

AHST 2331-001 (21414)

Understanding Art

Dr. Charissa N. Terranova

Tuesdays and Thursdays 11:30-12:45

ATC 1.102

Tuesday April 24

Biology in Art



A SYMPOSIUM

Viral Culture

HOW CRISPR GENOME EDITING
AND THE MICROBIOME ARE TRANSFORMING
HUMANITY AND THE HUMANITIES

w/ Guest Speakers & Student Presenters

Friday Apr. 27, 9AM-5PM @ Founder's Room, Honnold Mudd Library
organized by Prof. Claire Nettleton (POM) & Prof. Rachel Mayeri (HMC)

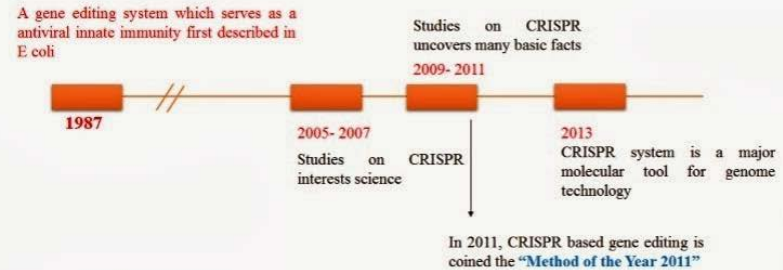
CRISPR-Cas9



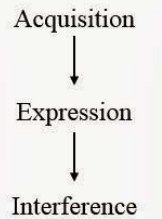
Summary of CRISPR Cas System

CRISPR type	Dependence on PAM	Signature Cas	Functionality
1	Yes	Cas 3	Cleave and degrade DNA
2	Yes	Cas 9	Cleave DNA
3	No	Cas 10	Cleave DNA (Subtype III A) or RNA (Subtype IIIB)

CRISPR Timeline



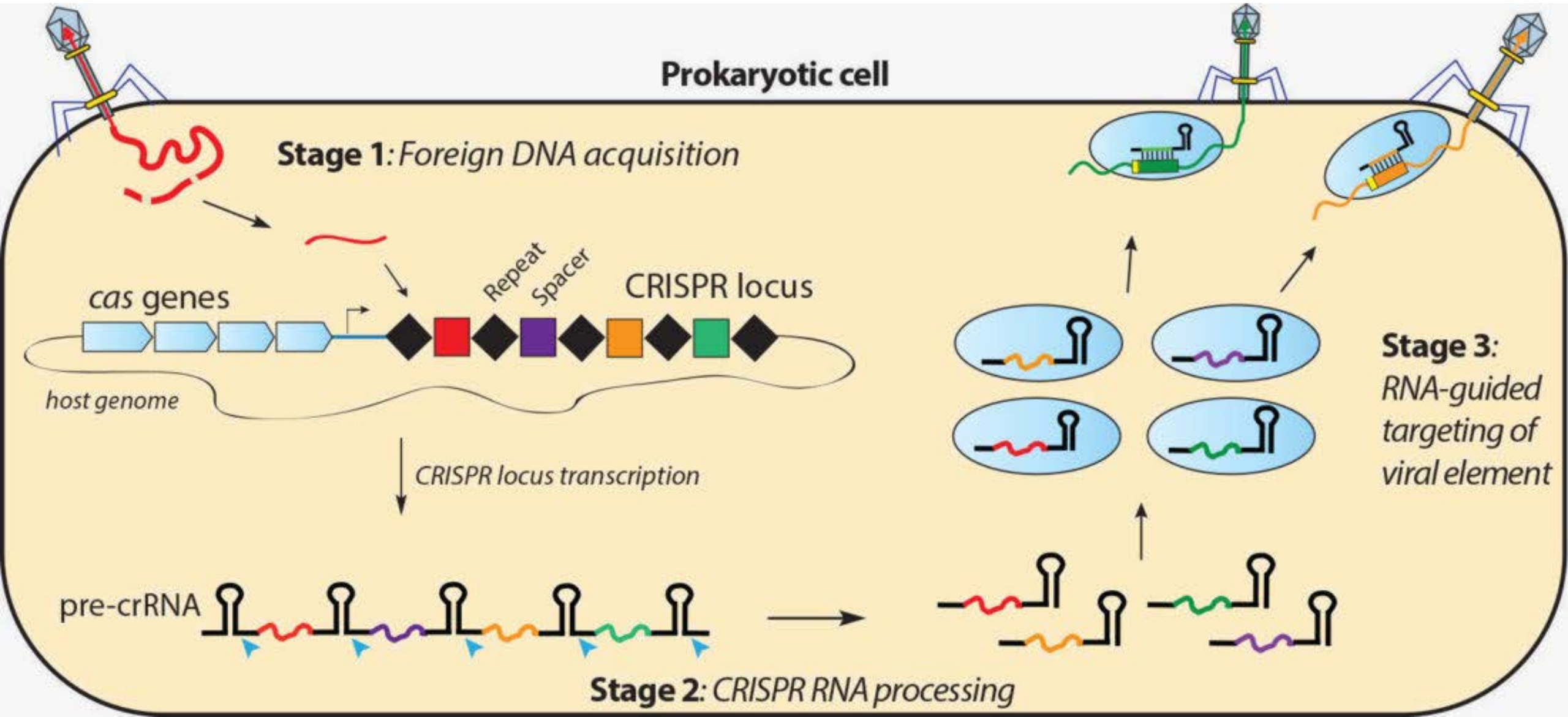
Steps in CRISPR Cas functioning

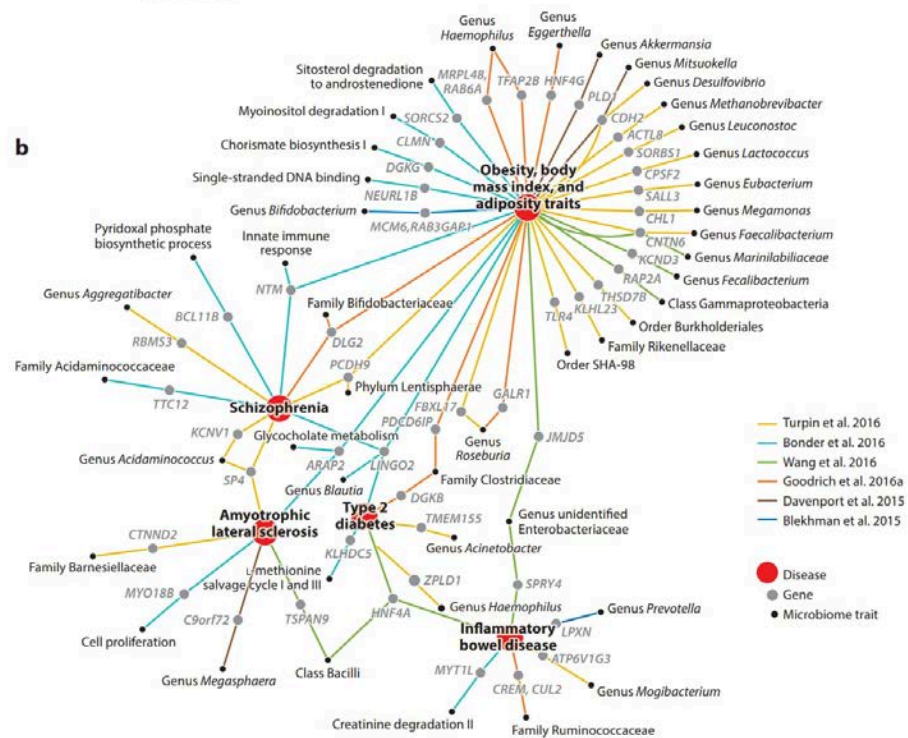
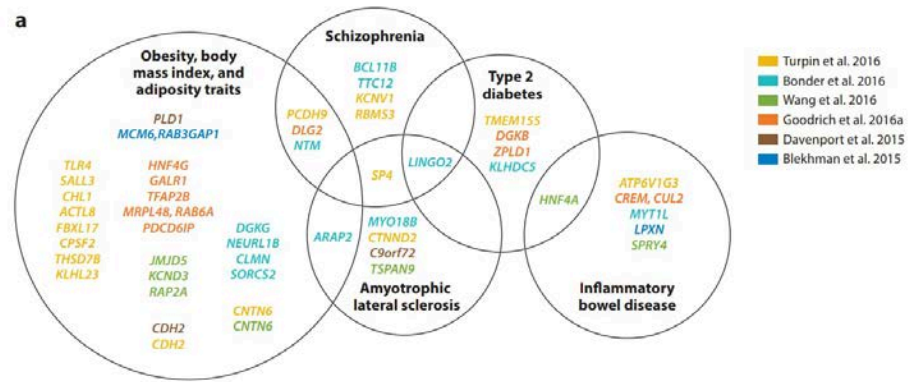


- CRISPR- Clustered Regularly Interspaced Short Palindromic Repeats
- Cas- CRISPR associated
- Based on the structure, activity and mechanism of functioning, it is classified into 3 types and several subtypes.

CRISPR-Cas9

<https://www.youtube.com/watch?v=avM1Yg5oEu0>





Microbiome

Definitions

- **Microbiota:** microbial community.
- **Microbiome:** can refer to microbiota but can also refer to collective genomes and gene products of microbes living within and on humans.
- **Metagenome:** collection of genomes within complex microbial communities and human DNA, some also include RNA and proteins and other metabolites.
- **Biodiversity** is a measure of the complexity of a community. Includes number of taxa (richness) and their range of abundance (evenness).

Johnson, Pediatrics, 2012
Weinstock, Nature, 2012

CRISPR ART NOW:

