

Genetics, Reproductive Health,
Science & the Future

**BOLD BRAVE FEARLESS
BLACK FUTURISM CONFERENCE**

Black Women for Wellness conference
October 20, 2016

Marcy Darnovsky, Center for Genetics and Society

BIOPOLITICS

The way in which human biotechnologies interact with power dynamics, structural inequalities, and public policies

Genetic Engineering

- Heritable modification
- Gene editing
- Genetic selection
- Reproductive cloning
- Synthetic biology
- Artificial gametes
- Eugenics

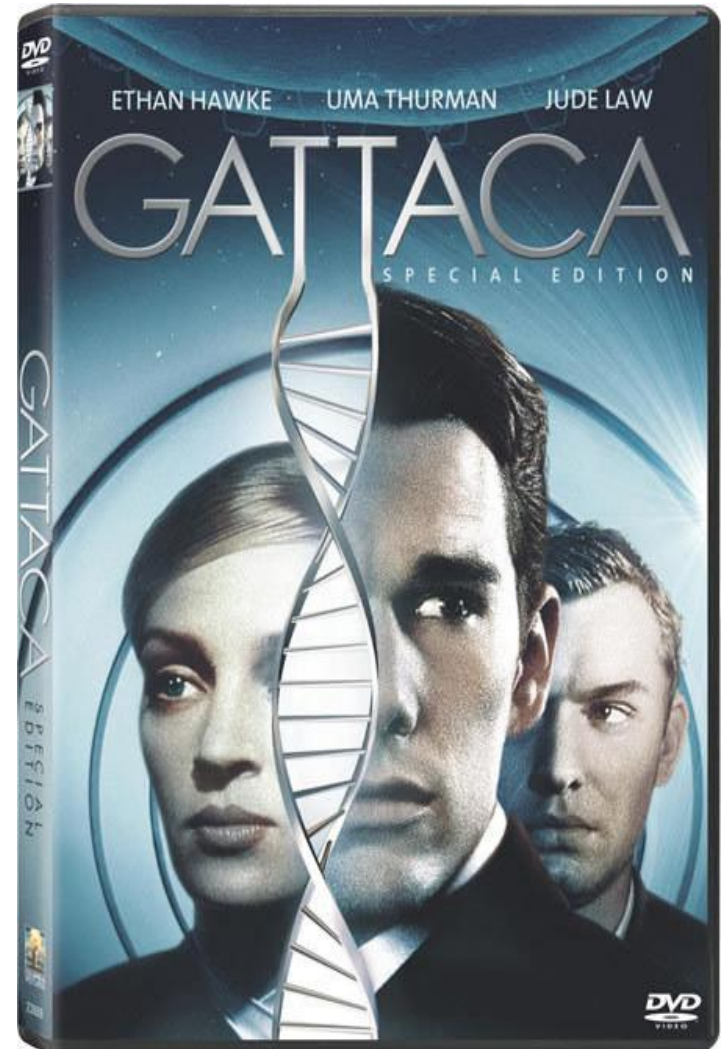
Assisted Reproduction

- In vitro fertilization
- Egg retrieval
- Social egg freezing
- Commercial surrogacy
- Embryo screening
- Sex selection
- Early prenatal gene tests

Genetic Data

- Genetic testing
- Genetic discrimination
- Direct-to-consumer & ancestry gene tests
- DNA biobanks
- Police DNA databases
- “Precision” medicine
- Race-based medicine

“The not-too-distant future”



Human clones & GM babies?

FEBRUARY 18, 2001 \$2.50

www.fox.com AOL Keyword: FOX

TIME

HUMAN CLONING IS CLOSER THAN YOU THINK

For couples who can't have a child—or who have lost one—the unthinkable may soon be possible. Here are the perils



SCIENCE

Designer Babies

Scientists say that, with gene therapy, they may soon be able to cure a child's inherited disease before he is even born. But should they be allowed to create kids with made-to-order traits? BY SHARON BEGLEY

IT IS ONLY A MATTER OF TIME. ONE day—a day probably no more distant than the first wedding anniversary of a couple who are now teenage sweethearts—a man and a woman will walk into an in vitro fertilization clinic and make scientific history. Their problem won't be infertility, the reason couples now choose IVF. Rather, they will be desperate for a very special child, a child who will elude a family curse. To create their dream child, doctors will fertilize a few of the woman's eggs with her husband's sperm, as IVF clinics do today. But then they will inject an artificial human chromosome, carrying made-to-order genes like pearls on a string, into the fertilized egg. One of the genes will carry instructions ordering cells to commit suicide (graphic). Then the doctors will place the embryo into the woman's uterus. If her baby is a boy, when he becomes an old man he, like his father and grandfather before him, will develop prostate cancer. But the cell-suicide gene will make his prostate cells self-destruct. The man, unlike his ancestors, will not die of the cancer. And since the gene that the doctors gave him copied itself into every cell of his body, including his sperm, his sons will beat prostate cancer, too.

