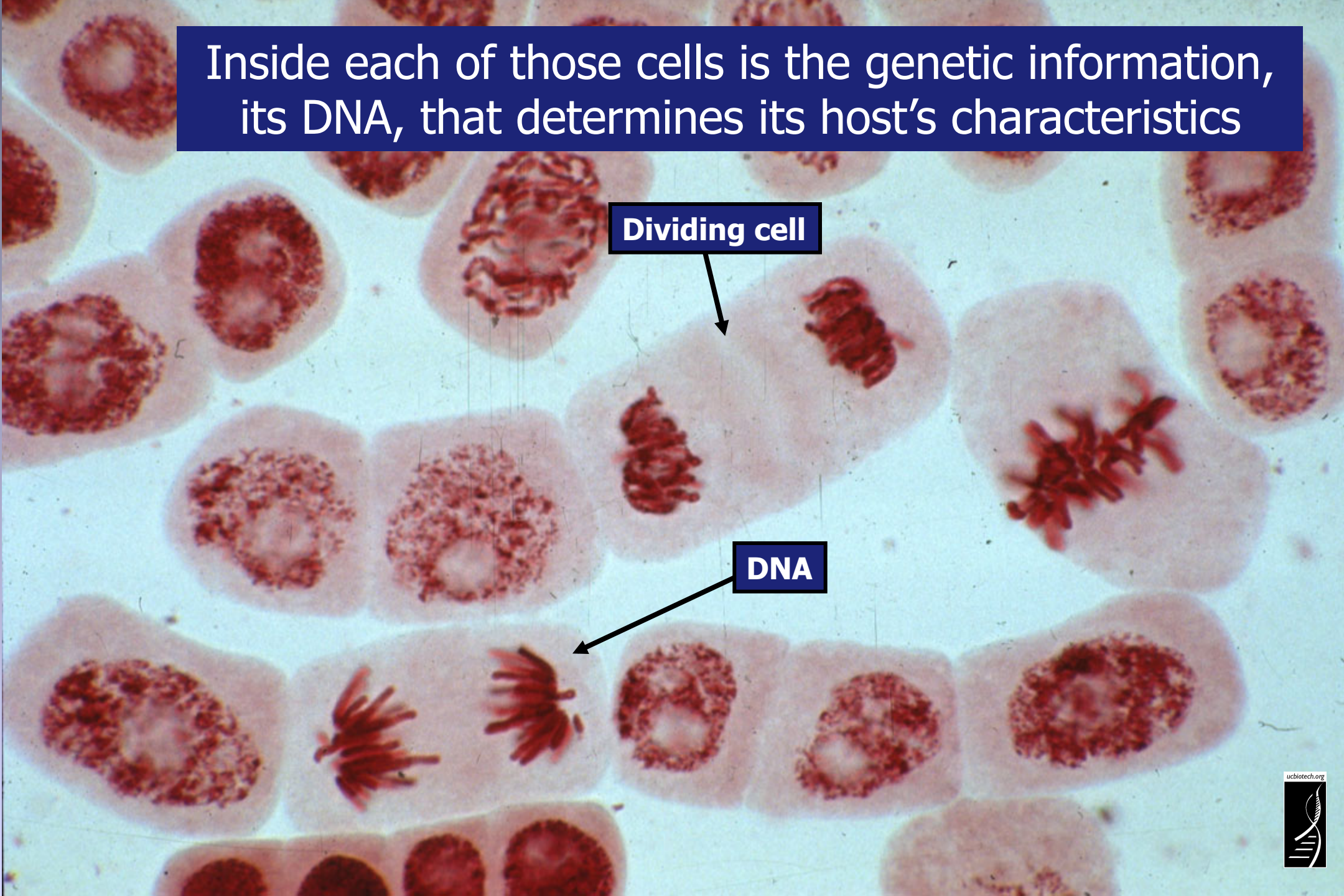
3. What about the labeling issue with GE foods?

ucbiotech.org

Animals and plants are made of cells – humans too – billions of them!

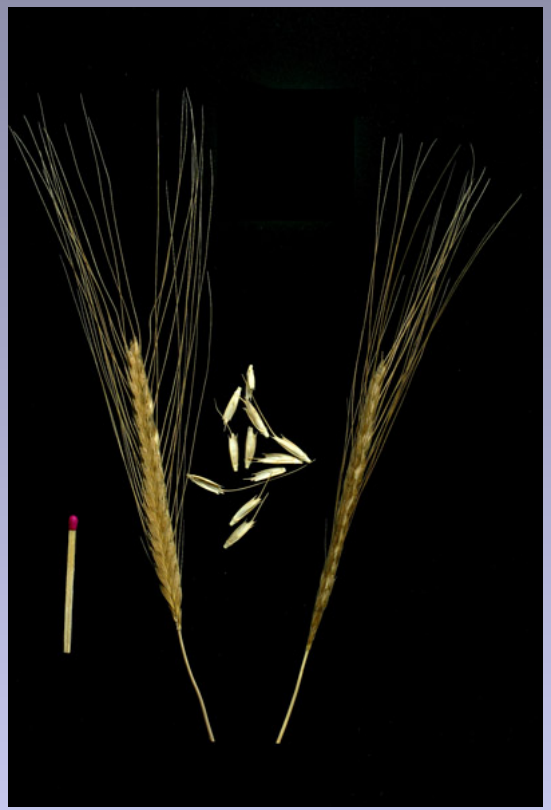


Inside each of those cells is the genetic information, its DNA, that determines its host's characteristics



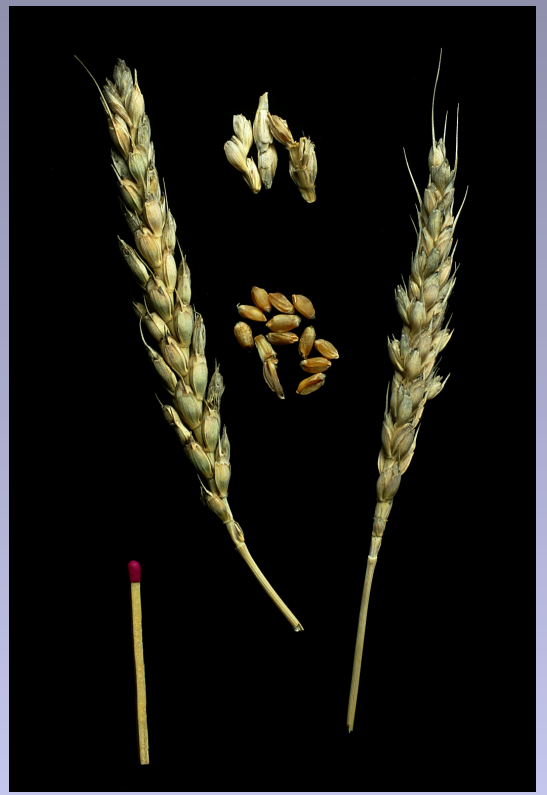
Genes are the individual recipes in the DNA that specify the characteristics and now we can find where those recipes are on the DNA

How are the genes and chromosomes manipulated to create a new plant variety… by classical breeding?



