**What Will You Teach with CRISPR?**

**Clustered Regularly Interspaced Short Palindromic Repeats**

### Ethics
- Germline vs. somatic changes
- Potential for powerful cures/therapies
- Release of gene drives into ecosystem
- Safety
- Non-medical enhancements
- Informed consent
- Justice and equity
- DIY science

### Natural History
- Adaptive immune system in archaea and bacteria
- Safeguard against bacteriophages
- DNA repair mechanisms

### Regulation
- Lack of global regulations
- Varied stakeholders
- No established safeguards against off-target effects

### Legal
- Patent wars between research institutions

### Impact
CRISPR Publications:
- 2011: 100
- 2018: 17,000

### Transformative Science
So much more than a bacterial transformation
- Agricultural innovation
- Immunotherapies
- Cures for genetic diseases
- Create novel infectious disease therapeutics

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**Ethics**

1987
1st report on CRISPR published

2002
"CRISPR" name coined

April 2012
1st commercialization of CRISPR-Cas9 technology for pizza cheese by DuPont

May 2012
1st patent application submitted for CRISPR-Cas 9 technology by Doudna, Charpentier (UC Berkeley, U. of Vienna)

December 2012
Fast track patent application submitted by Zhang (Broad Institute)

November 2015
US Scientists edit mosquito genome to combat malaria

November 2018
1st CRISPR-Cas9 clinical trial launched for sickle cell disease

November 2018
1st gene edited babies announced by Chinese scientist

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**Legal**

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**Transformative Science**

- Agricultural innovation
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**What Will You Teach with CRISPR?**

BIO-RAD Explorer

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**BIO-RAD**
Get ready to teach CRISPR! Bring true CRISPR gene editing into your classroom. In addition to ideas and facts from this infographic, see bio-rad.com/outoftheblue for additional resources including videos, publications, and more.

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