Genetic engineers are preparing to cross what has long been an ethical Rubicon. Since 1990, gene therapy has meant slipping a healthy gene into the cells of one organ of a patient suffering from a genetic disease. Soon, it may mean something much more momentous: altering a fertilized egg so that genes in all of a person's cells, including eggs or sperm, also carry a gene that scientists, not parents, bequeathed them. When the pioneers of gene therapy first requested government approval for their experiments in 1987, they vowed they would never alter patients' eggs or sperm. That was then. This is now. One of those pioneers, Dr. W. French Anderson of the University of Southern California, recently put the National Institutes of Health on notice. Within two or three years, he said, he would ask approval to use gene therapy on a fetus that has been diagnosed with a deadly inherited disease. The therapy would cure the fetus before it is born. But the introduced genes, though targeted at only blood or immune-system cells, might inadvertently slip into the child's egg (or sperm) cells, too. If that happens, the genetic change would affect that child's children unto the nth generation. "Life would enter a new phase," says biophysicist Gregory Stock of UCLA, "one in which we seize control of our own evolution."

Judging by the 70 pages of public comments NIH has received since Anderson submitted his proposal in September, the overwhelming majority of scientists and ethicists weighing in oppose gene therapy that changes the "germline" (eggs and sperm). But the opposition could be a

JOE RELEY—STOCK PHOTO

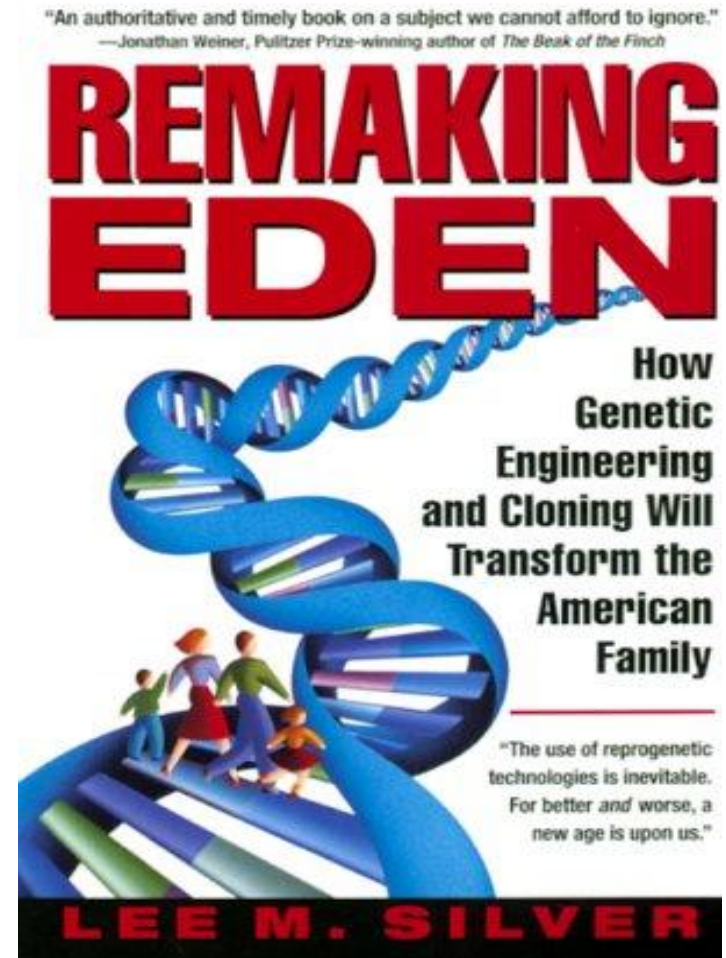
What, me worry? DNA tricks may ease ethical concerns about 'playing God'



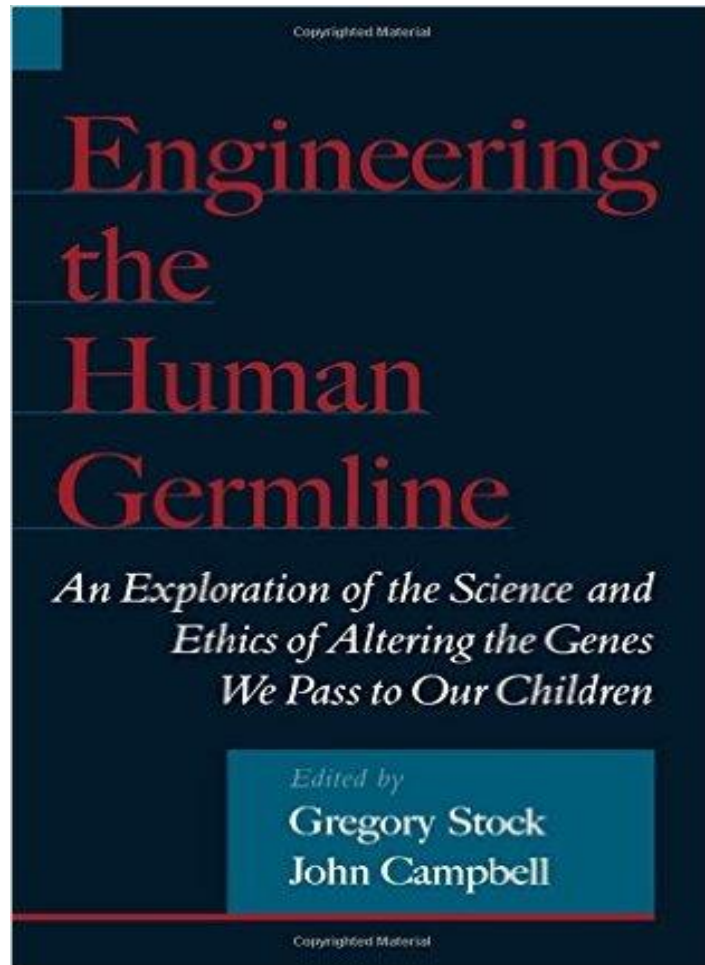
“GenRich” & “Naturals”

“Eventually the GenRich class and the Natural class will become... entirely separate species with no ability to cross-breed.”