CRISPR-Cas9 between Futurity and Futures

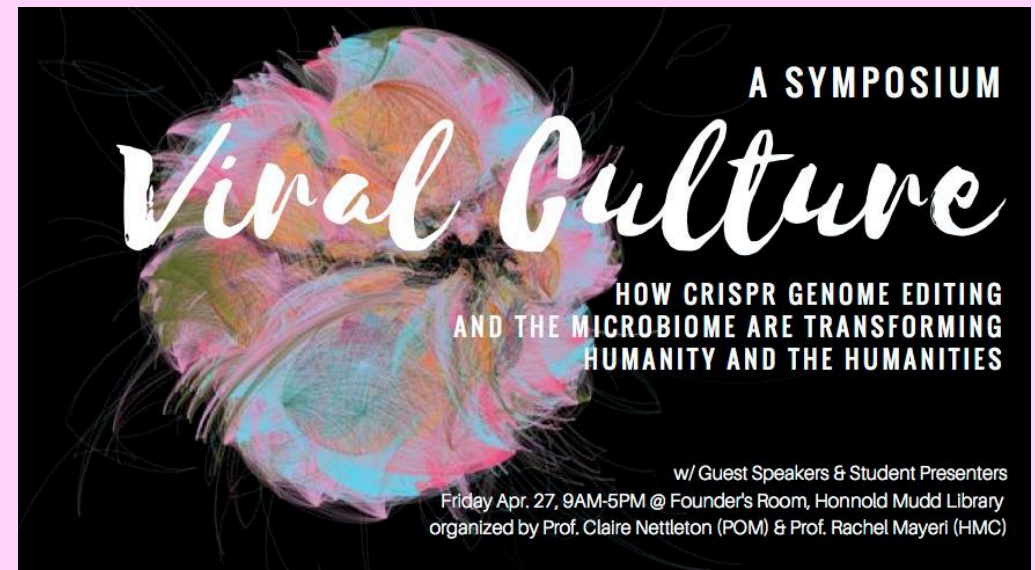
Charissa N. Terranova, PhD

Associate Professor of Aesthetic Studies

University of Texas at Dallas

www.charissaterranova.com

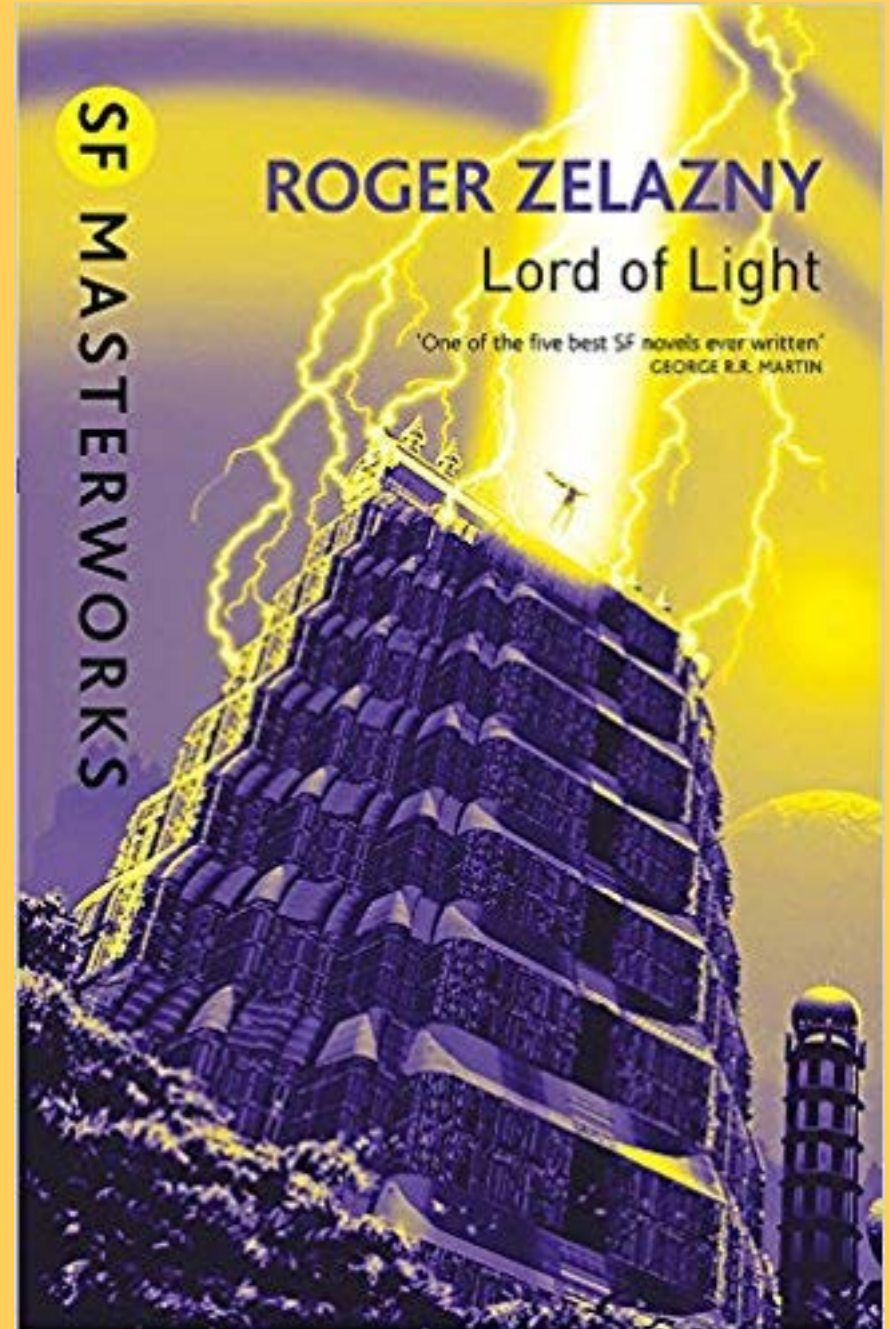
terranova@utdallas.edu

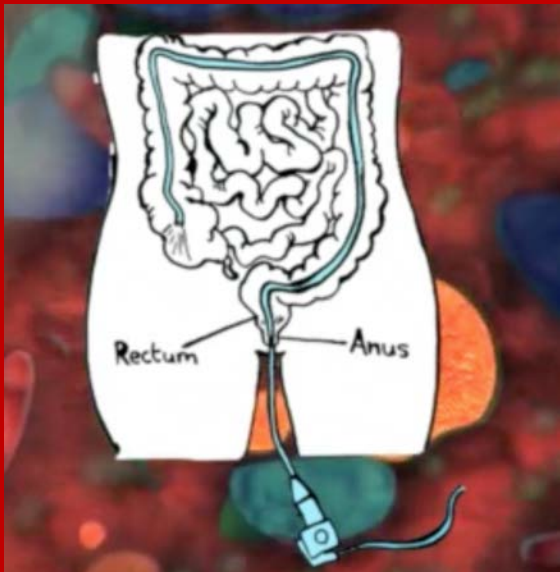


CRISPR ART NOW

Futurity and Futures

***ACCELERATION
AND
ACCELERATIONISM***





BIOART



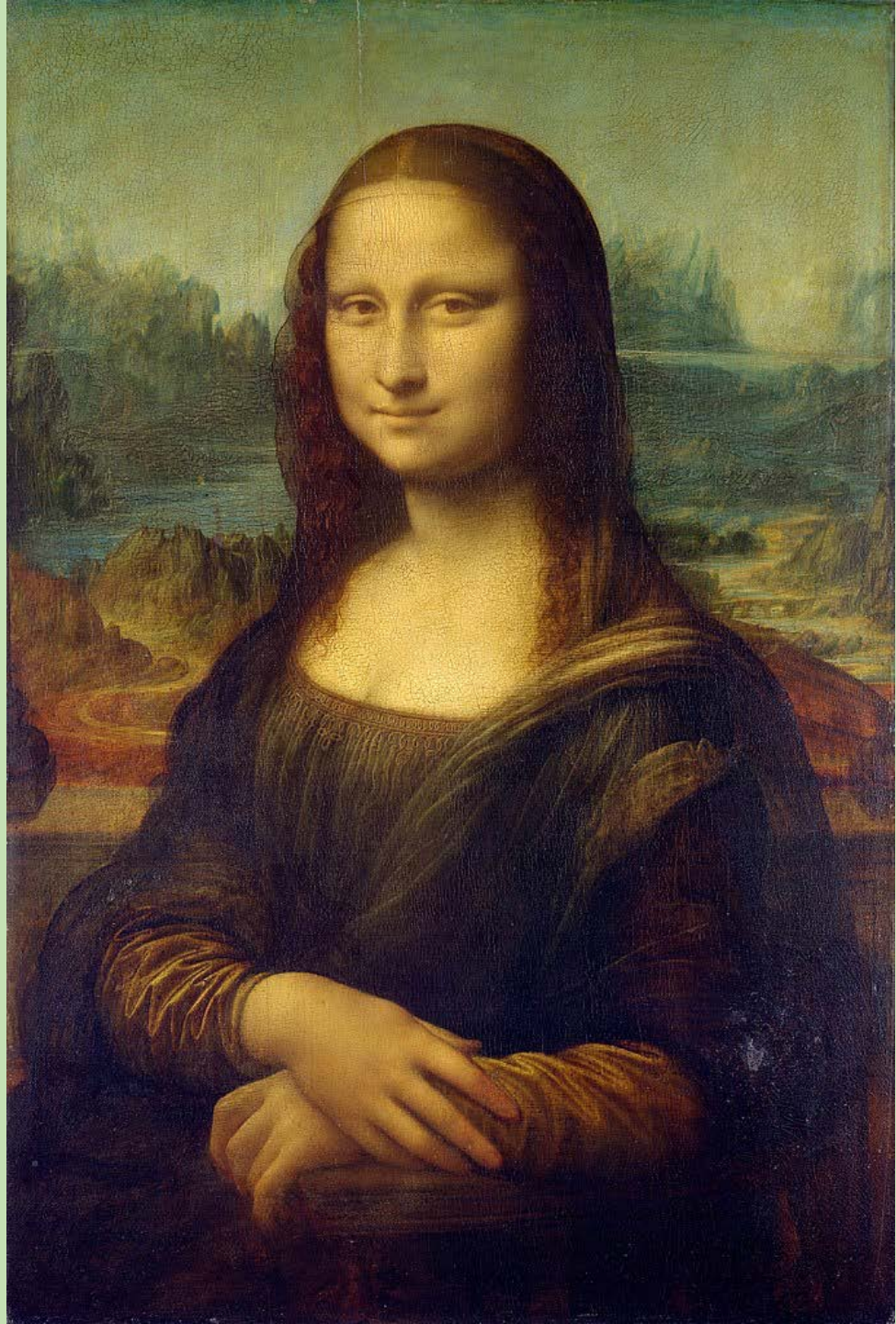
manure matters

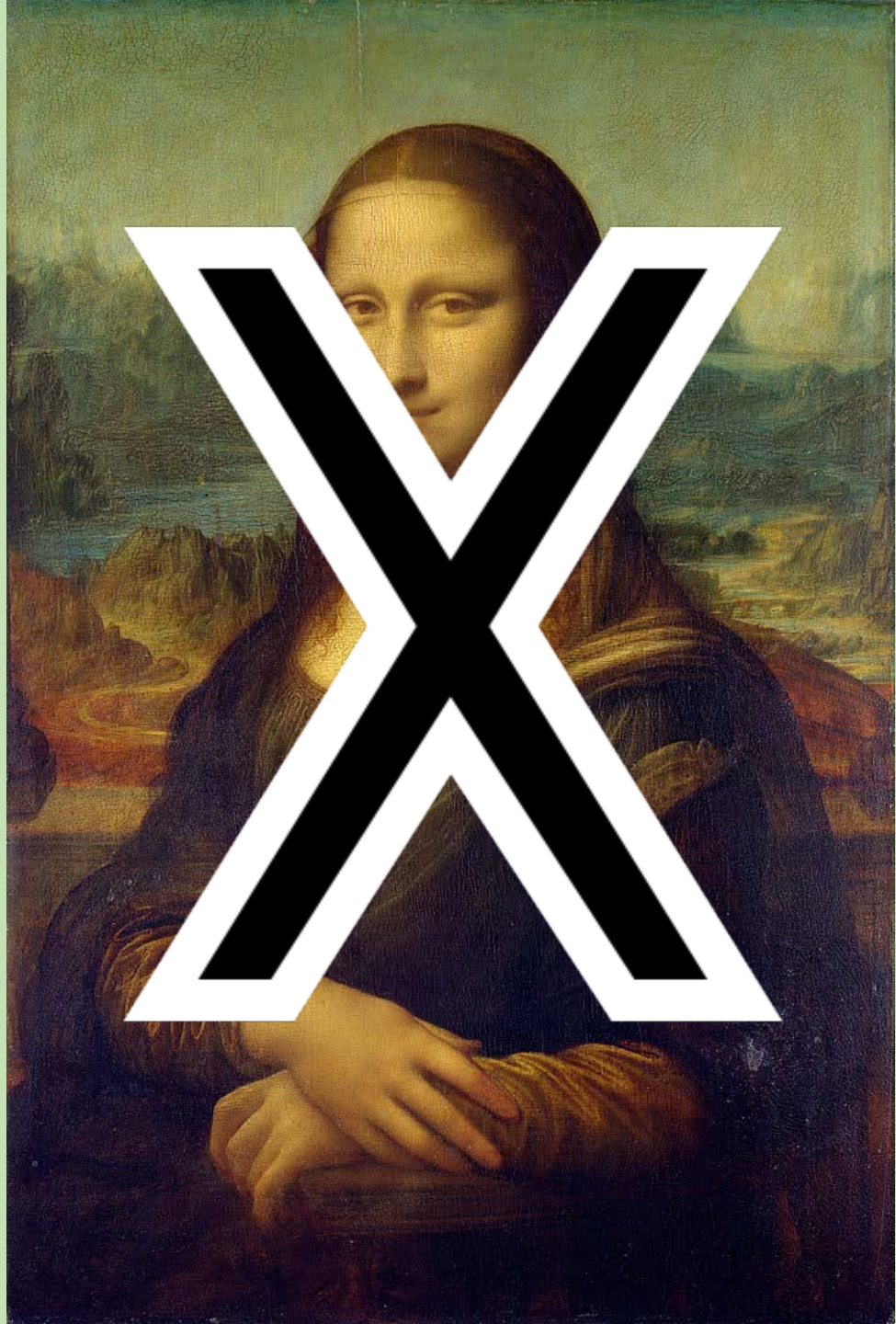


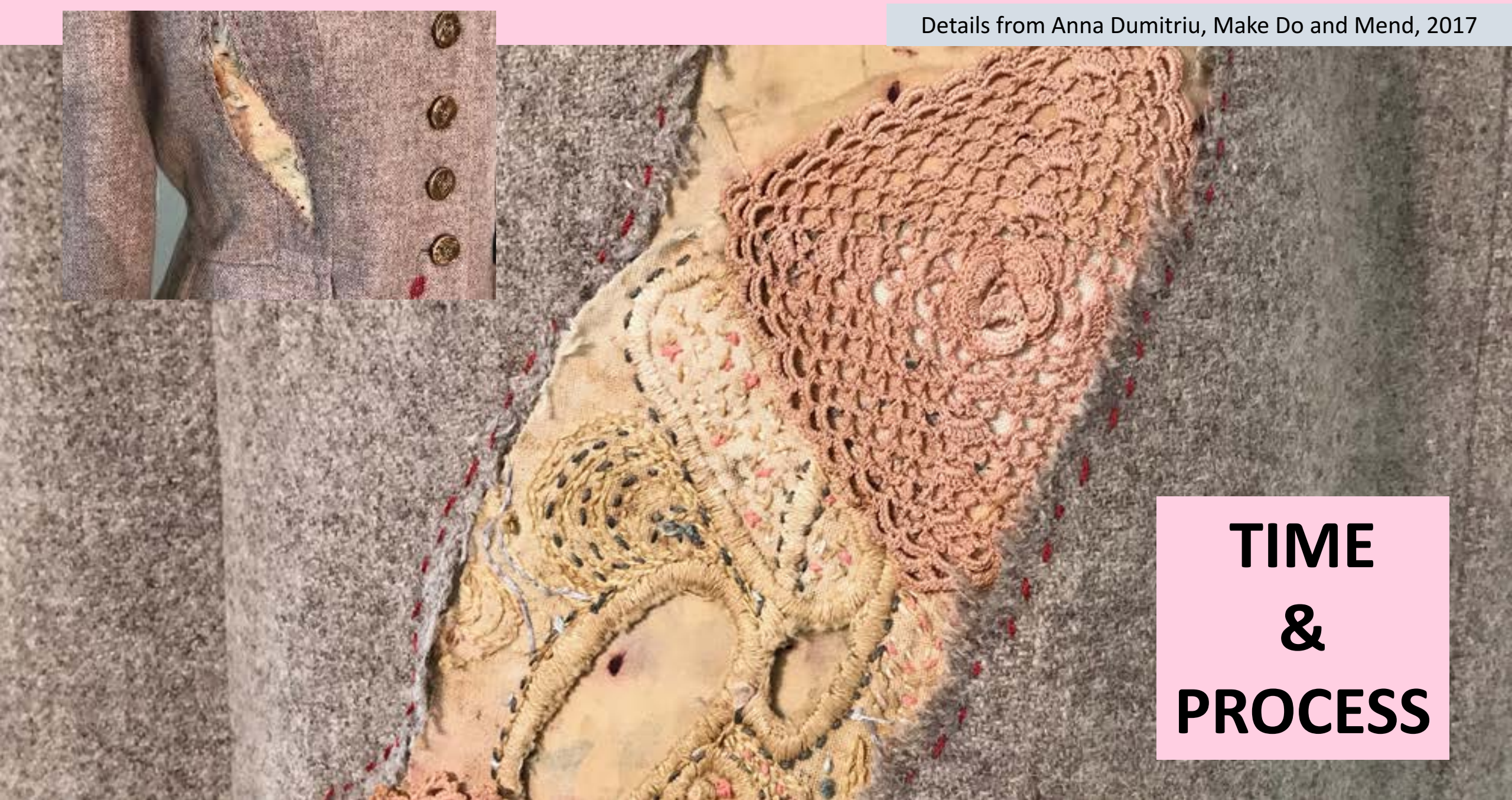
A CRACK IN CREATION

GENE EDITING AND
THE UNTHINKABLE
POWER TO CONTROL
EVOLUTION

JENNIFER A. DOUDNA
SAMUEL H. STERNBERG







**TIME
&
PROCESS**

PERFORMANCE & PERFORMATIVITY



BIOART

and/or

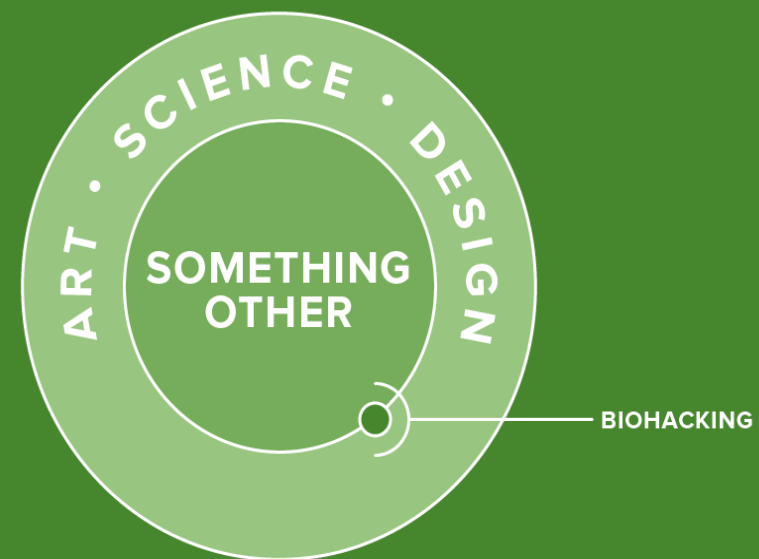
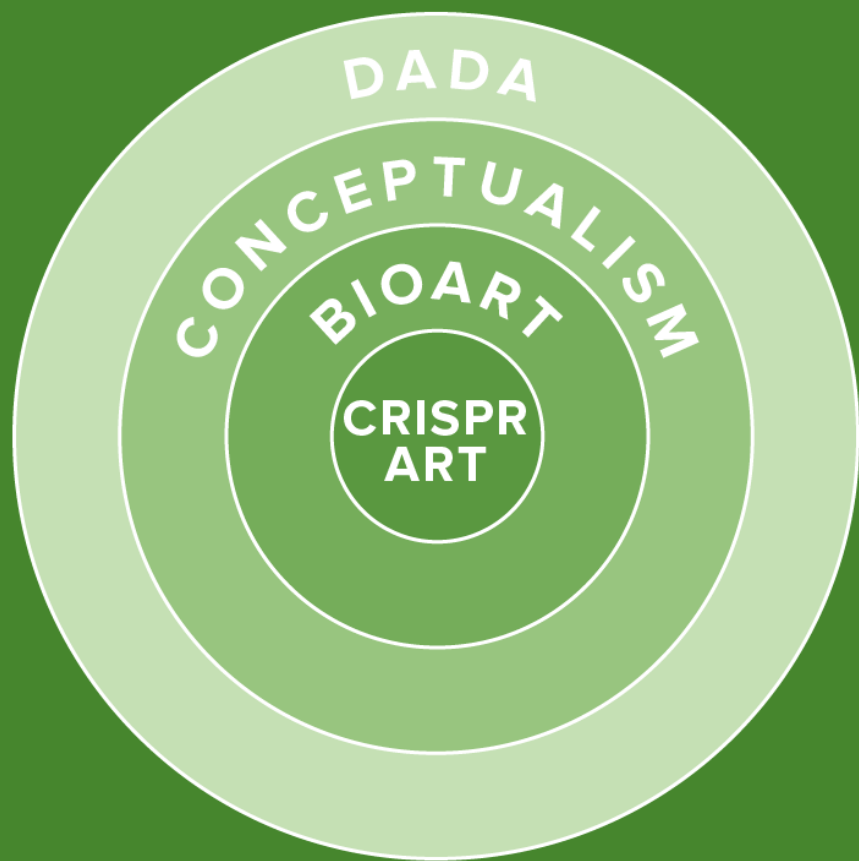
BIOHACKING



Left: Marta De Menezes, Bioartist
Right: Josiah Zayner, Biohacker

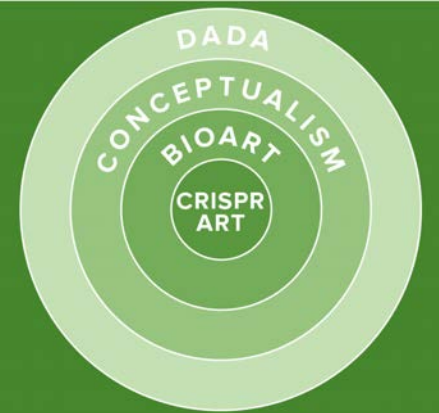
DIY Human CRISPR Myostatin Knock-Out