Triticum monococcum

Ancient variety



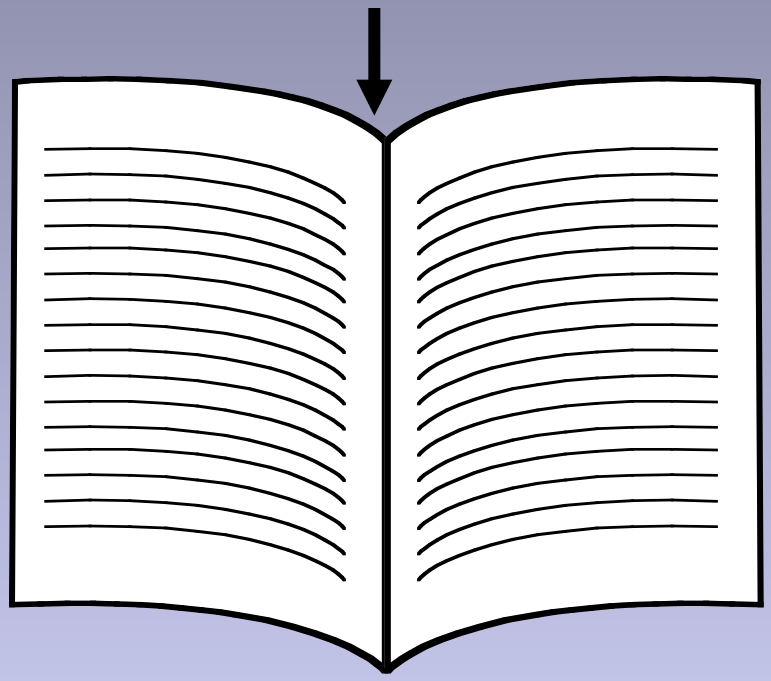
Triticum aestivum

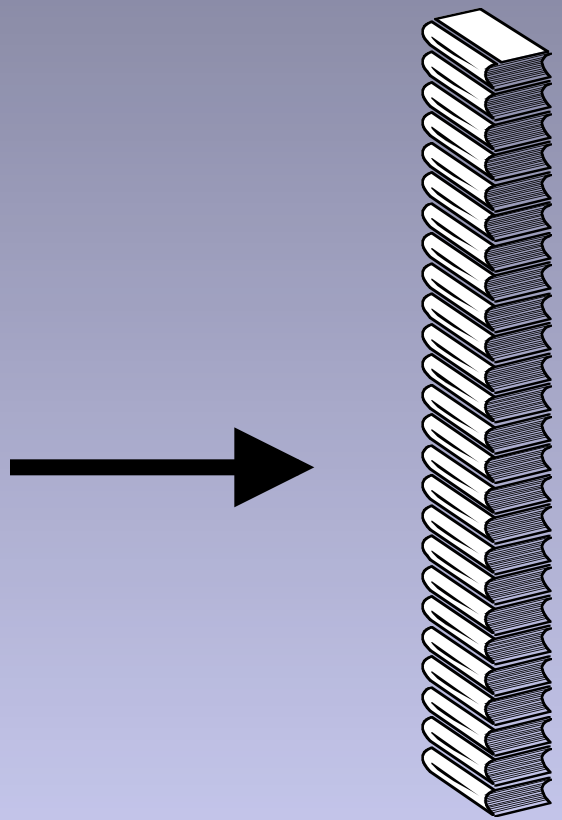
Modern bread variety

Information in the wheat genome

Chemical units represented by alphabetic letters

...CTGACCTAATGCCGTA...

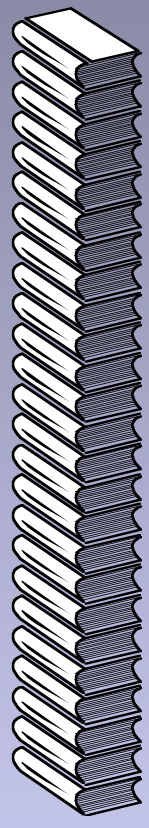




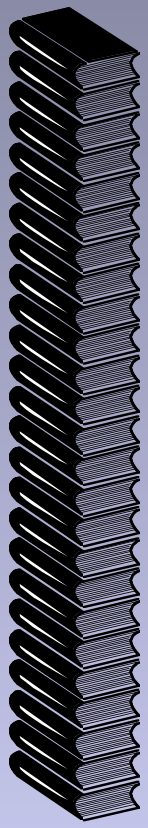
1700 books
1000 pages each

1700 books
(or 1.7 million pages)