Lee Silver,
Princeton biologist



“Engineering the Human Germline”

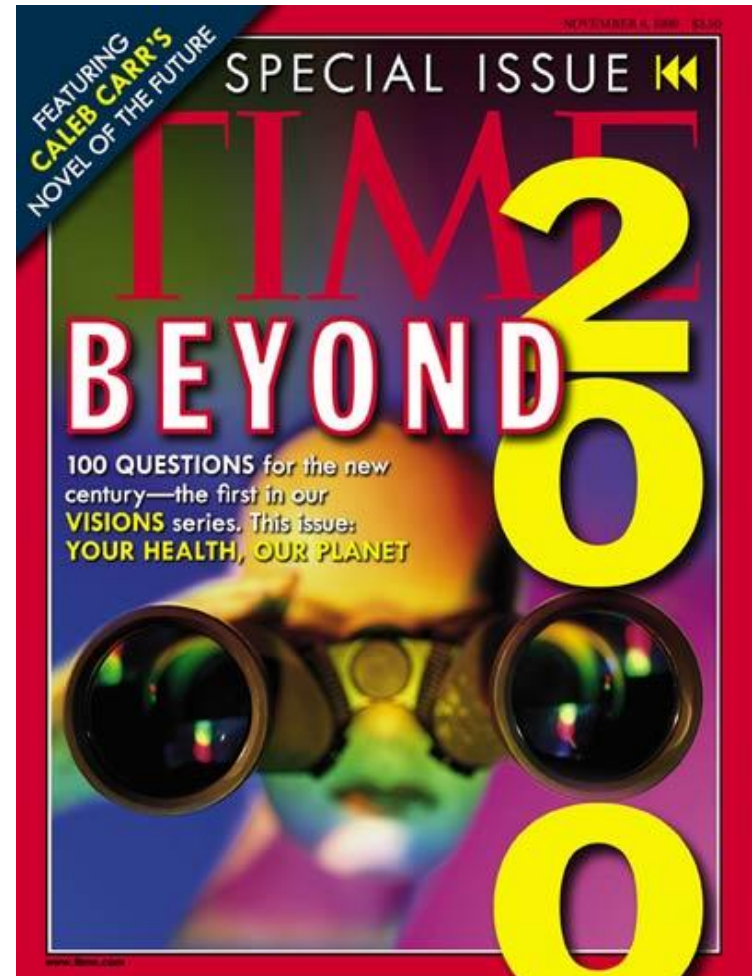


Goal: To make inheritable genetic modification “acceptable” to the public.

Conclusion: “The question is not if, but when and how.”

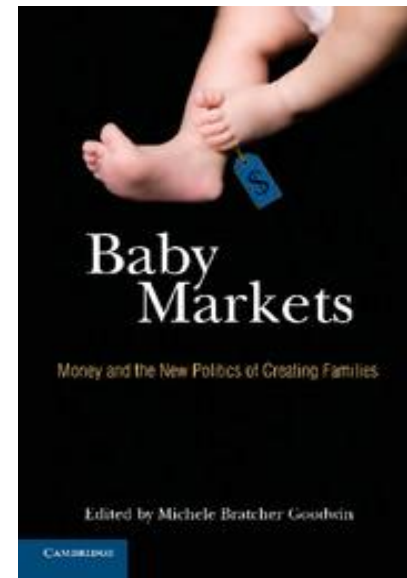
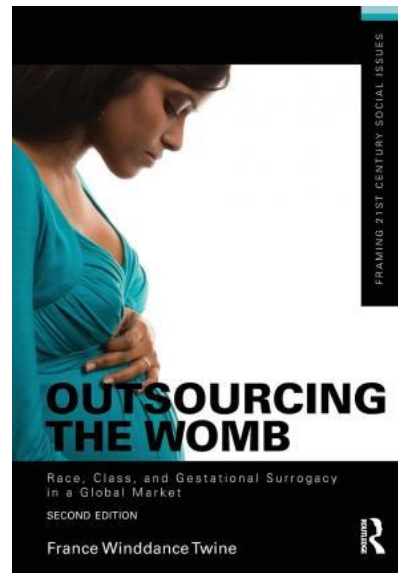
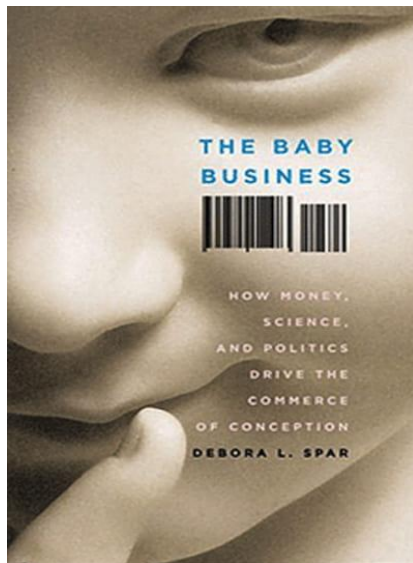
Fertility clinic of the future?