CRISPR

ART





Anna Dumitriu, Make Do and Mend, 2017



Anna Dumitriu, Make Do and Mend, 2017
A patchwork of fabric sewn by hand and dyed using bacteria manipulated by CRISPR and then autoclaved.



Anna Dumitriu made the installation, "Make Do and Mend," as part of The FEAT (Future Emerging Art and Technology) residency program.



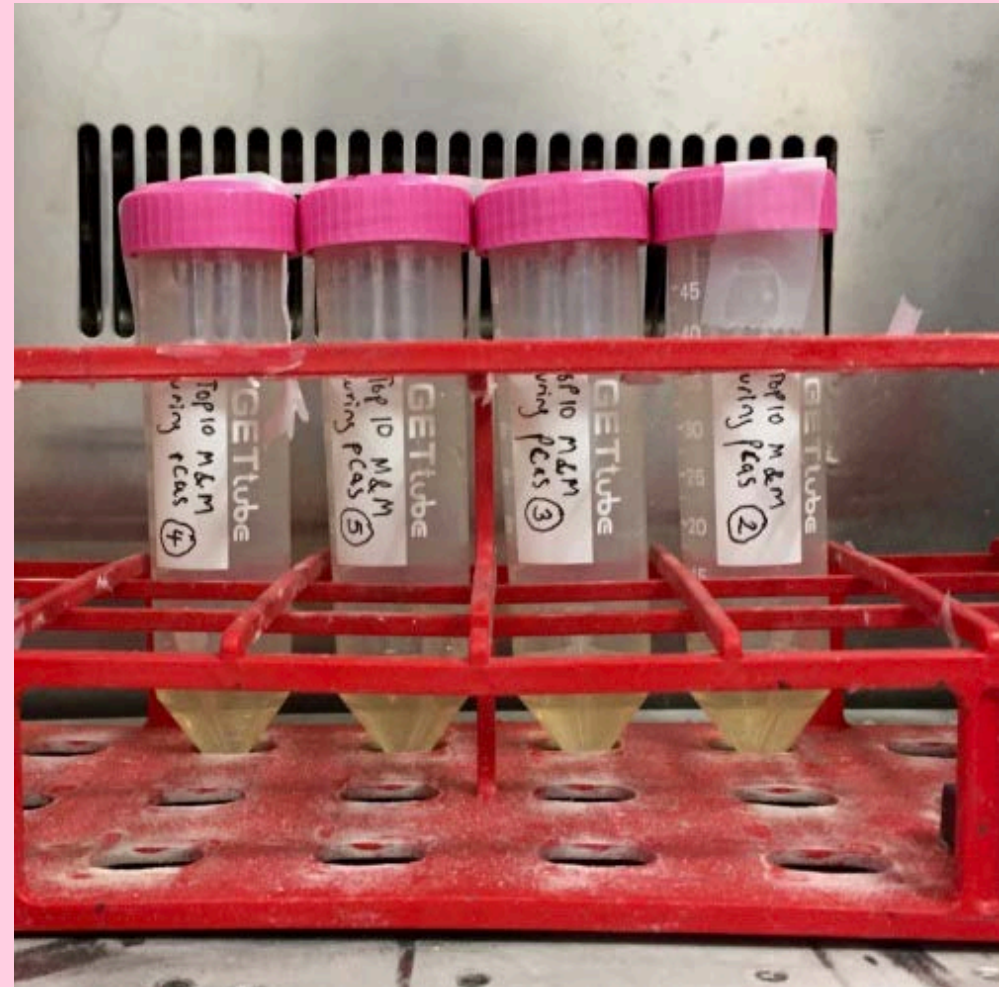


The holes and stains in the suit have been patched and embroidered with silk patterned with *E. coli* bacteria grown using a dye-containing growth medium, forming pink colonies or spots.

The genomes of these E. coli bacteria have been edited using CRISPR to remove an ampicillin antibiotic resistance gene and repaired using a technique called homologous recombination to scarlessly patch the break with a fragment of DNA (converted into ASCII code and then to base 4) encoding the WWII slogan “Make Do and Mend”, which encouraged housewives to repair their clothes during the wartime rationing period.