Hybridization or cross breeding of wheat



X



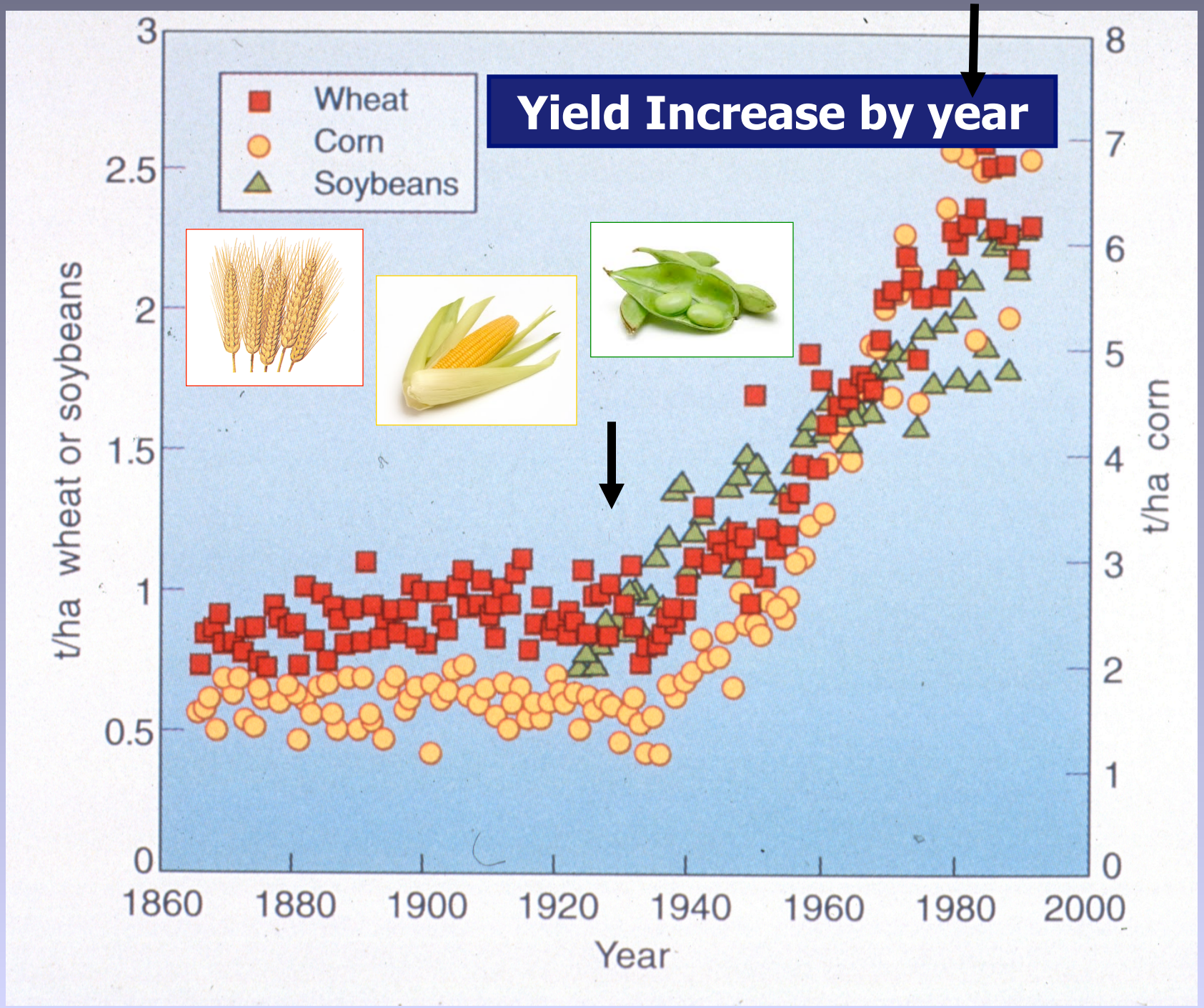
Random retention of information from each parent

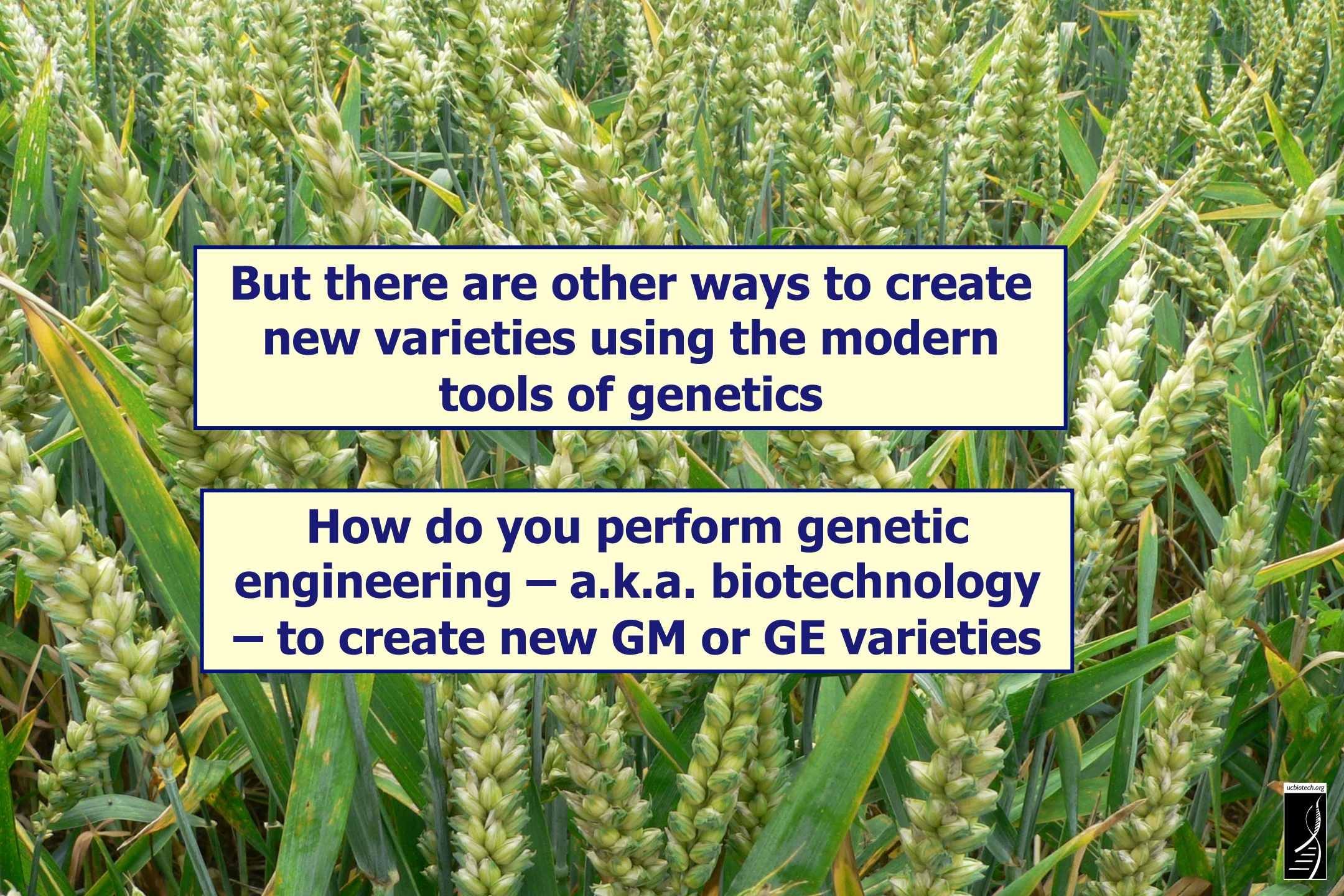
1700 books
(or 1.7 million pages)