“You must act before you get pregnant. Don't be sorry after she's born. This really is a once-in-a-lifetime opportunity for your child-to-be.”



Fertility clinics today

Are you having trouble conceiving? We can help!



Egg markets



Immediate need for
Black egg donors!

Make up to \$8,000!+

myeggbankdonor.com



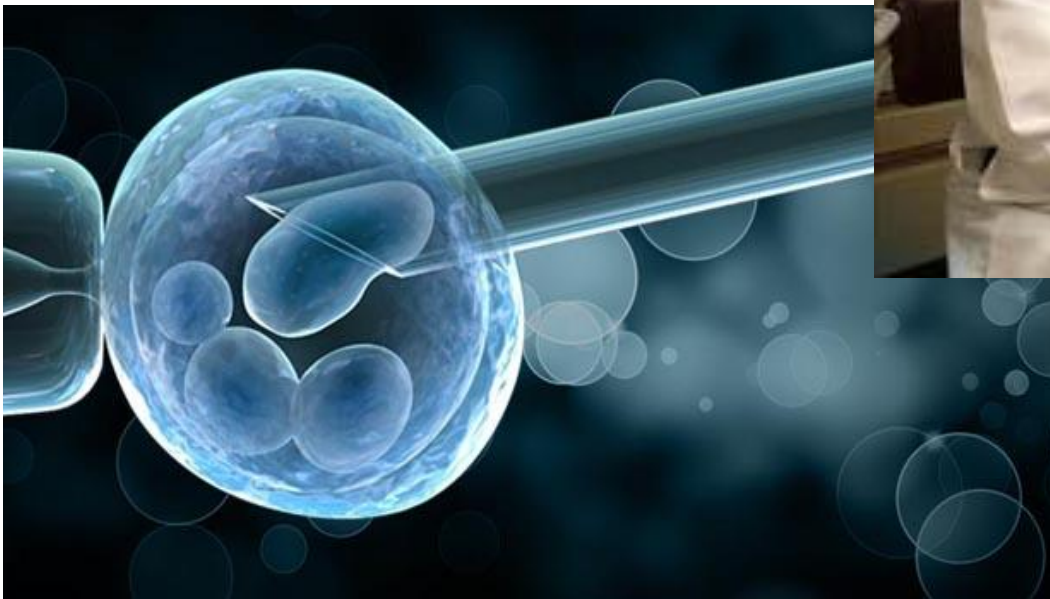
EGG DONOR NEEDED

\$50,000

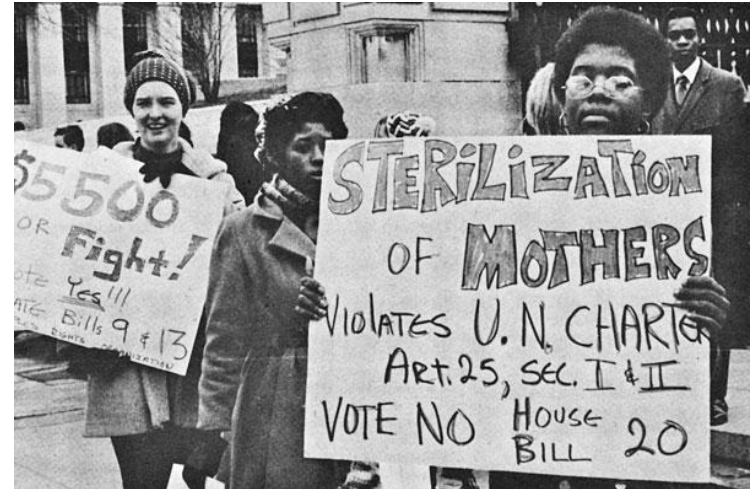
(guaranteed compensation to selected donor)

Loving couple needs help from an egg donor. Intended Mother is tall, a graduate from a prestigious university and of Northern European and Mediterranean heritage. She desires an attractive donor, of any European background, who is 5'6" or taller, and has high SAT/ACT scores.

Preconception selection



Eugenics in the U.S.



They came to have their babies. They went home sterilized.

MIT GLOBAL STUDIES AND LANGUAGES · WOMEN'S AND GENDER STUDIES · MIT ANTHROPOLOGY · COUNCIL FOR THE ARTS AT MIT PRESENT

no más bebés

no more babies

Tuesday, October 27, 2015
Room 32-155
5:30 P.M.