Detail of patched and stained fabric



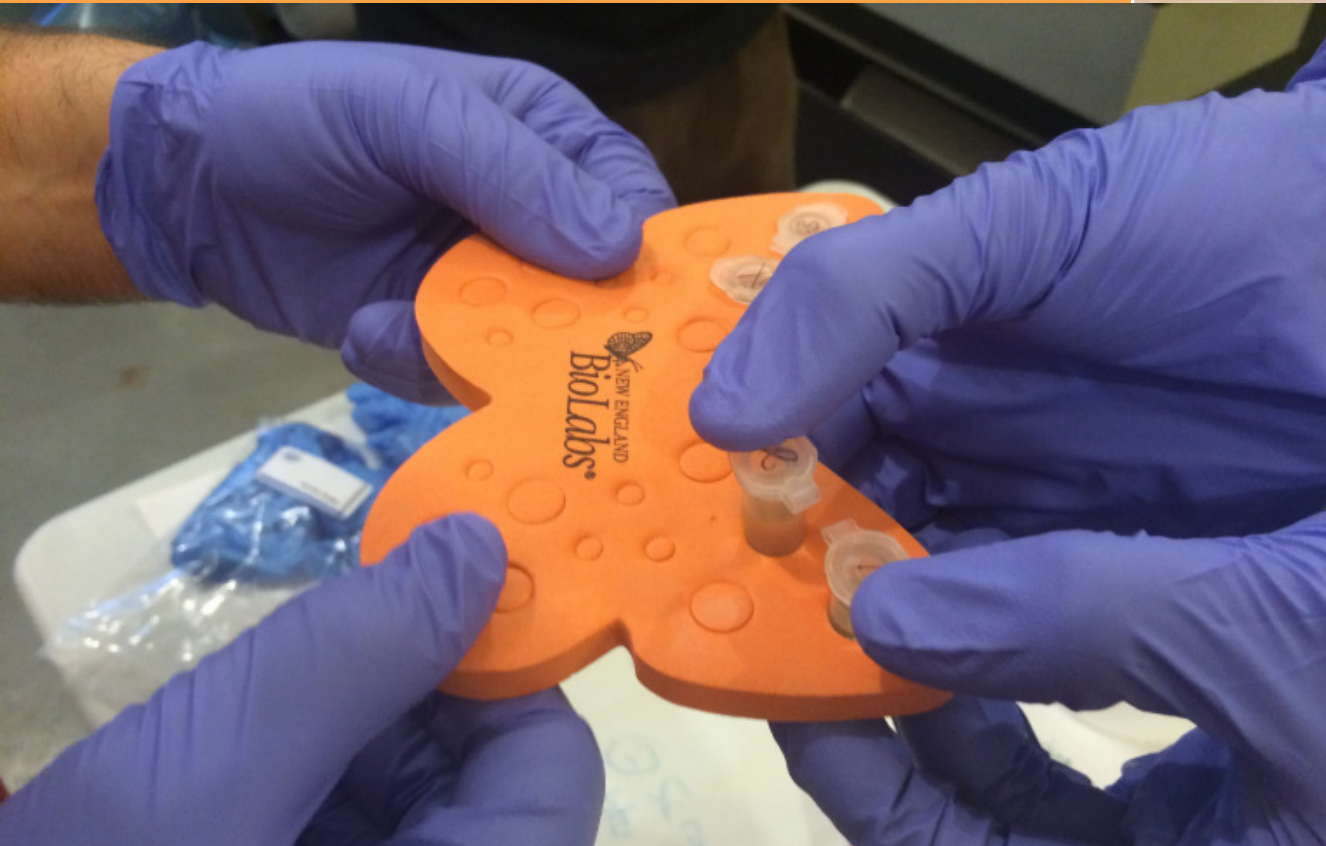


Ken Rinaldo, CRISPR Seed Resurrection, 2018

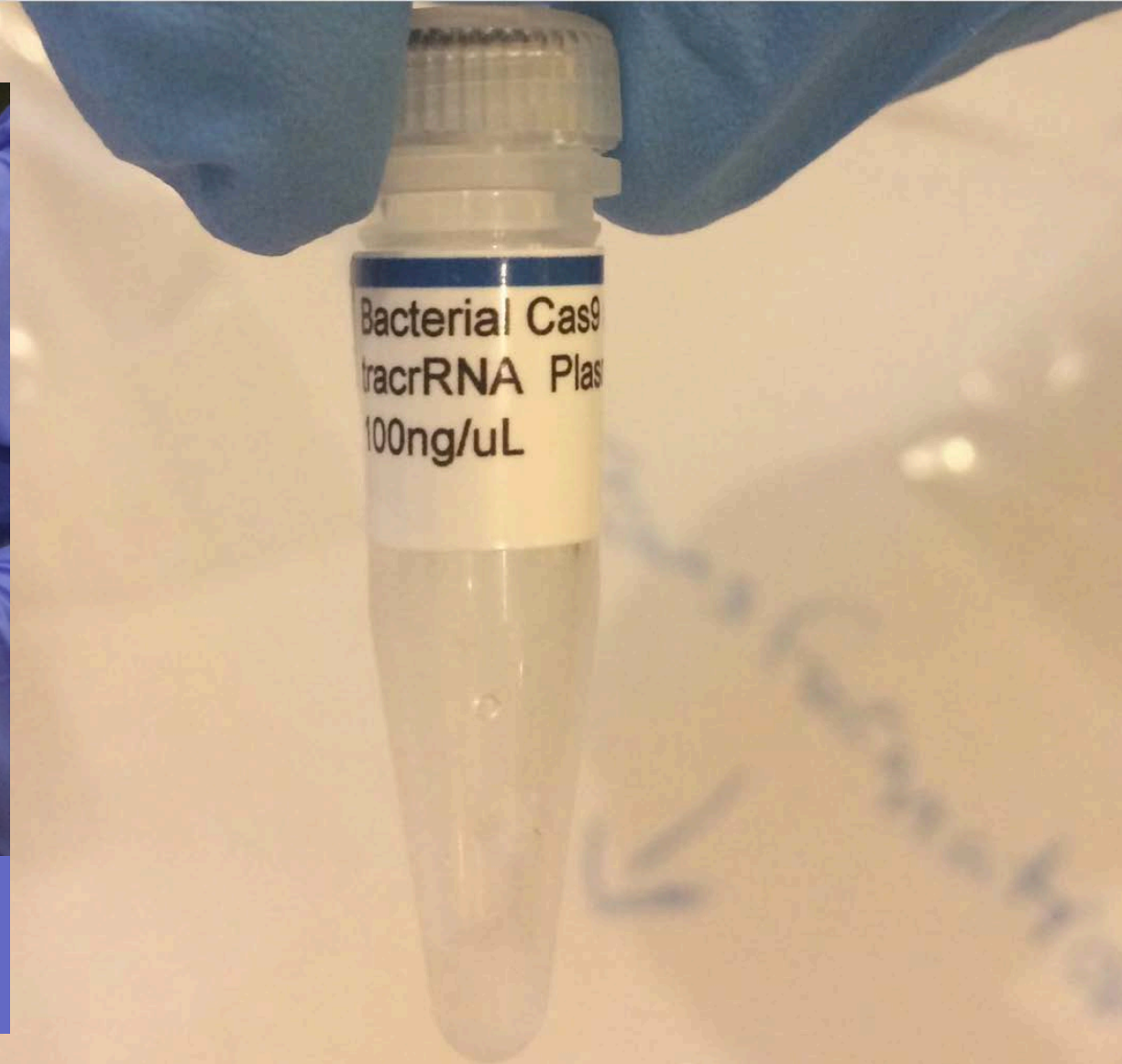


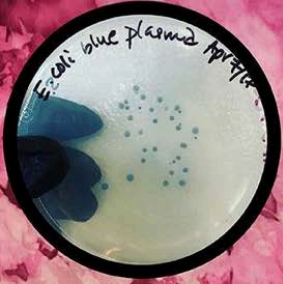
WHITEFEATHER HUNTER

The witch in the lab coat.



Left: Prepping to add the tubes to the warm water bath.
Right: Microcentrifuge Tube Containing Cas9/ tracrRNA
10uL + rpSL Template DNA 10uL.





SUMMER ATELIER

MILIEUX MAKE

workshop series

Bacterial BioPigments: GMO play, from DNA to CMYK!

July 3, 5, 10, 12 (Mondays and Wednesdays) from 2-4pm each day

Milieux Institute for Arts, Culture & Technology @ Concordia University

1515 Ste-Catherine Street West, EV 10.835 (Speculative Life Lab)

Instructors: WhiteFeather Hunter & Marc Beaulieu

Day 1 - Learn to prepare agar plates and streak competent cells to incubate them for genetic modification

Day 2 - Learn plasmid transformation (genetic modification) to grow bacteria that produces colours:
raspberry red, yellow, teal, violet, blue, purple and orange!

Day 3 - Learn how to take your newly modified pigment-producing bacteria and amplify it
so that you can make art with it!

Day 4 - Explore natural dyeing and printing on silk using your new bacterial colour palette!

Attendance in all four workshops is not mandatory - participants can decide to attend
Day 1 & 2 or Day 3 & 4, depending on the skills you'd like to acquire!

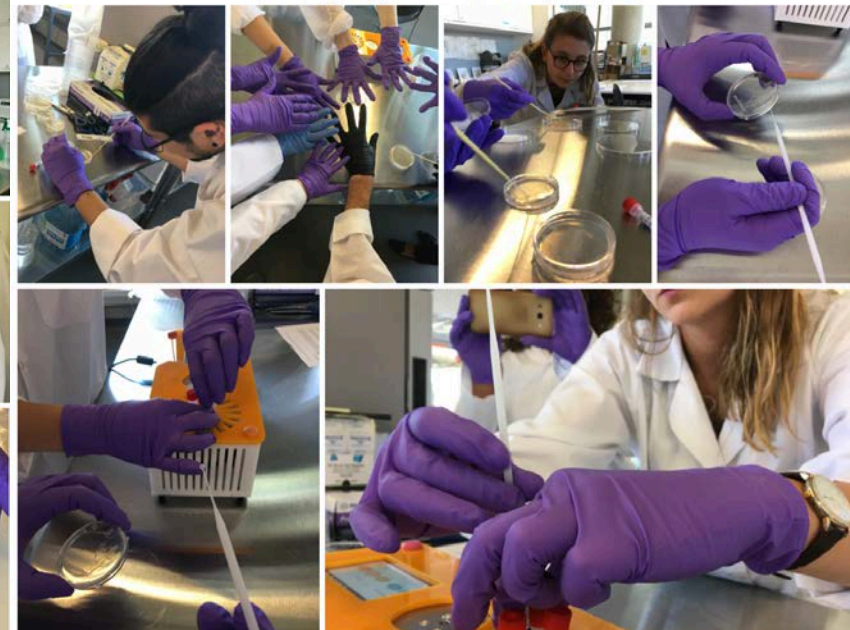
Spaces are limited! Email marc.beaulieu@concordia.ca to reserve a spot!
Confirmations will be sent out soon!



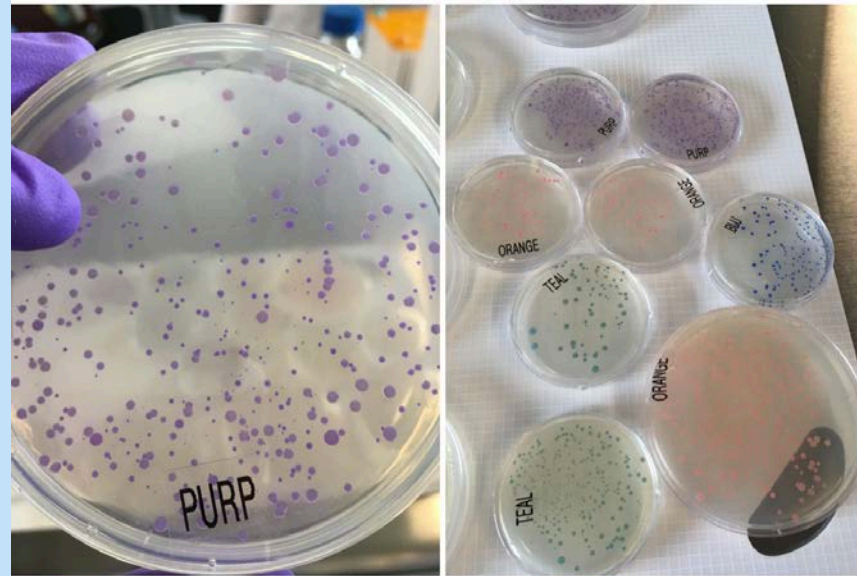
Workshop Day 1: Prepping competent cells



Workshop Day 2: Plasmid Transformation



Workshop Day 3: Amplifying Cells



Workshop Day 4: Bacterial dyeing and printing

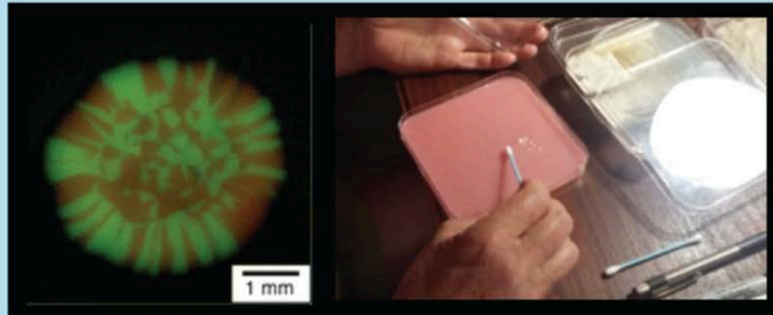


Contemporary Art and Life Sciences CRISPR-Cas9 technology a workshop by Marta De Menezes

This workshop will address issues pertaining to the uses, ethics, and representations of CRISPR-cas9 genome editing system; and the evolution of bioart as a cultural phenomenon .

The workshop will focus on:

1. Scientific strategies and ethical issues related to the modification of organisms through the most advanced technology;
2. Techniques and biological materials to develop and express complex concepts into art objects.



When:

Wednesday, Jan. 24,
5:00-8:00 pm

Thursday, Jan. 25,
5:00-8:00 pm

Contact:

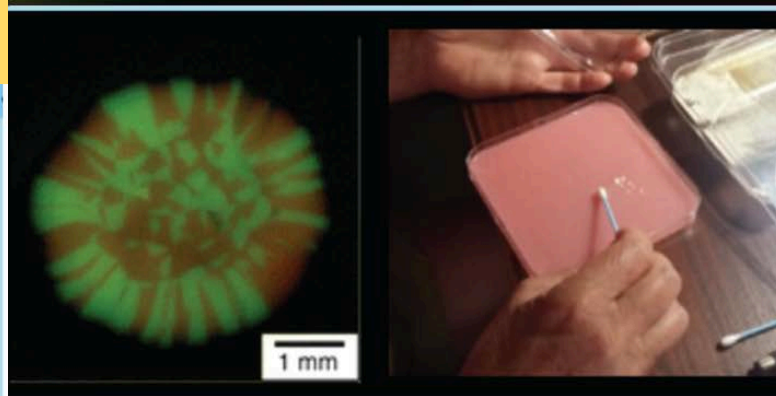
artscisalon@gmail.com

Where:

DIYbio Toronto
Hacklab
1266 Queen Street West, Unit #6
Toronto, ON M6K 1L3

Space is limited !!! register here:

<http://bit.ly/2ACZY7J> or



JAN
24

CRISPR Cas9 Workshop with Marta De Menezes

by The ArtSci Salon

Free



Sold Out

[DETAILS](#)

DESCRIPTION

This is a two day intensive workshop on

Jan. 24 5:00-9:00 pm

and

Jan. 25 5:00-9:00 pm

This workshop will address issues pertaining to the uses, ethics, and representations of CRISPR-cas9 genome editing system; and the evolution of bioart as a cultural phenomenon . The workshop will focus on:

1. Scientific strategies and ethical issues related to the modification of organisms through the most advanced technology;
2. Techniques and biological materials to develop and express complex concepts into art objects.

This workshop will introduce knowledge, methods and living material from the life sciences to the participants. The class will apply that novel information to the creation of art. Finally, the key concepts, processes and knowledge from the arts will be discussed and related to scientific research. The studio--lab portion of the course will focus on the mastering and understanding of the CRISPR - Cas9 technology and its revolutionary applications. The unparalleled potential of CRISPR - Cas9 for genome editing will be directly assessed as the participants will use the method to make artworks and generate meaning through such a technique. The participants will be expected to complete one small project by the end of the course. In developing and completing these projects, participants will be asked to present their ideas/work to the instructors and fellow participants. As part of the course, participants are expected to document their work/methodology/process by keeping a record of processes, outcomes, and explorations.

DATE AND TIME

Wed, 24 Jan 2018, 5:00

PM -

Thu, 25 Jan 2018, 9:00

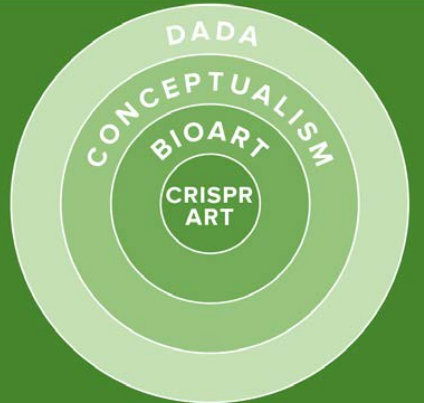
PM EST

[Add to Calendar](#)

LOCATION

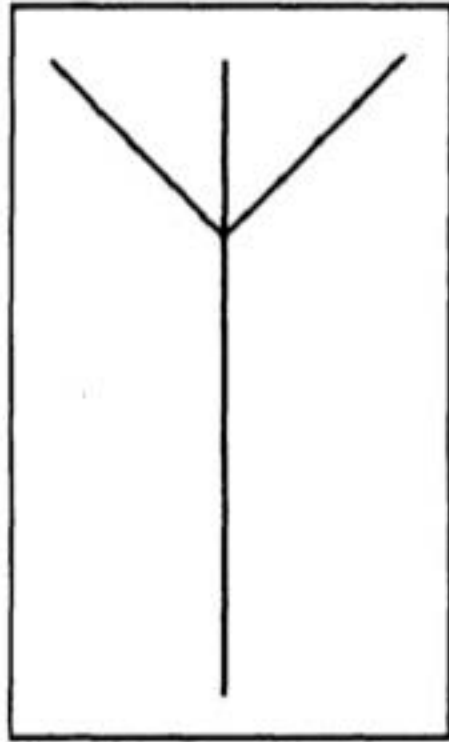
Hacklab
1266 Queen Street West
Toronto, ON M6K 1L3
Canada
[View Map](#)

BIOART





Left: Installation view of the exhibition, *Edward Steichen's Delphiniums*, June 24, 1936 through July 1, 1936, MoMA
Right: Steichen's *Delphiniums*, 1940



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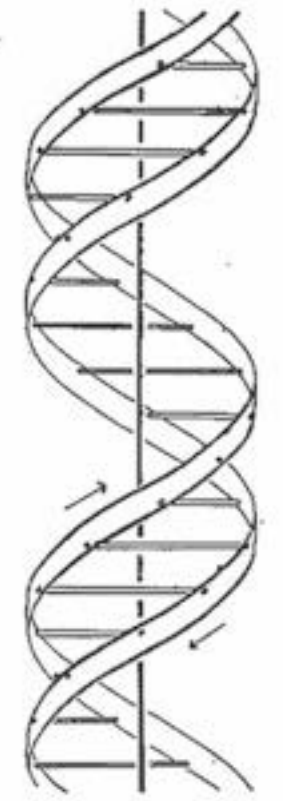


FIG. 1 *Microvenus* icon.