1700 books
(or 1.7 million pages)

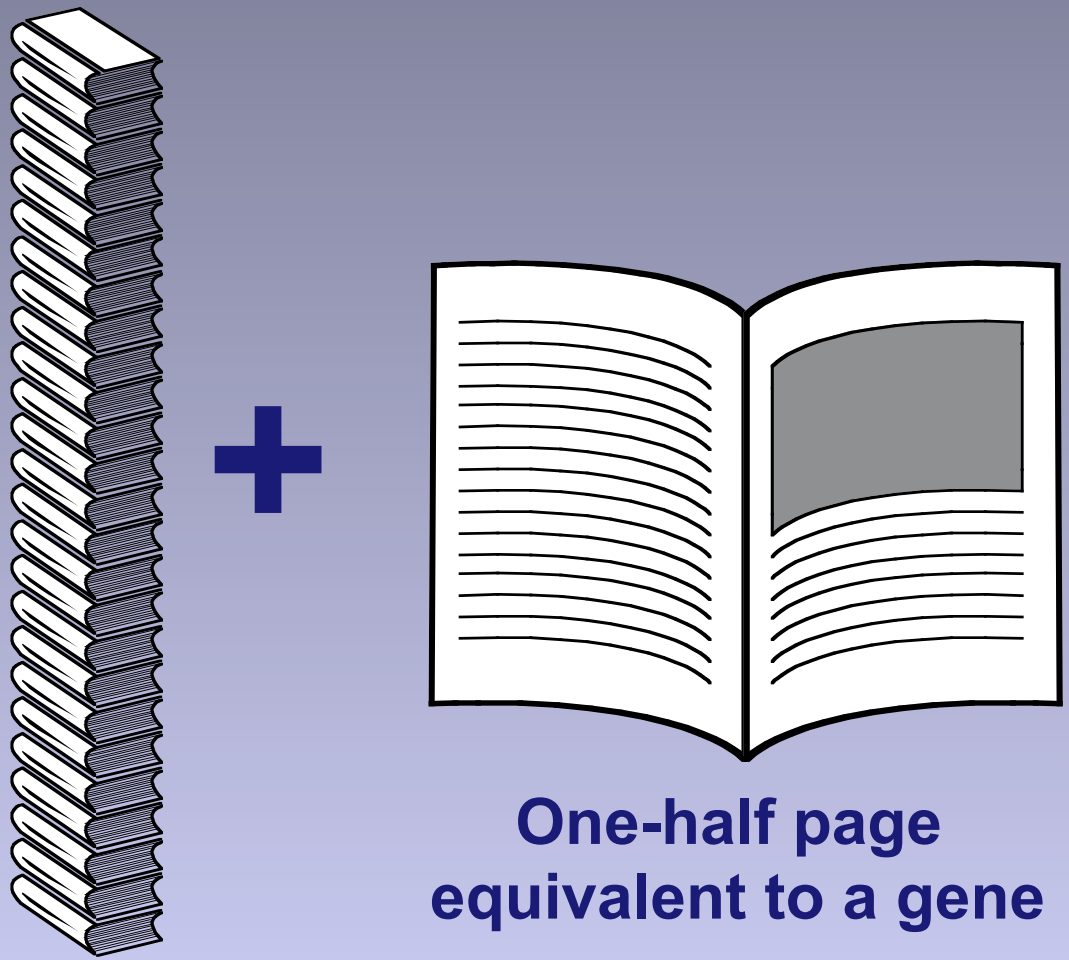
1700 books
(or 1.7 million pages)

ucbiotech.org


Yield Increase by year
Wheat
Corn
Soybeans
t/ha wheat or soybeans
t/ha corn
Year
0
0.5
1
1.5
2
2.5
3
0
1
2
3
4
5
6
7
8
1860
1880
1900
1920
1940
1960
1980
2000


But there are other ways to create new varieties using the modern tools of genetics
How do you perform genetic engineering – a.k.a. biotechnology – to create new GM or GE varieties
ucbiotech.org

Genetic Engineering Methods



1700 books
(or 1.7 million pages)

One-half page
equivalent to a gene

Inserts
randomly
in genome

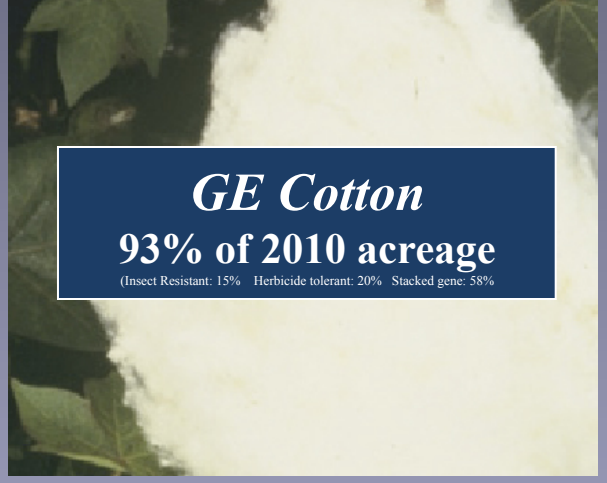
Inserted
gene(s)

1700 books
(or 1.7 million pages)