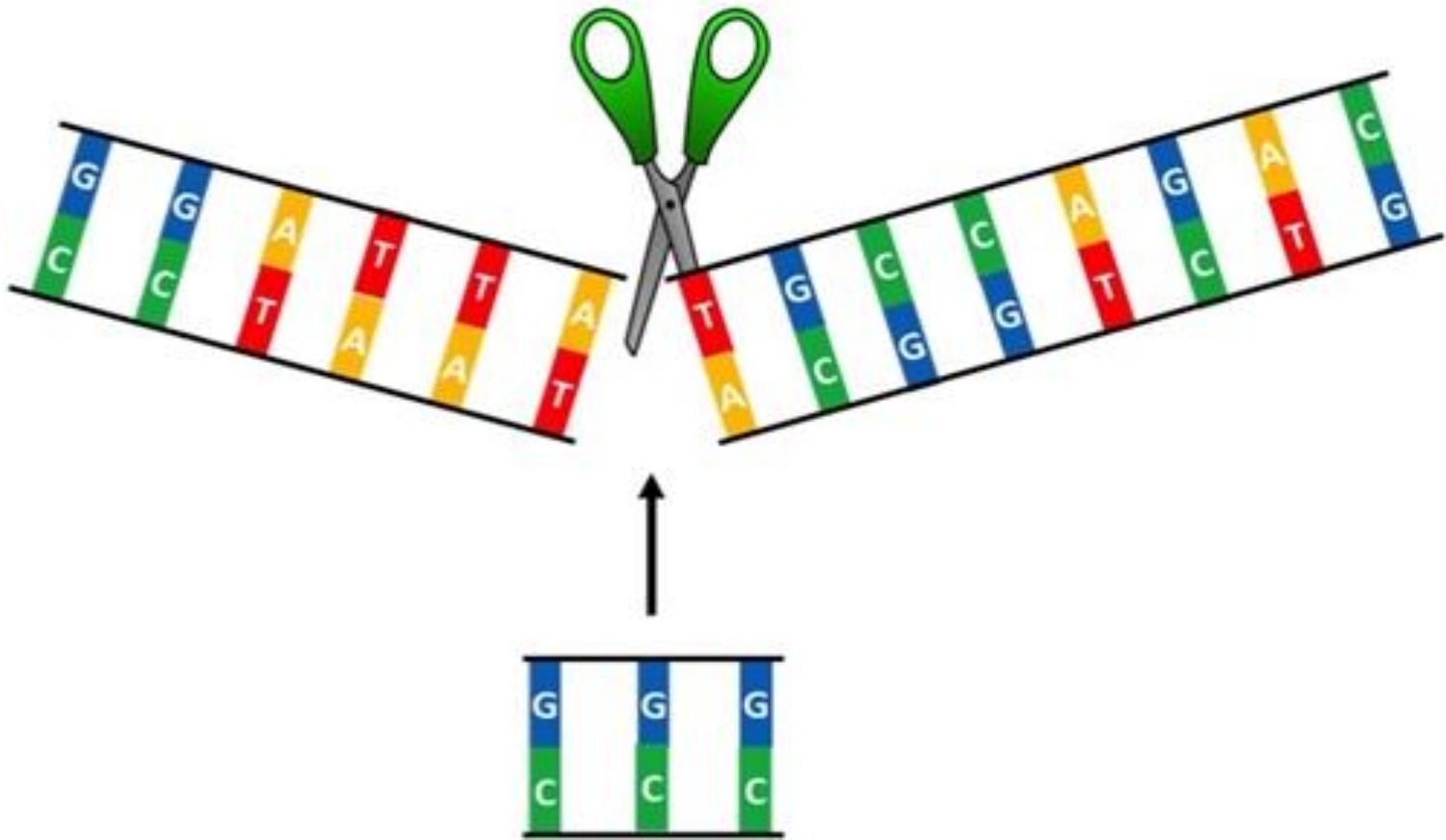
Screening + Q&A with filmmaker [Renee Tajima-Peña](#)



Healthy seed & fitter families

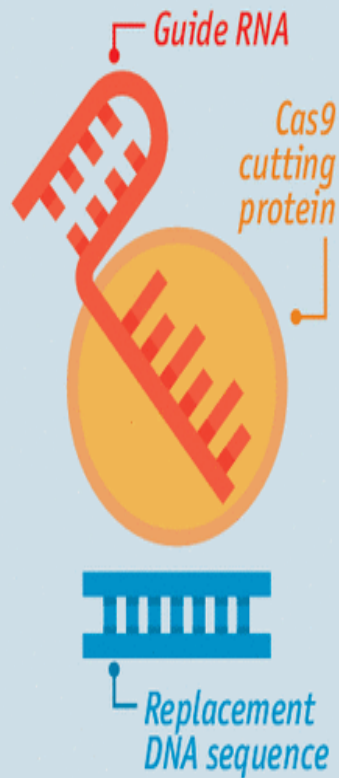


Gene “editing”