CCCCCAACGCGCGCT

Left: Joe Davis in Cambridge, MA
Right: The Microvenus Icon, 1986

SEQUENCING AND CODE



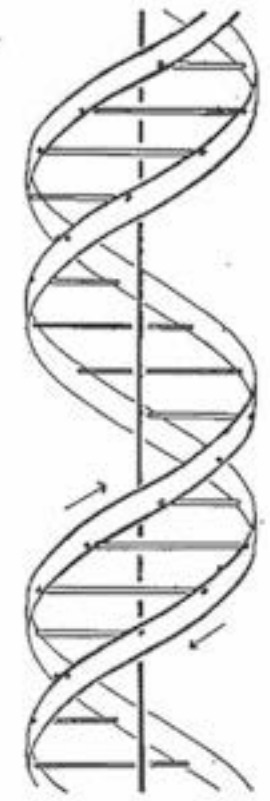
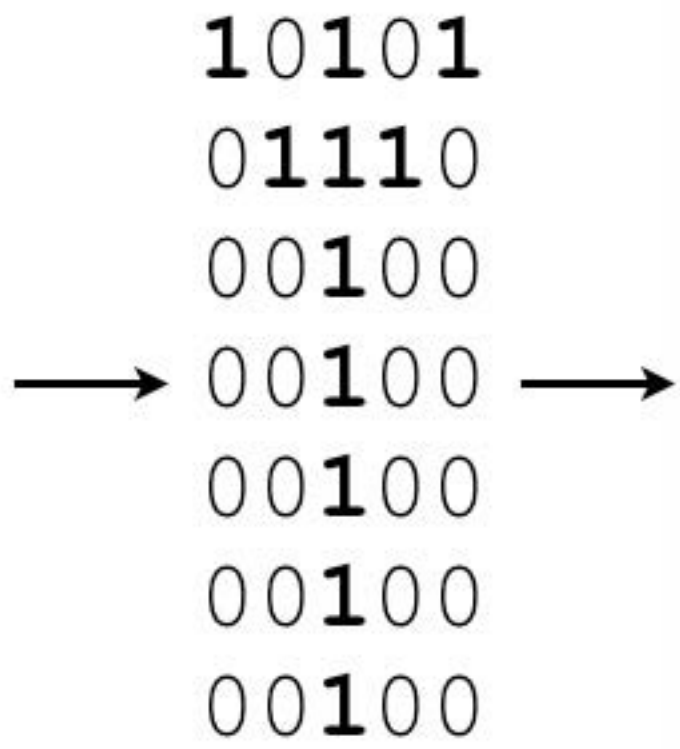
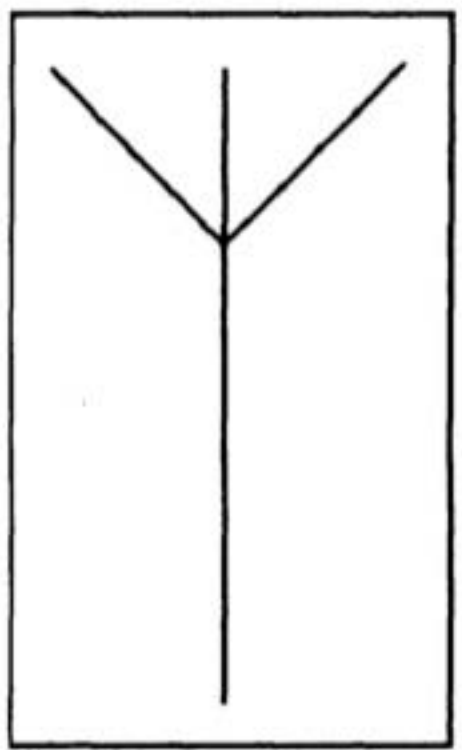


FIG. 1 *Microvenus* icon.

CCCCCAACGCGCGCT

Left: Joe Davis in Cambridge, MA
Right: The Microvenus Icon, 1986



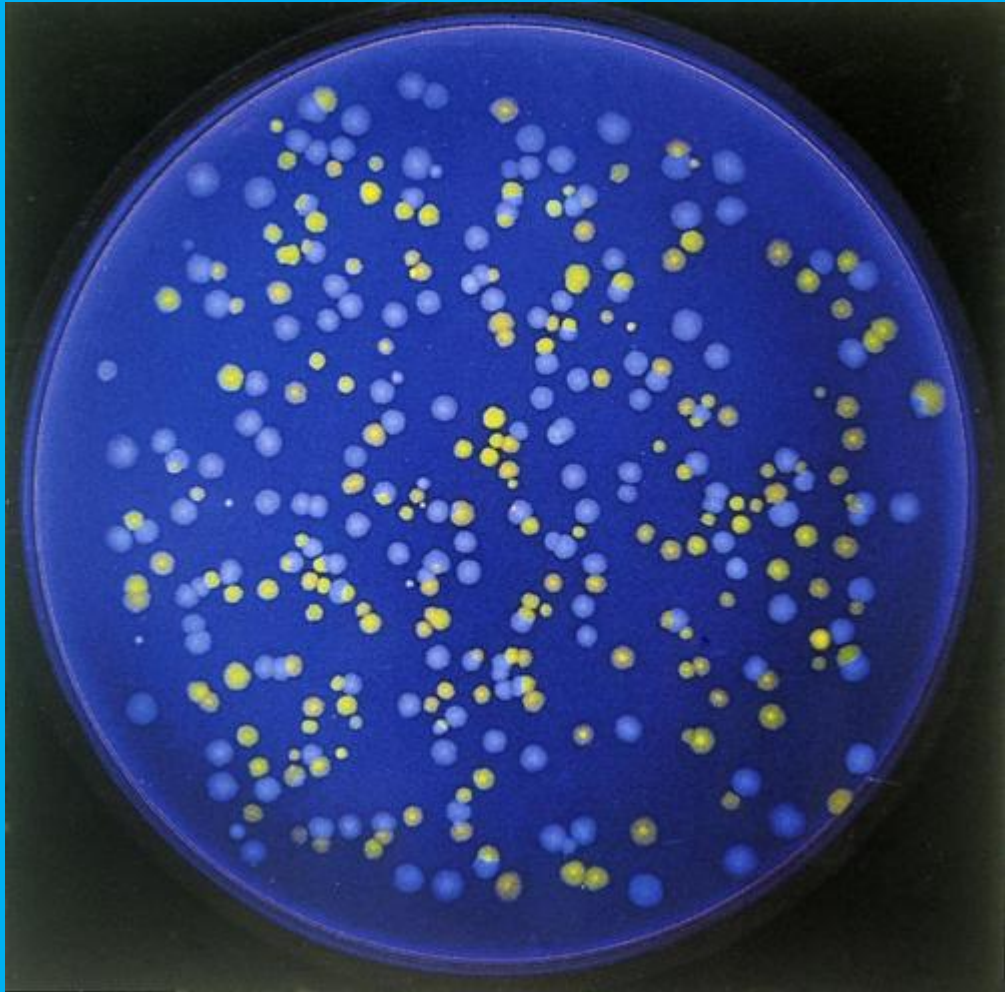
Joe Davis, The 28-mer Microvenus DNA Molecule, 2006

Transgenic Art

transgenic: adj., of or relating to an organism that contains genetic material into which DNA from an unrelated organism has been artificially introduced.



Eduardo Kac, Genesis, 1999



Eduardo Kac, Genesis, 1999

Let man have dominion over the fish of the sea and over the fowl of the air and over every living thing that moves upon the earth



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Morse to DNA conversion principle

DASH (-) = T

A = WORD SPACE

DOT (.) = C

G = LETTER SPACE



CTCCGGTATTGCTGTCACCCCGCTGCCCTGCATCCGTTTGTGCGCTGCGCGTTTGTCA
TTTGCCCTGCGCTCATGCCCCGACCTCGCCGCCCCGCCCATTTCCATGCCCCGACCC
CGCGTACTGTGCTCCATTTGCCCTGCGCTCATGCCCCGACCTCGTTTGTCTGCTCCAT
TTGCCATGCCCCGACTGCCGCTCACTGTCGTCATTTGCCCTGCGCTCACGCCCTGC
GCTCGTCTTACTCCGCCGCCCTGCCGTCGTTTCATGCCCCGCCGTCGTTTCATGCCCCGCTG
TATTGTTTGCCTGCGCCACCTGCTTCGTTTGCATGCCCCGACCGTCTCGTGCCCC

Let man have dominion over
the fish of the sea and over
the fowl of the air and over
every living thing that
moves upon the earth

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CTCCGGTATTGCTGTCACCCCGCTGCCCTGCATCC
GTTTGTGCGCTCATGCCCCGACCTCGCCGCCCCGCCCATTTCCAT
GCCCCGACCCCGCTACTGTGCTCCATTTGCCCTG
CGCTCATGCCCCGACCTCGTTTGTCTGCTCCATTTG
CCTCATGCCCCGACTGCCGCTCACTGTCGTCATTT
GCCCTGCCCTCACGCCCTGCCGCTCGTCTTACTCCGC
CGCCCTGCGCTCGTTTCATGCCCCGCCGTCGTTTCATG
CCCCGCTGATTGTTTGCCTGCGCCACCTGCTTCG
TTTGTTCATGCCCCGACCGTCTCGTGCCCC

CTCCGGTACTGCTGTCACCCCGCTGCCCTGCATCC
GTTTGTGCGCTCATGCCCCGACCTCGCCGCCCCGCCCATTTCCCTG
TCATGCCCCGACCTCGCCGCCCCGCCCATTTCCCTG
ATGCCCCGACCCCGCTACTGTGCTCCATTTGCCCTG
TGGCTCATGCCCCGACCTCGTTTGTCTGCTCCAT
TTGCCATGCCCCGACTGCCGCTCACTGTCGTC
ATTTGCCCTGCCCTCACGCCCTGCCGCTCGTCTTACT
CGCCGCCCTGCCGCTCGTTTCATGCCCCGCCGTCGTT
CATGCCCCGCTGTACCGTTTGCCTGCGCCACCTG
CTACGTTTGCATGCCCCGACCGTCTCGTGCCCC

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Let aan have dominion over
the fish of the sea and over
the fowl of the air and over
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Eduardo Kac, Genesis, 1999



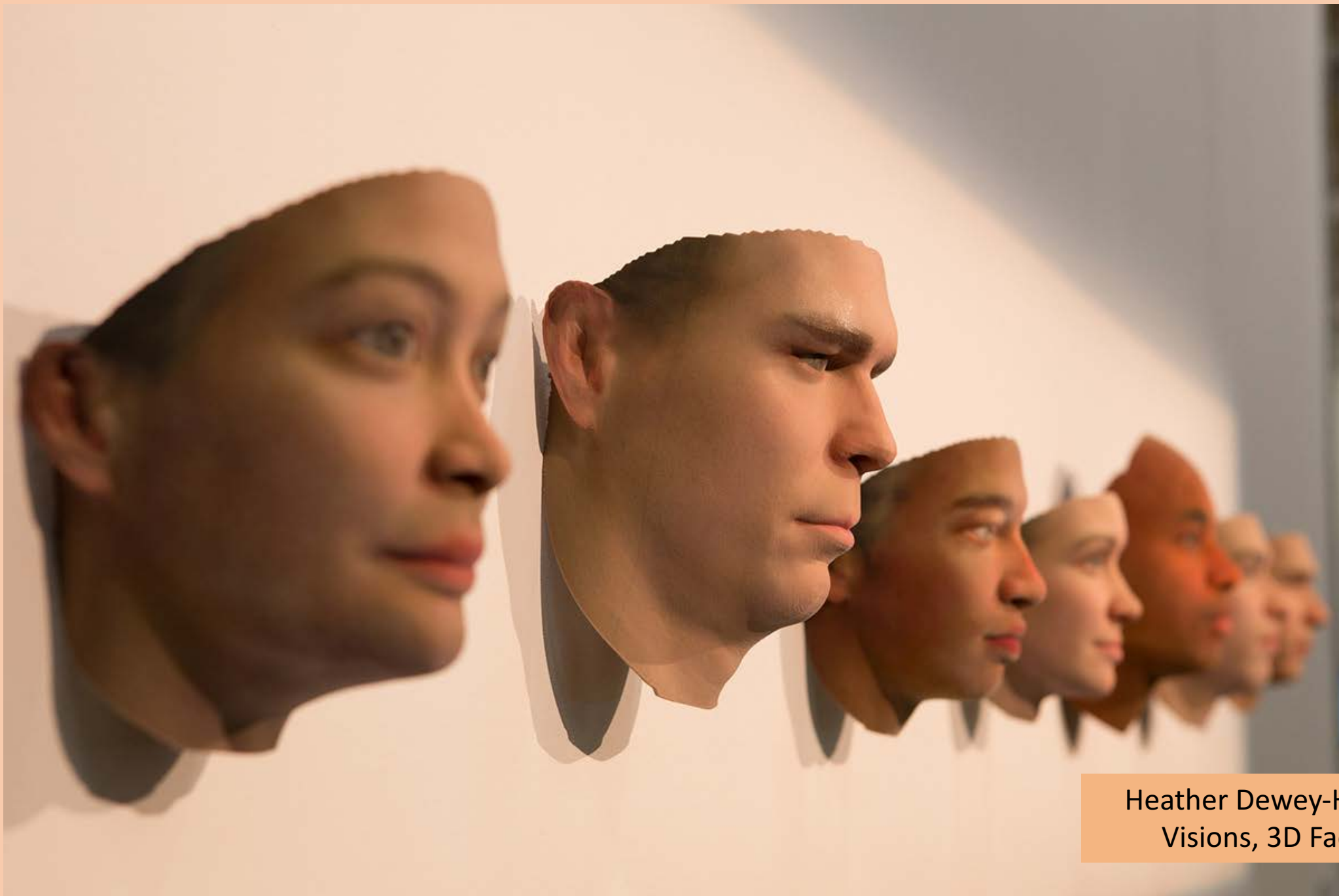
Eduardo Kac, GFP [Green Fluorescent Protein] Bunny, 2000