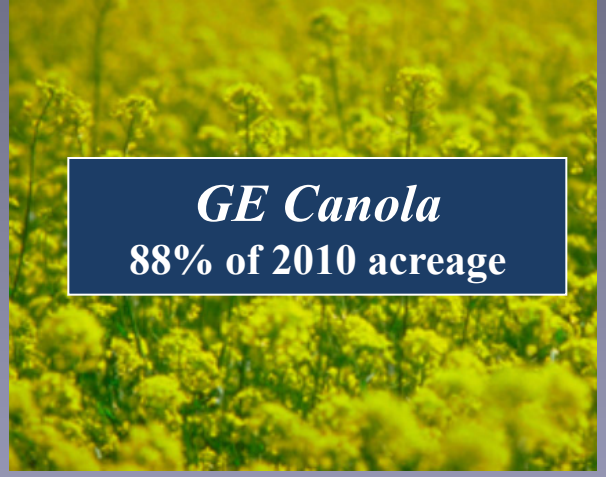
ucbiotech.org

Classical Breeding compared to *Genetic Engineering*

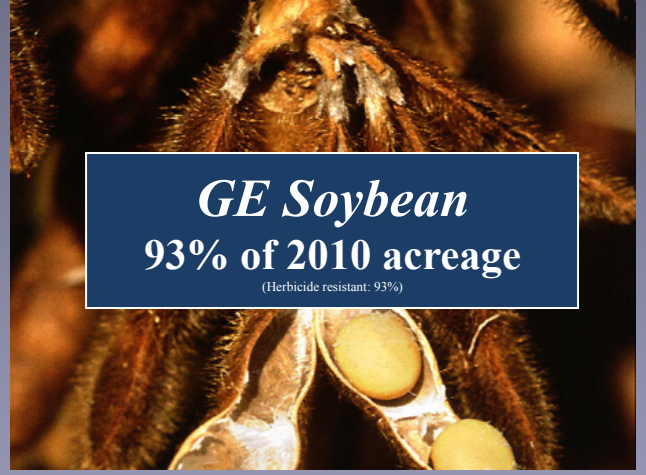
Classical Breeding	*Genetic Engineering*
Uses plant machinery in plant	Uses plant machinery in laboratory
Gene exchange is random involving whole genome	Gene exchange is specific involving single or few genes
Source of gene primarily within genera – not between kingdoms like plants & bacteria	Source of gene from any organism



GE Cotton
93% of 2010 acreage
(Insect Resistant: 15% Herbicide tolerant: 20% Stacked gene: 58%



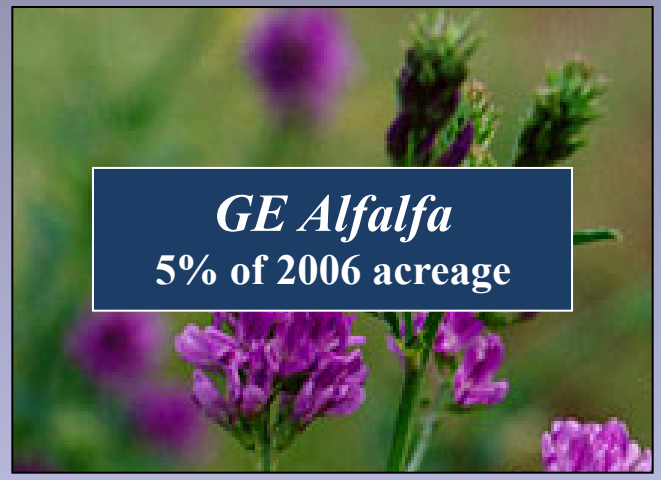
GE Canola
88% of 2010 acreage



GE Soybean
93% of 2010 acreage
(Herbicide resistant: 93%)

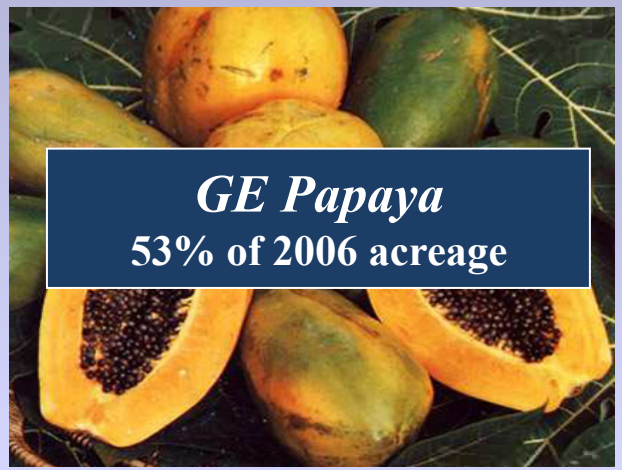
GE Corn
86% of 2010 acreage
(Insect Resistant: 16% Herbicide resistant: 23% Stacked gene: 47%)
1% of corn with Bt (ECB) + Bt (rootworm) + herbicide

GE Sugarbeet
96% of 2010 acreage



GE Alfalfa
5% of 2006 acreage

GE crops presently grown commercially



GE Papaya
53% of 2006 acreage

GE Squash
10% of 2004 acreage

ucbiotech.org

USDA ERS

Although there are few GE whole foods, use of ingredients from corn, soybean, canola, sugarbeet leads to estimates that 75% of U.S. processed foods have GE ingredients

This fact has led to demands by some for mandatory labeling of foods containing GE ingredients

Why Doesn't FDA Have a Labeling Policy for GE Foods?

Actually it does…

GE foods are subject to same labeling laws as all other foods and food ingredients

This label information relates to composition not agricultural or manufacturing practices

No label needed if food is essentially equivalent in safety, composition and nutrition

GE food must be labeled if it has:

1. Different nutritional characteristics
2. Genetic material from known allergenic source e.g., peanut, egg
3. Elevated levels of antinutritional or toxic cmpounds