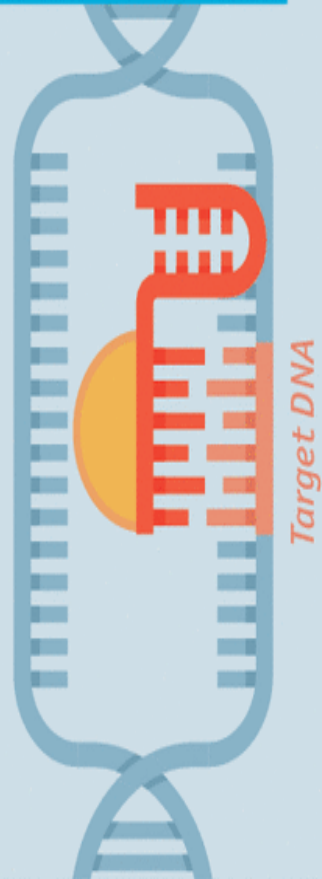


Using CRISPR

The tools



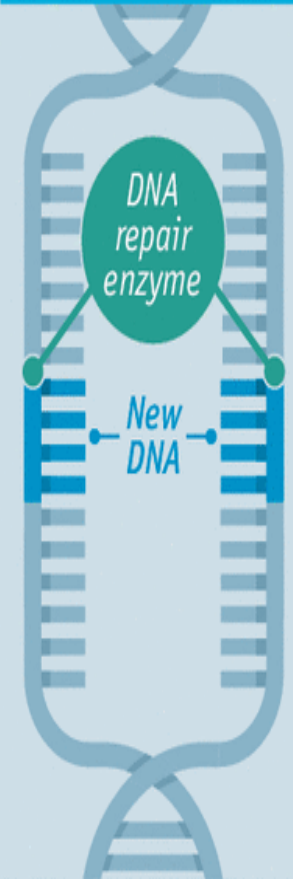
STEP 1 Guide RNA finds target DNA in cell



STEP 2 Cas9 protein cuts DNA strands



STEP 3 Replacement DNA inserted



Source: *The Economist*

CRISPR developers



Somatic vs germline

- “Somatic genetic modification”
 - ▣ If it works, it’s gene therapy
 - ▣ Affects existing patients
 - ▣ Not inheritable
- “Germline genetic modification”
 - ▣ Also known as germline gene editing
 - ▣ Changes genes in eggs, sperm, early embryos
 - ▣ Inheritable and irreversible

“Engineering the Perfect Baby”

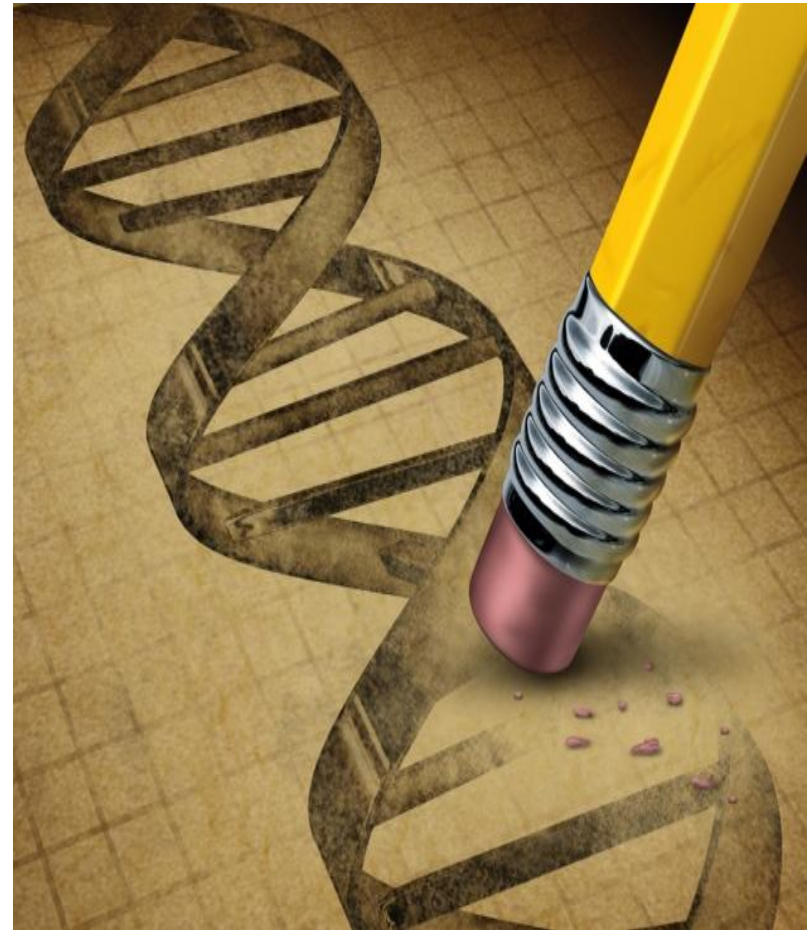


“Scientists are developing ways to edit the DNA of tomorrow’s children. Should they stop before it’s too late?”

“Don’t edit the human germ line”

Nature, March 2015

“Serious risks...the therapeutic benefits are tenuous...a path towards... genetic enhancement.”



“A prudent path forward...”



Science, April 2015

“A prudent path forward for genomic engineering and germline gene modification”

The
Economist

AUGUST 22ND - 28TH 2016

Economist.com

How Russians cope with recession
No-go for NGOs in China
Islamic State's taste for slavery
Commodities: the binge, the hangover
India's poet-politicians

Editing humanity

The prospect of genetic enhancement





Not safe

Profound risks
to future
children &
generations...