More Transgenic Art





Heather Dewey-Hagborg, Stranger Visions, 3D Face Prints and Sample Boxes, 2014



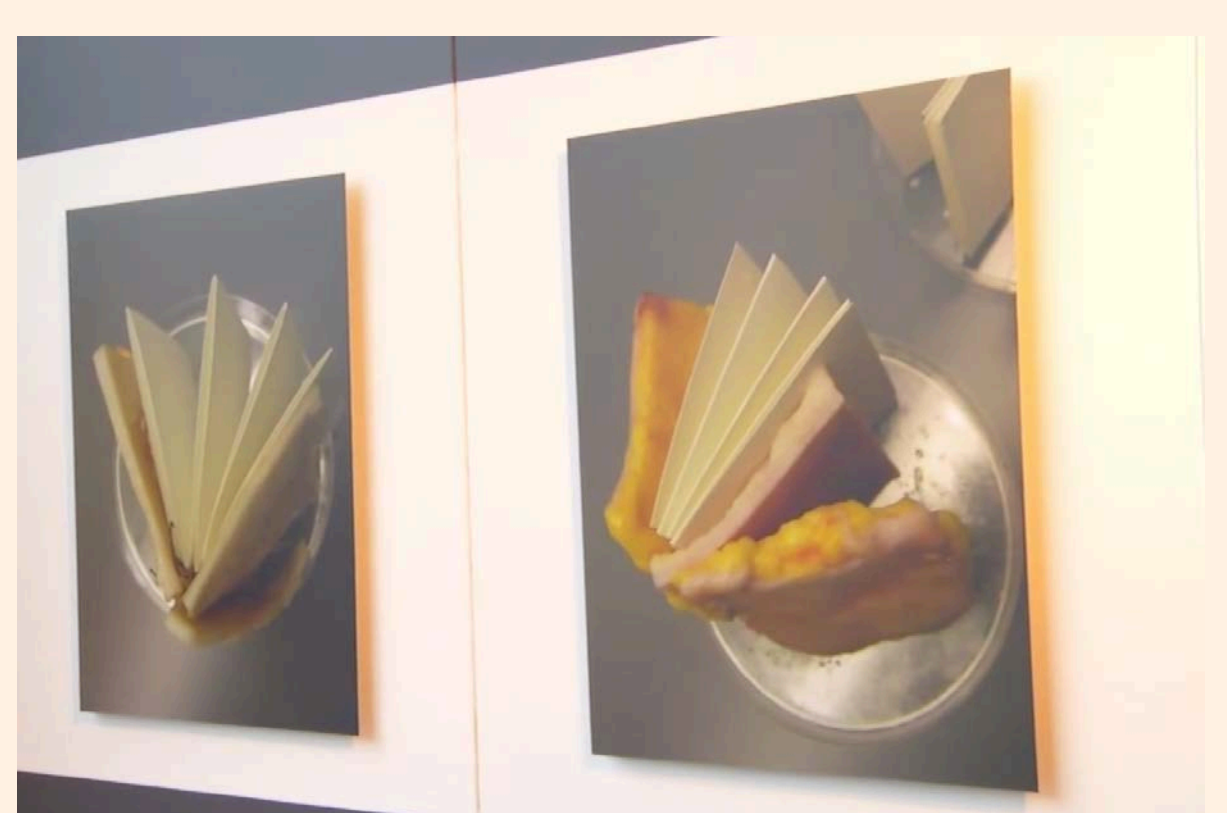
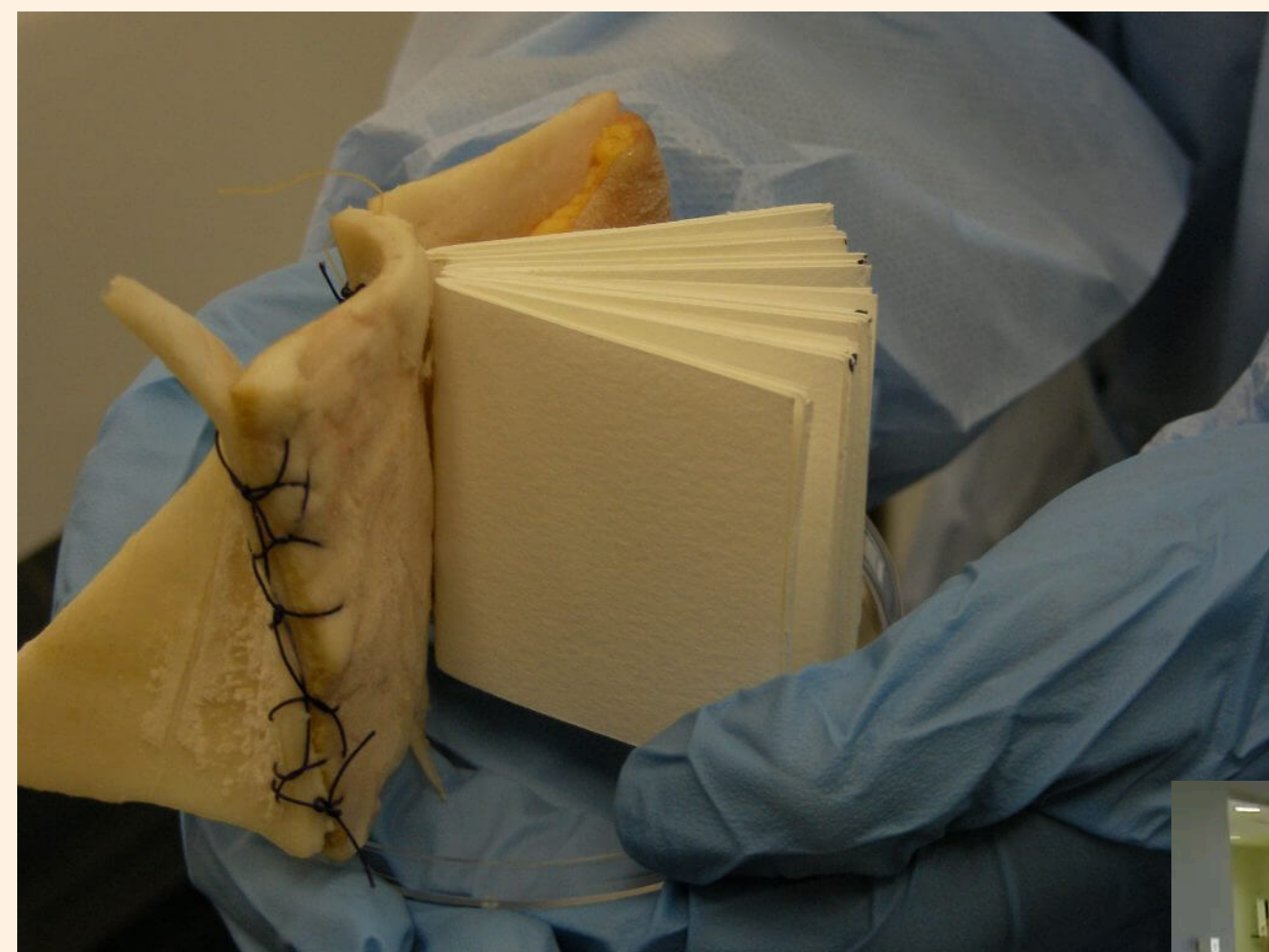
Heather Dewey-Hagborg, Stranger
Visions, 3D Face Prints, 2014

TISSUE CULTURE





Tagny Duff, Cryobook Archives, 2010-ongoing

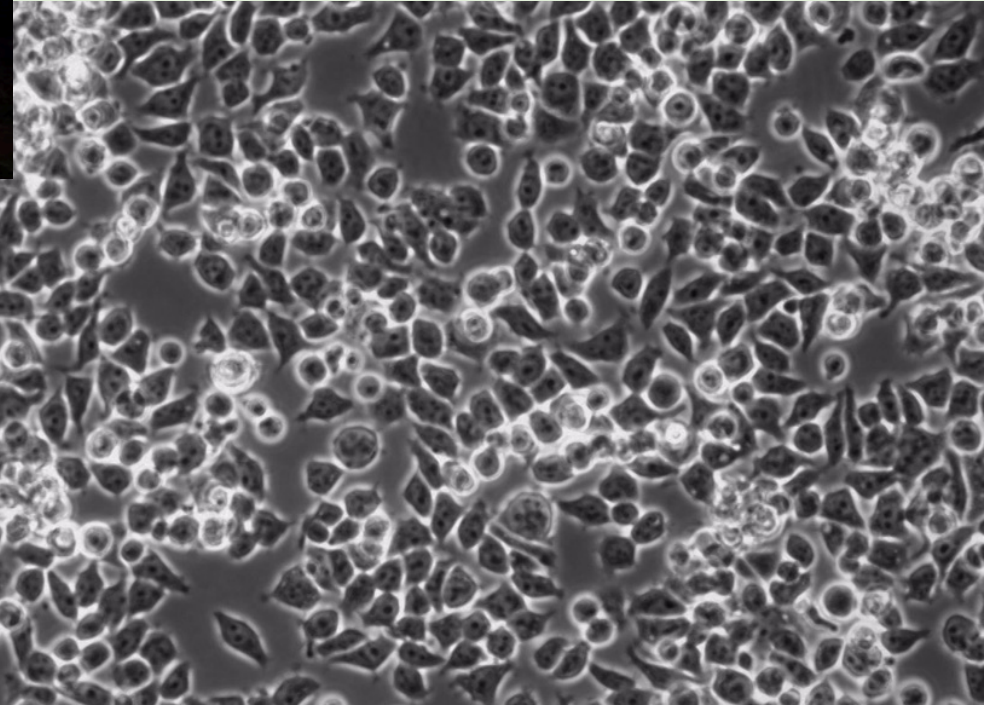
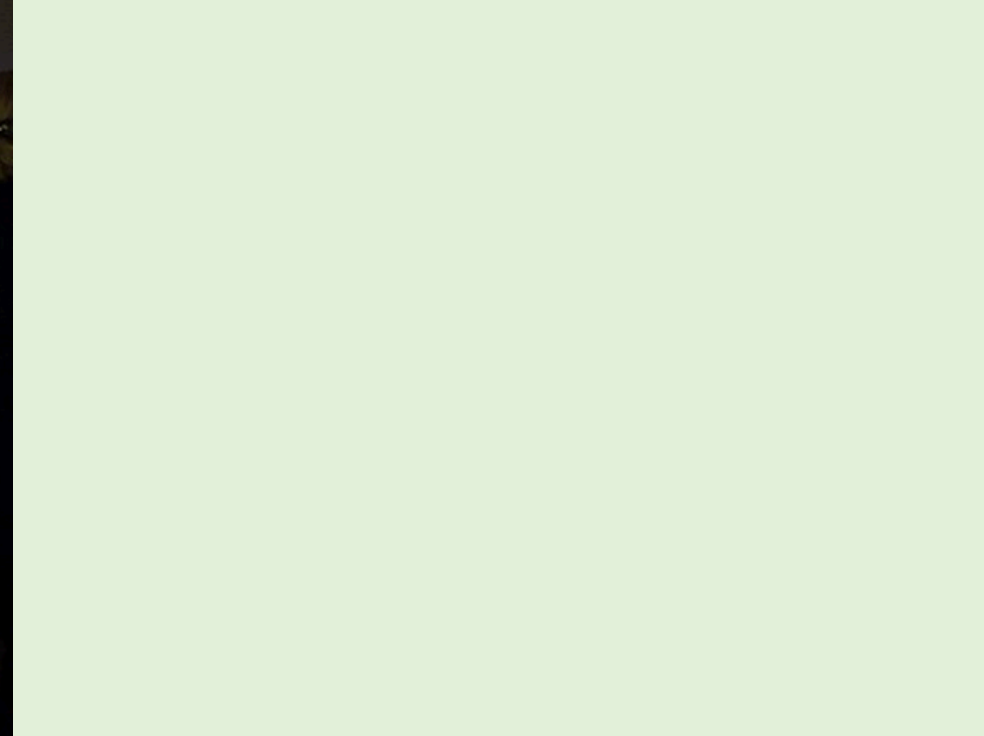


Tagny Duff, Cryobook Archives, 2010-ongoing





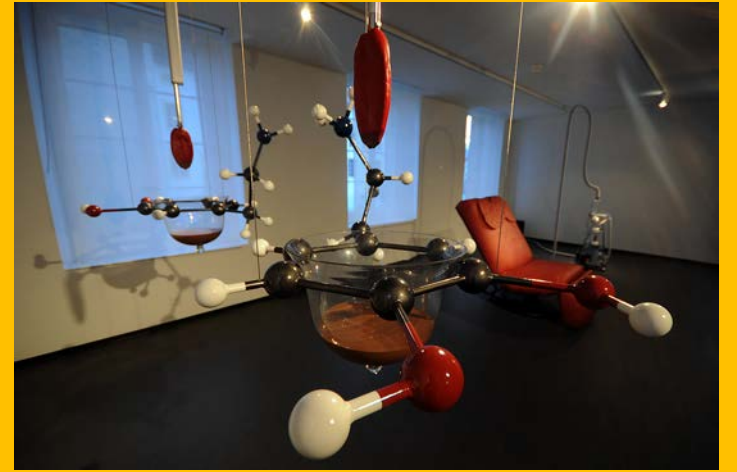
Tagny Duff,
Tissue Cultures
Point of View,
2010-ongoing



Marta De Menezes with Luís Graça, Immortality for Two, 2014

GUT-BRAIN AXIS





Ken Rinaldo, Enteric Consciousness, 2010-11



Kathy High, Kathy as Bowie, Proposed Fecal Exchange project with David Bowie, 2015



David Bowie, Aladdin Sane,
Contact Sheet, 1973



Kathy High, Kathy as Bowie and Letter to Bowie, Proposed Fecal
Exchange project with David Bowie, 2015

Dear David Bowie,

I have a bargain for you... I am writing you with a strange request... I am a life-long fan...