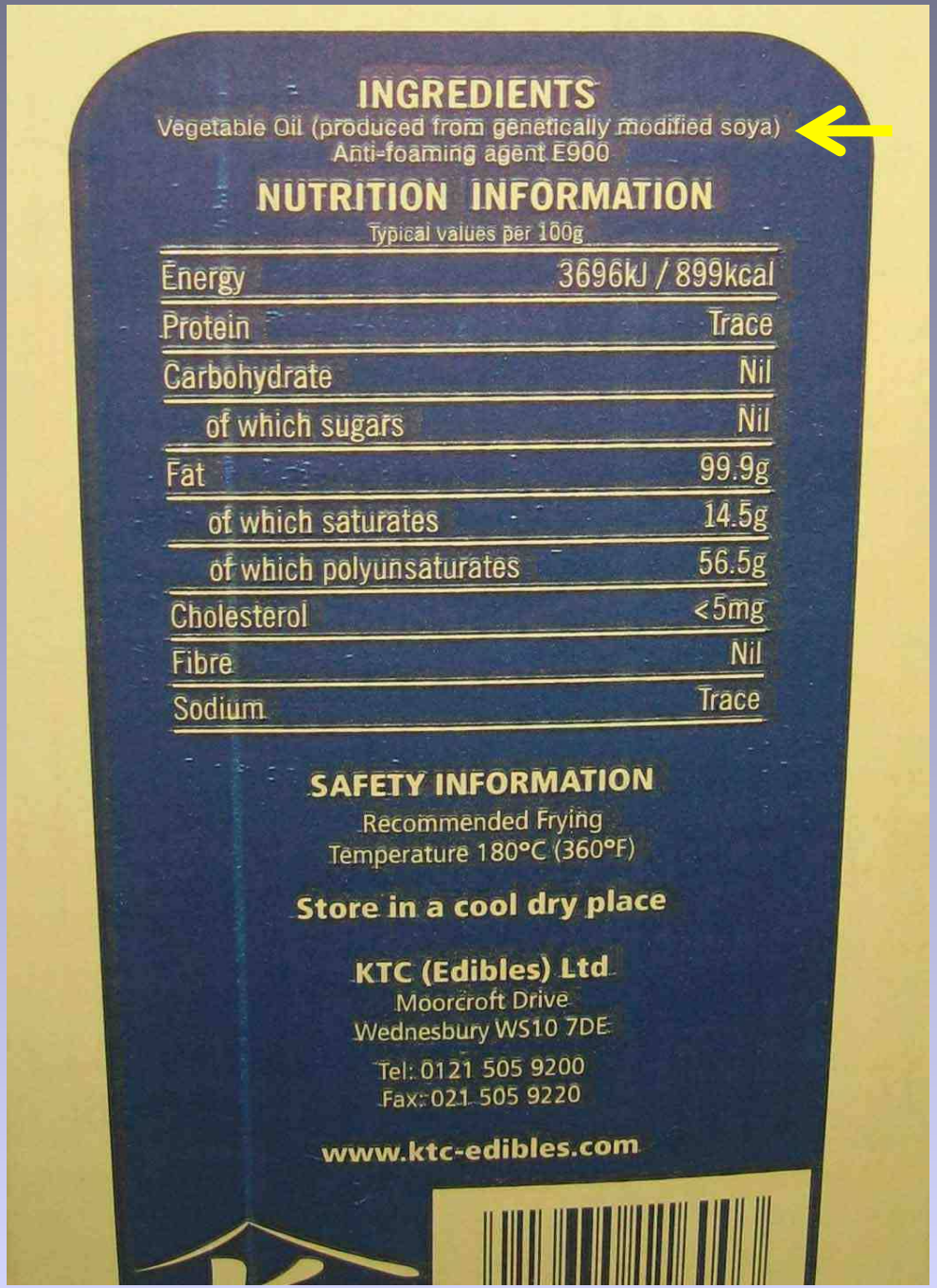
Also, for whole fresh foods, there are existing PLU labels that indicate whether they are GE or organic

National GM Labeling Laws and Policies

Type of GM labeling	Countries that enforce labeling policies	Countries with partially enforced or unenforced labeling policies	Countries with probable plans to introduce a labeling policy
Mandatory	Australia, Brazil, China, European Union, Japan, New Zealand, Norway, Russia, Saudi Arabia, South Korea, Switzerland, Taiwan	Croatia, Ecuador, El Salvador, Indonesia, Malaysia, Mauritius, Serbia, Sri Lanka, Thailand, Ukraine, Vietnam	Nigeria, Uganda, UAE, Zambia
Voluntary	Argentina, Canada, Chile, Hong Kong, Kenya, Philippines, South Africa, USA		Peru

But other nations have specific mandatory labeling laws for GE, although they vary dramatically among countries, making international trade difficult

SOURCE: Marchant, G.E., Cardineau, G.A. and Redick, T.P. 2010. Thwarting Consumer Choice: The Case against Mandatory Labeling for Genetically Modified Foods. American Entreprise Institute, p. 71.



One place is the E.U.

Where very little is labeled.
Two GE soy cooking oils
Margarines in processed foods
Minor products, like soy lecithin
No GE-maize or -canola products in U.K.
Other EU countries have more, some with GE maize.

There is adventitious GE-free labeling on products that do not have ingredients likely to be GE

ucbiotech.org

But do consumers act on this information?

FOOD STANDARDS AGENCY

66% of UK consumers think GE food labeling is important…

But only 2% actively look for GE content when buying foods”

SOURCE: “FSA survey: Majority of UK consumers back GM labelling”, Food Navigator, January 10, 2013. http://www.foodnavigator.com/content/view/print/728839
Link to report: http://www.food.gov.uk/science/research/ssres/foodsafetyss/gm-labelling/#.UPXkHaHr7jm

ucbiotech.org

In November 2012 California voted on a Proposition to require mandatory labeling of foods with GE ingredients.

What did that Proposition look like?

CA Labeling Proposition

Labeling Relating to Genetic Engineering

- Any retail product that has been or may have been partially or wholly produced with genetic engineering must be labeled.
- Any raw retail agricultural commodity must contain on the front of its package in clear and conspicuous words, "Genetically Engineered".
- Any processed foods, unless exempted, must have conspicuous language on package stating, "Partially Produced with Genetic Engineering" or "May be Partially Produced with Genetic Engineering".

Labeling Relating to Using "Natural"

If food meets GE definitions above, or is processed, it may not be labeled for retail or in advertising that the food is "natural", "naturally made", "naturally grown", "all natural" or any similar wording.

What Exemptions Were There?

- Non-GE animals whether fed GE feed or injected with GE drugs.
- Raw commodities grown without intentional use of GE seed.
- Foods certified as "organic".
- Alcoholic beverages.
- Processed food with no one ingredient >0.5% of weight of food.
- Processed food for immediate consumption in restaurants.
- Medical food.
- Processed food labeled solely because it has one or more GE processing aids or enzymes.
- Processed foods with one or more GE substances added during processing but removed or present in very low amounts.