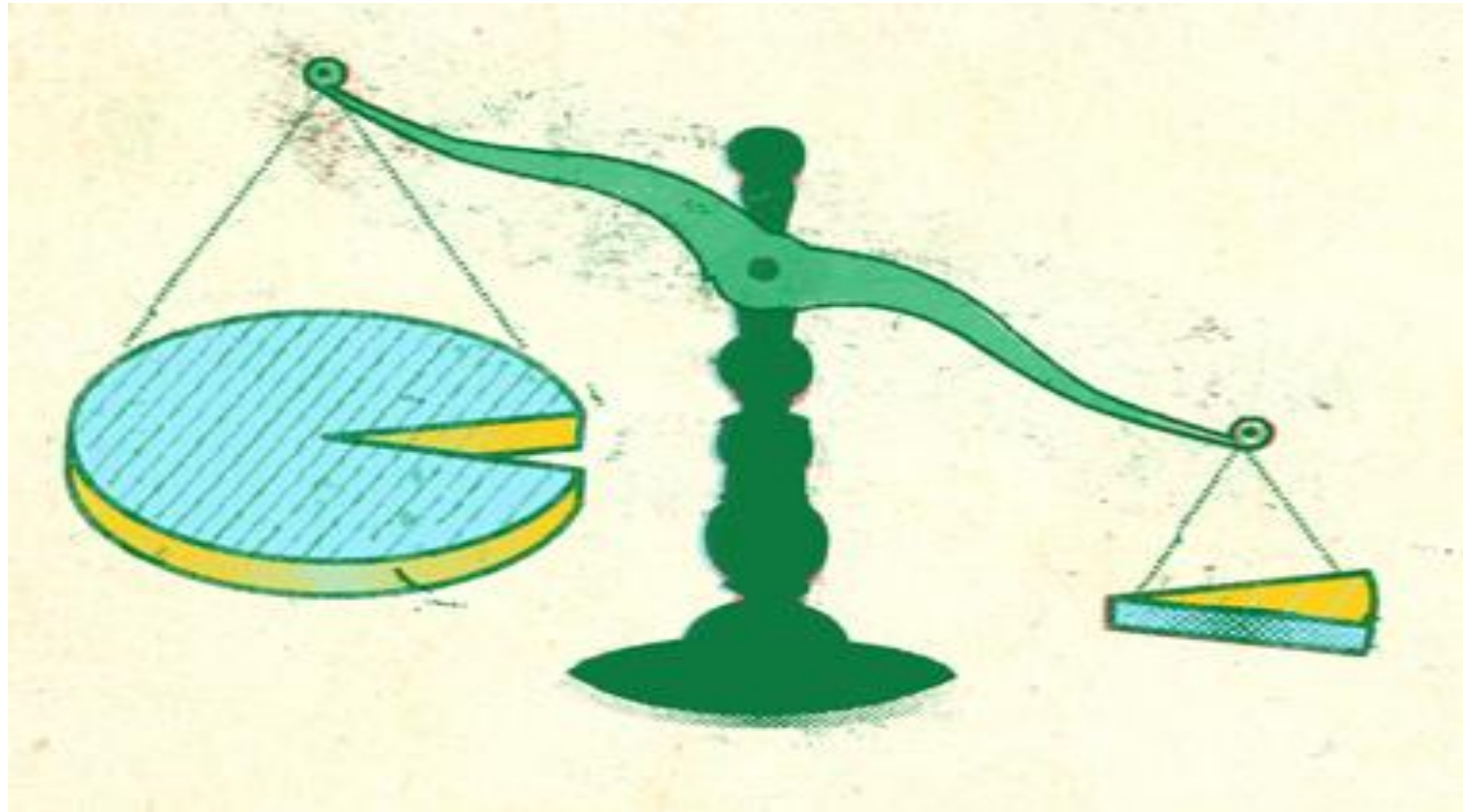


Not needed

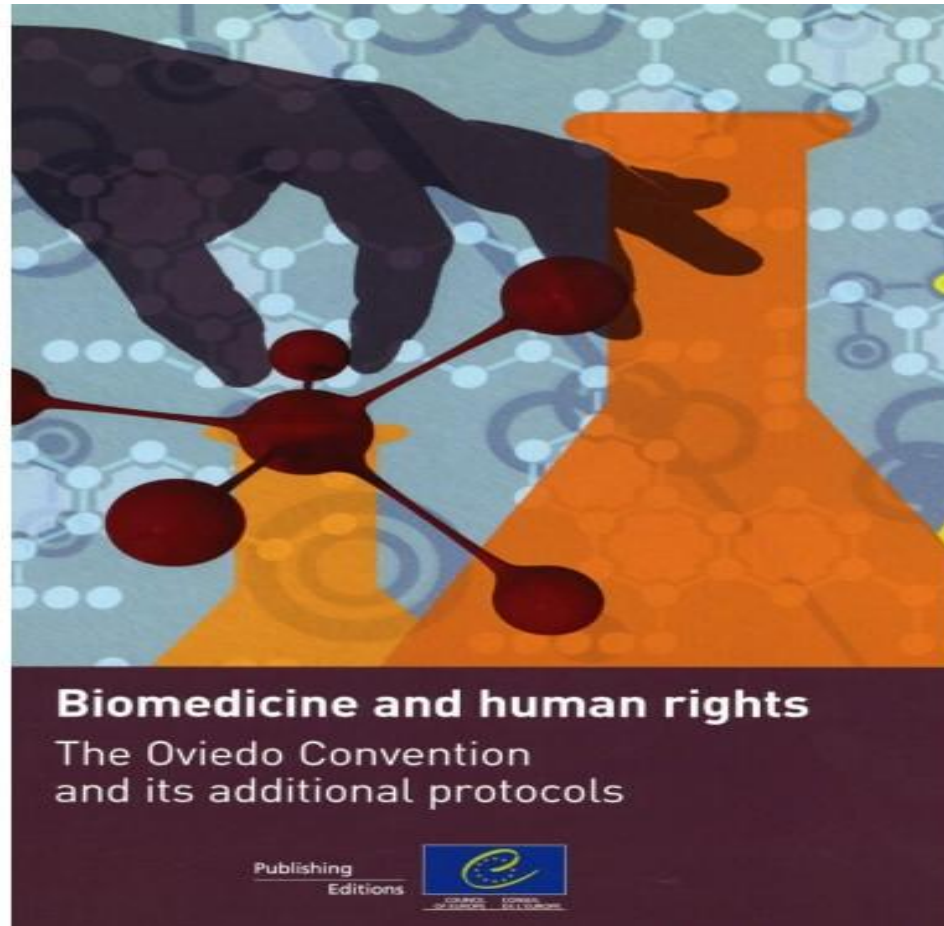


Safer ways
to have
health
children...

New forms of inequality?



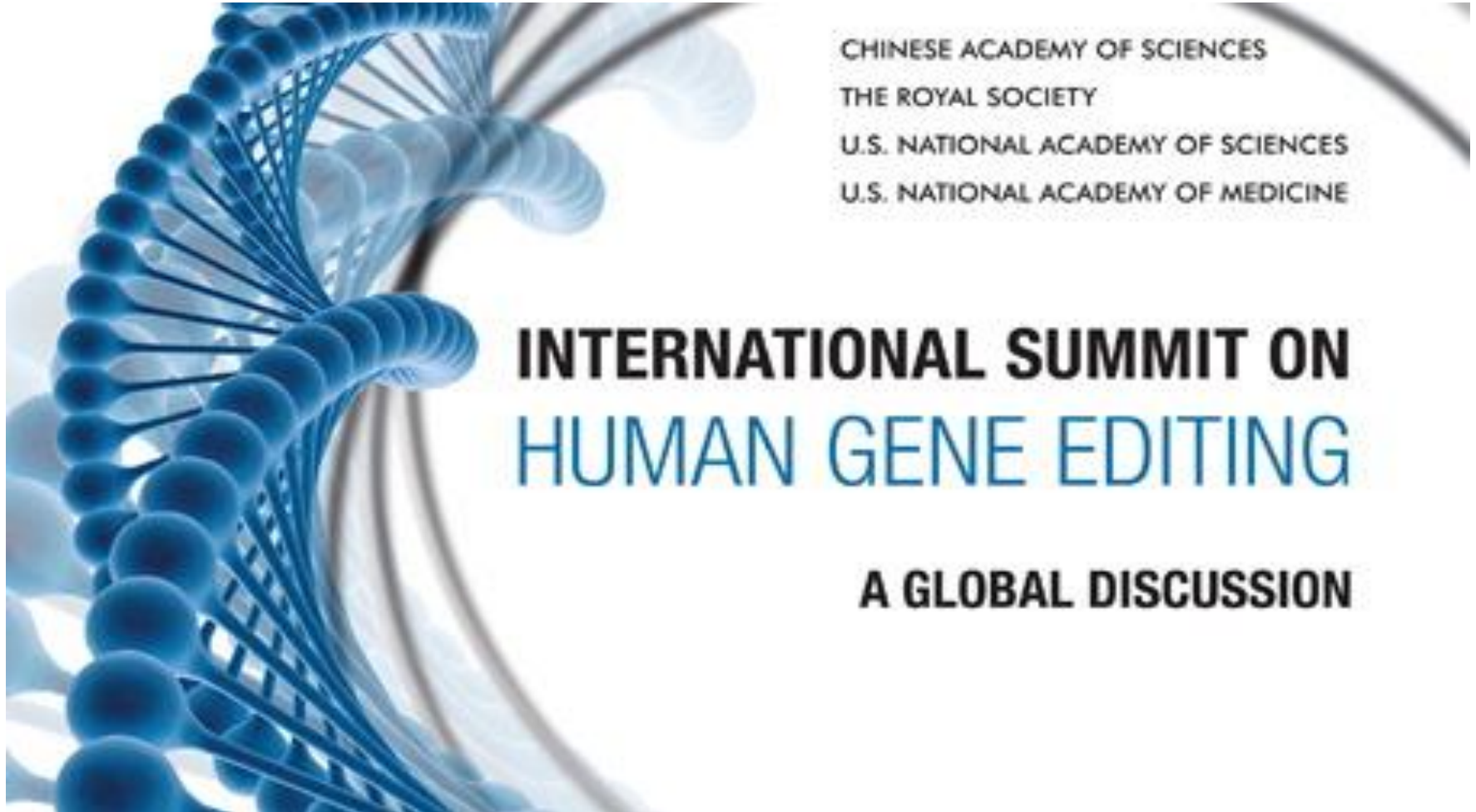
Convention on Biomedicine and Human Rights



Obama administration



National Academies



CHINESE ACADEMY OF SCIENCES

THE ROYAL SOCIETY

U.S. NATIONAL ACADEMY OF SCIENCES

U.S. NATIONAL ACADEMY OF MEDICINE

INTERNATIONAL SUMMIT ON HUMAN GENE EDITING

A GLOBAL DISCUSSION