I have been following your career since I was little. I was born in 1954, so not that much younger than you... but enough so that I feel like a younger sister.

I offer these photos to you – re-enacting famous images of your career. I know thousands of fans have done the same – Tilda, probably the best, but I humbly offer mine among the others.

I was hoping these photos might capture your attention for a moment.

I want to exchange these for a throw-away item. Your poo.

I want to conduct a fecal transplantation with your stool – implanting your poop/gut biome into my colon.

This goes against all the "rules" – it should be someone close to me, someone under 60, pre-tested, etc., but I know we will be compatible.

And basically if I could become you...well, say no more...

I know people, who know people, who know people, who can probably get this letter into your hands.

I hope you will look upon this strange request favorably. I have Crohn's disease and you could change my life forever – although you already have!

I eagerly await your response.

Your fan,

Kathy



Left: Anna Dumitriu, Don't Try This At Home, 2015

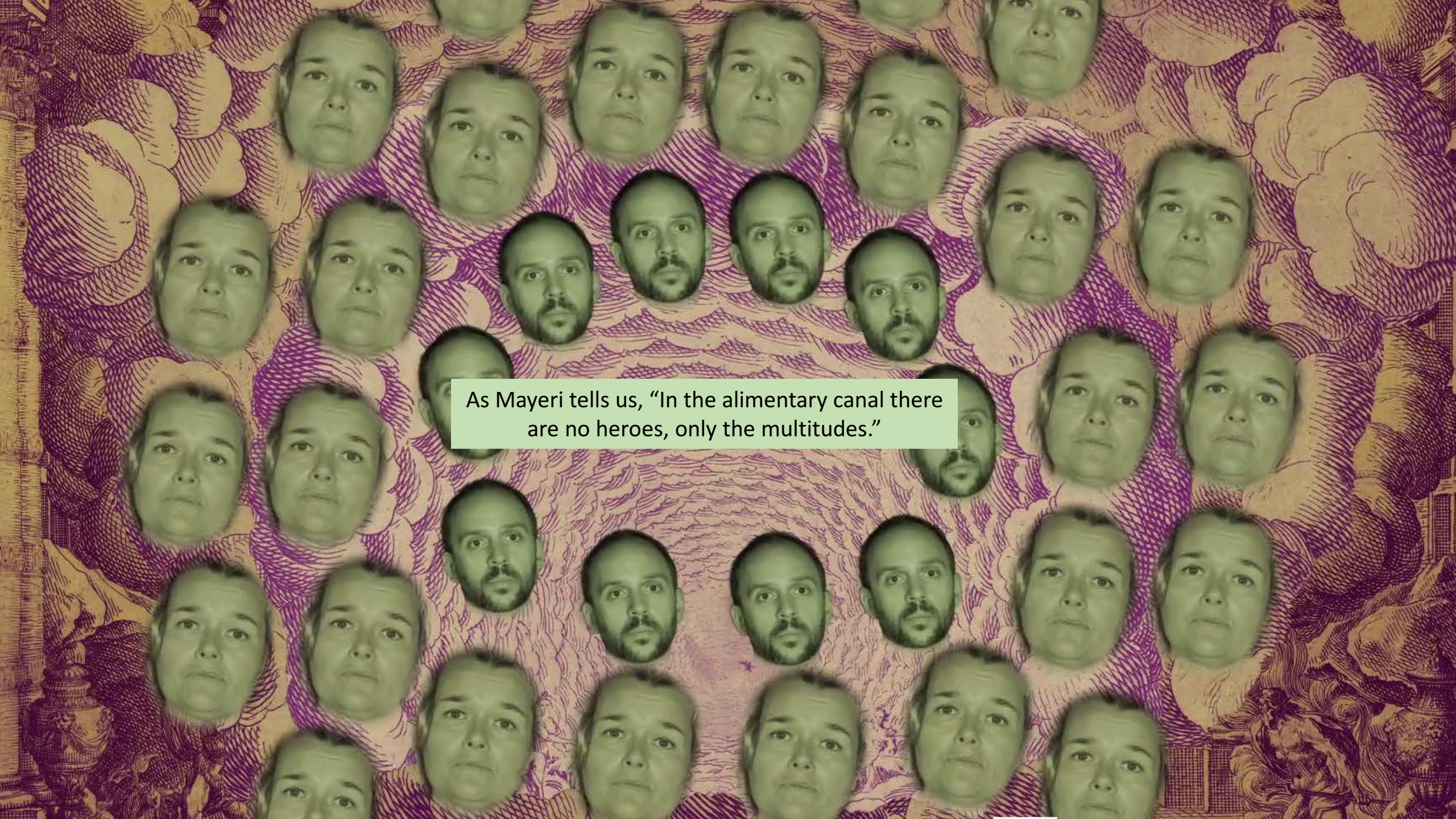
A DIY fecal transplant kit commissioned by Eden Project for the permanent exhibition
"Invisible You: The Microbiome"

Right: Detail of box interior showing patterns based on microbes



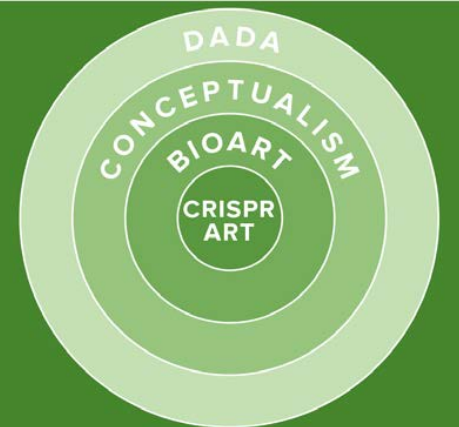


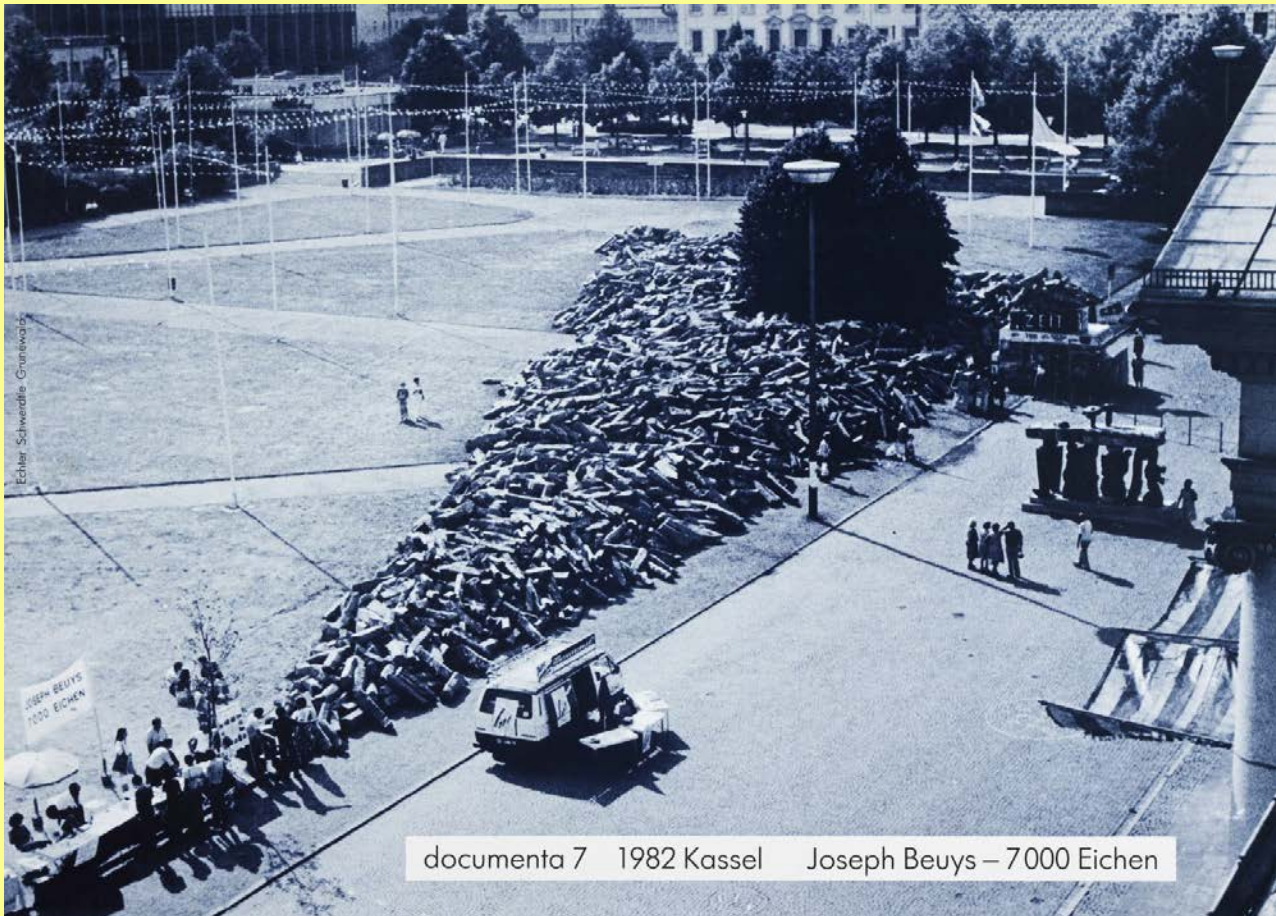
Still from Rachel Mayeri, *Orfeo Nel Canale Alimentare: An Animated Opera*, 2017



As Mayeri tells us, "In the alimentary canal there are no heroes, only the multitudes."

CONCEPTUAL ART





documenta 7 1982 Kassel Joseph Beuys – 7000 Eichen



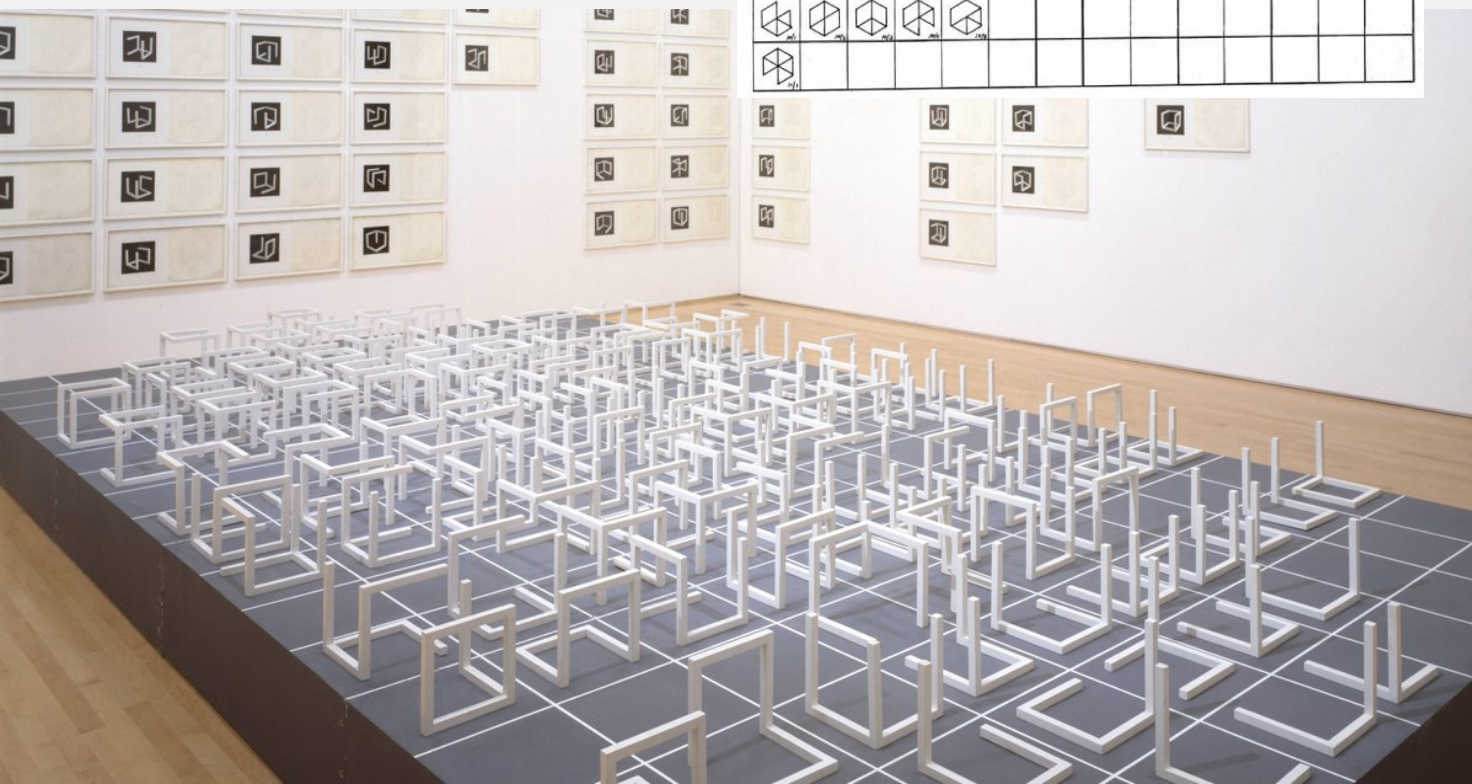
Joseph Beuys, 7000 Oaks, 1982



Helen and Newton
Harrison, Portable
Orchard, 1972/2015



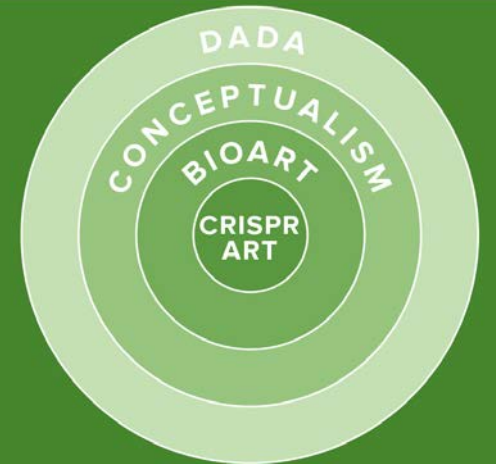
VARIATIONS OF INCOMPLETE OPEN CUBES												
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300												