Capital Press
Agriculture Newspaper

California voters nix biotech labels

Opponents raised $46 million to fight proposition

By ALICIA CHANG
Associated Press

LOS ANGELES — Voters spurned a ballot measure that would have made California the first in the nation to affix labels on breakfast cereals, baked goods and other processed foods containing genetically modified ingredients.

The rejection on Nov. 6 followed an expensive offensive from agri-business and chemical conglomerates, which raised $46 million to blitz airwaves and mailboxes with negative advertising.

We didn't think they'd like the lawsuits, more bureaucracy, higher costs and loopholes and exemptions. It looks like they don't," spokeswoman Kathy Fairbanks said.

Representatives with the California Right to Know campaign tried to put on a positive face.

"No matter what happens, we've raised awareness of a very important issue," said Grant Lundberg, chief executive of Lundberg Family Farms, who co-chairs the California Right to Know campaign.

Consumer activists and the organic food industry said shoppers crave information about what they're eating and should be given all the information they need to decide for them-

After over $40M was spent convincing voters one way or the other, the proposition was defeated 51.4% to 48.6%

gnning of this campaign that the more voters learned about Prop 37, the less they'd like it.

bioengineered foods are not significantly different in taste, texture and nutrition.

when the DNA has been tinkered with in the laboratory to resist pesticides and ward off

sodas.

Despite scientific consensus that genetically modified foods

force special labels. Mandatory labeling exists elsewhere, including the European Union.

cally engineered foods nationwide is pending before the U.S. Food and Drug Administration.

SOURCE: "California voters rebuff labels on GMO foods", Capital Press, November 8, 2012
http://www.capitalpress.com/print/AP-CA-Prop-37-Food-labeling-110712

ucbiotech.org

Organic Bytes

Health, Justice and Sustainability News from the Organic Consumers Association

A weekly e-newsletter edited by Katherine Paul and Ronnie Cummins

End of Story?

ESSAY OF THE WE

GMO Food Fight: Round Two 2013

"This gives us hope that you can, with a well-funded, well-organized, well-executed campaign, defeat a ballot initiative and go directly to the voters. We hope we don't have too many of them, because you can't keep doing that over and over again . . .".

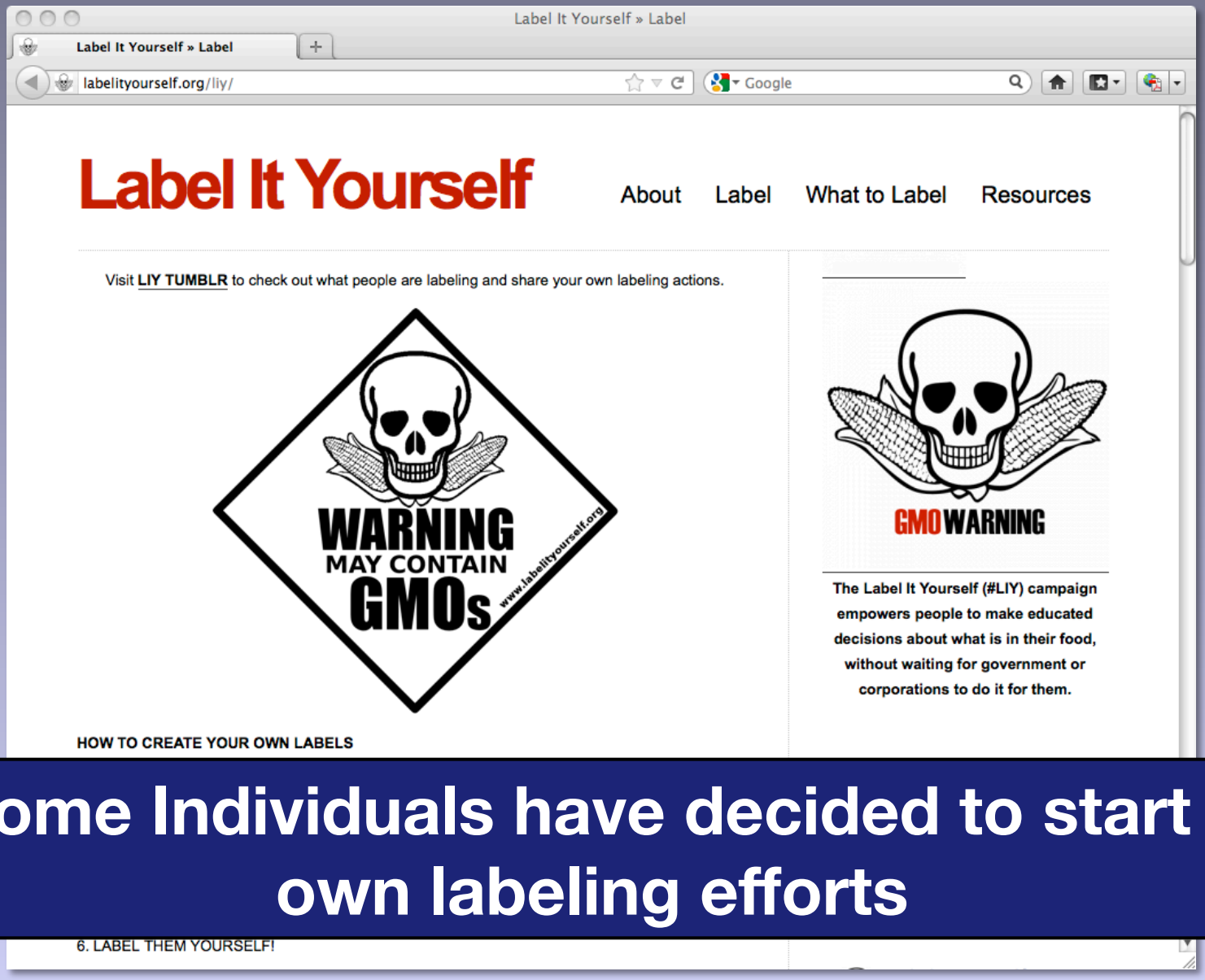
- Jennifer Hatcher, Food Marketing Institute, on Big Food and Big Biotech's narrow defeat of Prop 37, the California Right to Know GMO ballot initiative.

Not in California, nor a number of other states, like Washington, Oregon, Vermont…

, 2013

http://www.organicconsumers.org/bytes/ob361.htm

ucbiotech.org



And some Individuals have decided to start their own labeling efforts

SOURCE: http://labelityourself.org/liy/

ucbiotech.org

Capital Press
Agriculture Newspaper

'We intend to label our Arctic apples as genetically modified'

APPLE from Page 1

prohibition that barred the state Legislature from modifying it unless it was made more stringent. Opponents, including Monsanto, DuPont, food companies and grocery stores, spent $45 million against the proposition.

Carter believes he is about six months away from gaining USDA and U.S. Food and Drug Administration approval to grow and sell genetically modified apples in the United States. He is also seeking Canadian government approval.

His Arctic brand Golden Delicious and Arctic Granny Smith apples have been modified by switching off a gene, so they won't brown when sliced.

Dan Wheat/Capital Press

Joel Brooks, marketing communications specialist for Okanagan

And some companies have decided to voluntarily label.

browning, he said. Use of sliced apples in restaurants and food services would increase overall apple consumption, he said.

"As a company, labeling doesn't bother us. We intend to label our Arctic apples as genetically modified. We want people to make an informed decision," Carter said. "But we're not for mandatory labeling because it undermines the credibility of the FDA, which does its review. It has standards for food safety. This is mandating labeling of something that has no risk. I don't agree with that. It becomes too much negative marketing."

The battle isn't as much about food safety as it is about market share between the organic and natural food side versus big, biotech corporations, Carter said.

"We're a small company," he said. "We can't engage in that."

The recession shrank the organic industry, which "wants to use labeling to scare people into buying organic," he said. That's the wrong motivation, he said, and it should be about

there that are genetically modified but not 100 percent of the product. So labeling gets complicated in a hurry," he said.

"Biotech foods have been around for 15 years, fed 4 trillion people and never been a single health risk, yet nine people died from organic bean sprouts in Germany last year," he said. "Organics can kill people with E.coli."

But the Pacific Northwest apple industry, fearing negative public reaction, is on the record against USDA approval of genetically engineered apples.

The Northwest Horticultural Council in Yakima, Wash., representing tree fruit growers and packers in Washington, Oregon and Idaho, sent USDA Secretary Tom Vilsack a letter in 2011 asking him to reject Carter's application for non-regulated status of his two genetically engineered apples.

marketing issues to confront both organic and traditional apple growers should they be allowed into the general marketplace," Chris Schlect, hort coun-

cil president wrote in the letter.

Todd Fryhover, president of the Washington Apple Commission, has said genetic modification raises public concerns and doesn't seem to fit with the image of apples as healthy and nutritious.

Carter and other representatives of Okanagan Specialty Fruits early this month, for the first time, had booths to display and talk about Arctic apples at the annual meetings of the Washington State Horticultural Association and the Great Lakes Fruit, Vegetable and Farm Market Expo in Michigan.

It was an educational outreach with lots of grower questions answered, he said.

Contacts were made for po-

to test color and quality, Carter said. That planting should produce first fruit in 201 ch is when the apples s be deregulated, he said.

SOURCE: "Biotech apples inflame debate", Capital Press, December 20, 2012
http://www.capitalpress.com/orewash/djw-GMOapples-w-art-121912


GM
FREE
Putting a label on a whole food is relatively easy, but…

Processed foods are more difficult. For example, tomato sauce contains many varieties. Depending on type of label required, GE varieties would likely need to be tracked to assure correct content information.

May contain genetically modified tomatoes

Contains genetically modified tomatoes

Contains tomatoes genetically modified with polygalacturonase gene from tomato, phosphinothricin acetyl transferase from *Streptomyces hygroscopicus*, crystal toxin from *Bacillus thuringiensis*, alpha amylase gene from barley, s-adenosyl methionine transferase gene from tobacco, N protein gene from tobacco, coat protein gene from tomato bushy stunt virus

ucbiotech.org

If there is demand, might another solution be to allow the creation of a specialty market for labeled GE-free foods – for which people pay a premium price and for which farmers are paid premium prices to grow them?

But other consumers have the choice to buy GE foods.

Where to get more information on the issues and on labeling?

http://ucbiotech.org

ucbiotech.org

SCIENCE-BASED INFORMATION & RESOURCES ON AGRICULTURE, FOOD & TECHNOLOGY

ABOUT US | NEWS | ISSUES & RESPONSES | GMO LABELING | RESOURCES | LINKS | GLOSSARY | SEARCH

Select Language

This website provides educational resources focused broadly on issues related to agriculture, crops, animals, foods and the technologies used to improve them. Science-based information related to these issues is available, as well as educational tools and information, which can be used to promote informed participation in discussions about these topics.

BIOTECHNOLOGY INFORMATION

Labeling:
Informational resources available.

ANNUAL REVIEWS

Review articles:
Focused on food, environmental and socioeconomic issues of GE crops and foods.
Part 1 | Part 2

RESOURCES FOR OUTREACH & EXTENSION, RESEARCHERS & TEACHERS

DNA for Dinner 4-H curriculum:
For grades 5-8, covers topics from plant diversity to genetic engineering. Each of the five lessons has 3 to 5 activities.

DNA FOR DINNER?

New Game: Who's In Your Family?
A free educational game to teach participants about the diversity of fruits and vegetables, and how they are related.

Slide Archive:
Extensive collection of PP slides on agriculture & biotechnology.

Available on loan:

Teaching Aids: Handouts and cards available, in both English and Spanish.

Educational displays: "Genetics and Foods" and "Genetic Diversity and Genomics" available with companion educational cards and teacher worksheet in English and Spanish.

Gene-IE Juice Bar: Interactive activity to isolate DNA from common fruits and vegetables.

HELPFUL SITES

Academics Review
Academics Review website
Testing popular claims against peer-reviewed science.

BIOFORTIFIED

Biofortified website
Provides factual information to foster discussion about agriculture, especially plant genetics and genetic engineering.

Animal Genomics & Biotechnology Cooperative Extension Program, UC Davis

Provides education on use of animal genomics & biotechnology in livestock production.