art, ärt, n. practical skill, or its application, guided by principles: human skill and agency (opp. to *nature*): application of skill to production of beauty (esp. visible beauty) and works of creative imagination (as the *fine arts*): a branch of learning, esp. one of the *liberal arts* (see **trivium, quadrivium**), as in *faculty of arts, master of arts*: skill or knowledge in a particular department: a skilled profession or trade, craft, or branch of activity: magic or occult knowledge or influence: a method of doing a thing: a knack: contrivance: address: cunning: artifice: crafty conduct: a wile.—*adj.* **art'ful** (*arch.*), dexterous, clever: cunning: produced by art.—*adv.* **art'fully**.—*n.* **art'fulness**.—*adj.* **art'less**, simple: (*rare*) inartistic: guileless, unaffected.—

Left: Sol Lewitt, Variations of Incomplete Open Cubes, 1974
 Right: Joseph Kosuth, Art as Idea as Idea, 1966

DADA DADA





Left: Marcel
Duchamp,
Bicycle Wheel,
the first
“Readymade,”
1913

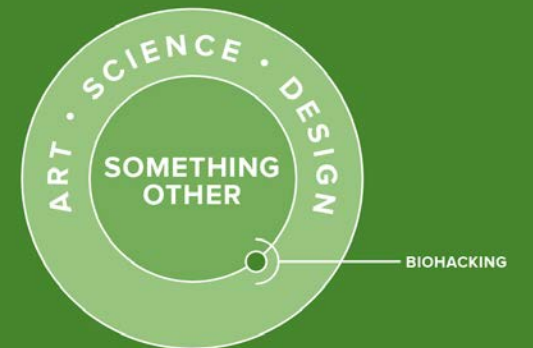
Right: Hugo Ball
reciting of the
sound poem,
'Karawane,'
1916

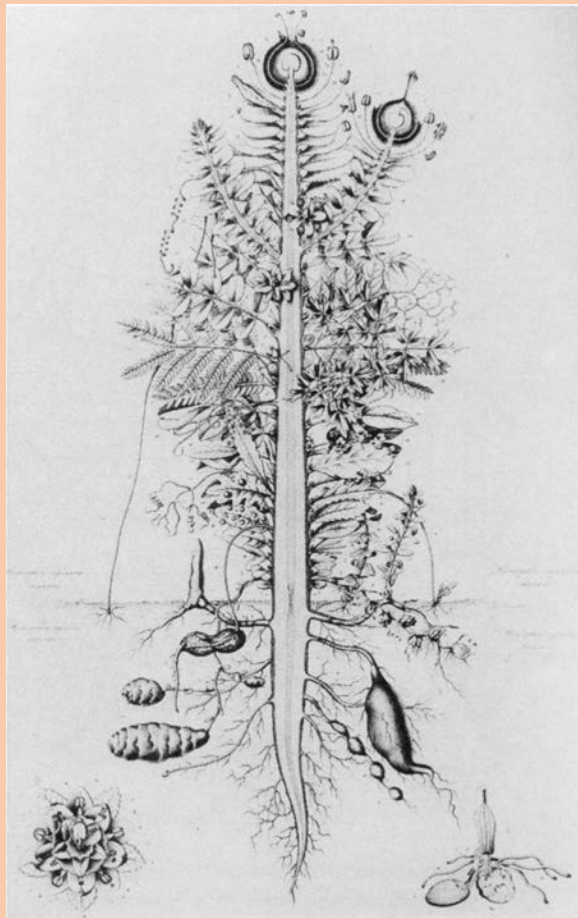
**SOMETHING
OTHER...**



BIOHACKING

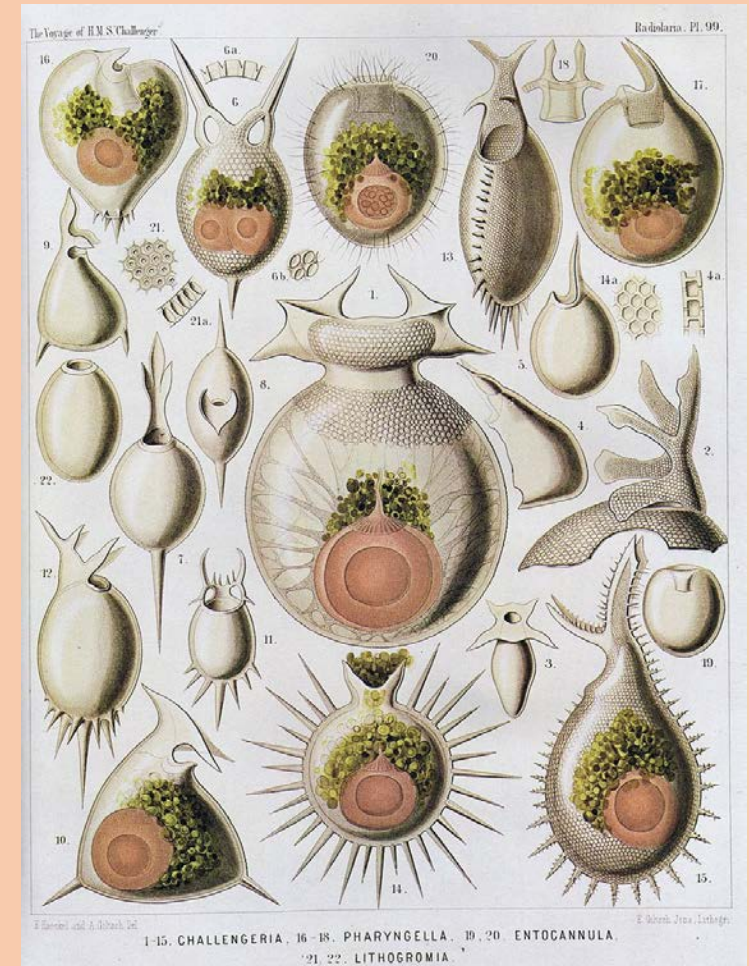
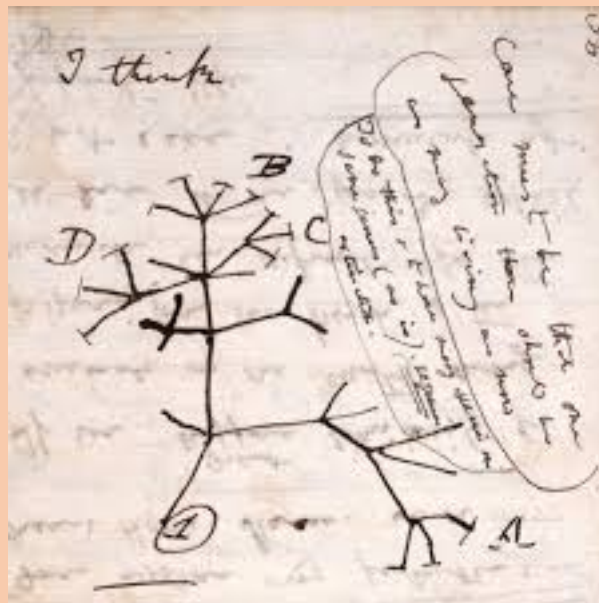
ART-SCIENCE-DESIGN





Urpflanze conceptualized by Johann Wolfgang von Goethe in 1787, here rendered by Pierre Jean Francois Turpin in 1837

Page from Charles Darwin's notebooks around July 1837, showing his first sketch of an evolutionary tree

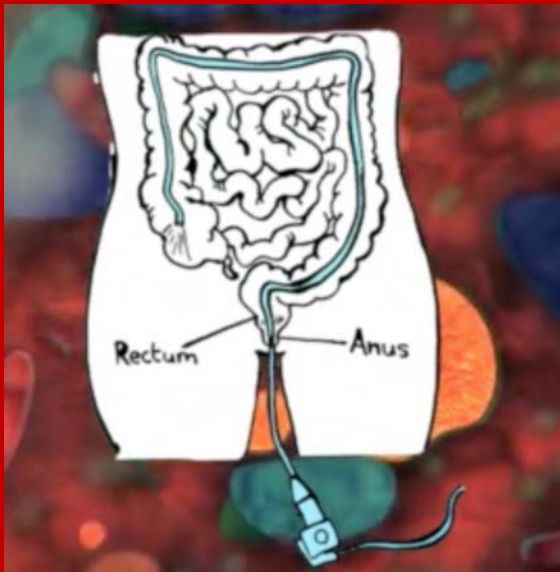


Ernst Haeckel, Radiolaria with algal symbionts inside, 1862



Left: Jalila Essaidi, Mestic, a manure-derived bioplastic, 2016
Right: Alana Bartol, Un-Camouflaging /Forms of Awareness, 2012-14





BIOART



manure matters



A CRACK IN CREATION

GENE EDITING AND
THE UNTHINKABLE
POWER TO CONTROL
EVOLUTION

JENNIFER A. DOUDNA
SAMUEL H. STERNBERG

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No Speed Limit

Three Essays on
Accelerationism

Steven Shaviro

FORERUNNERS
IDEAS FIRST
from the university of minnesota press



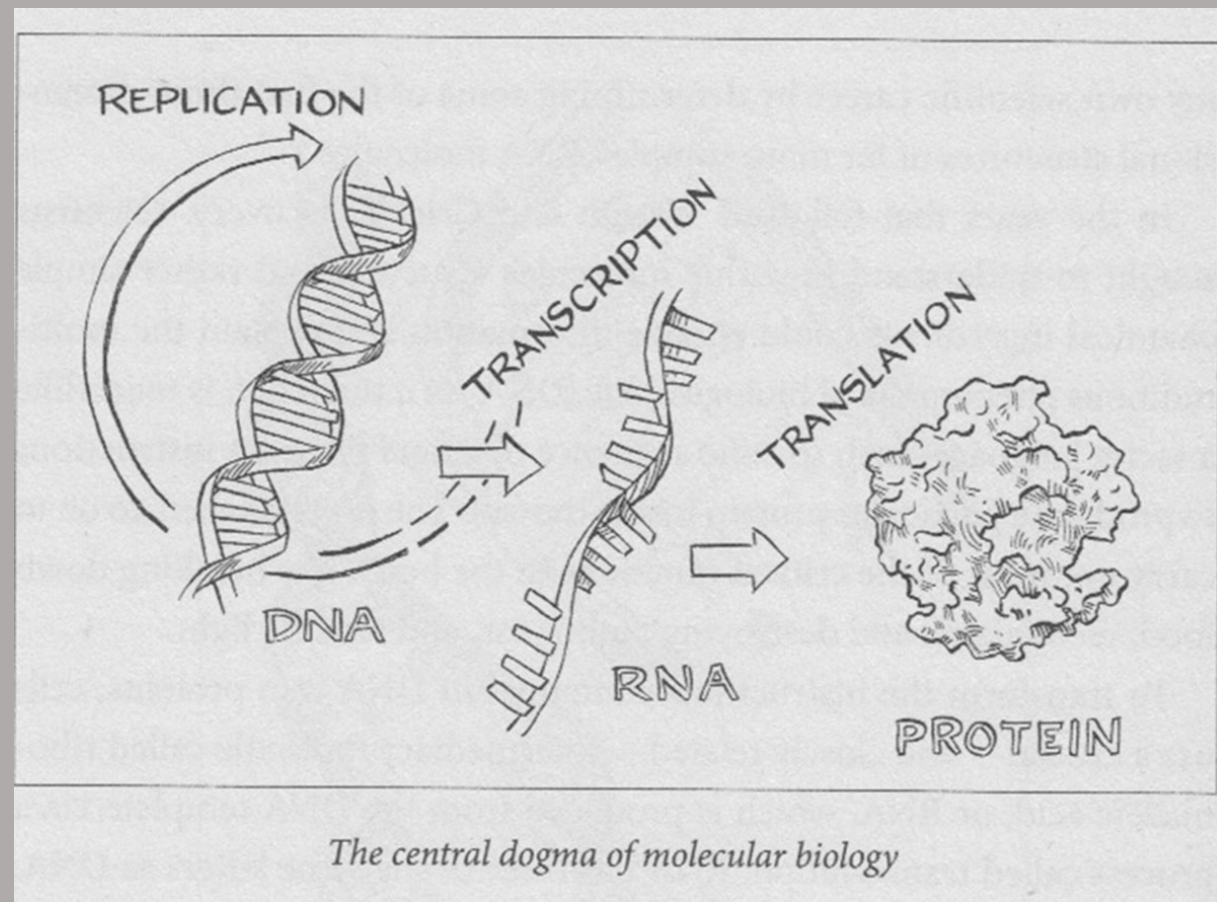
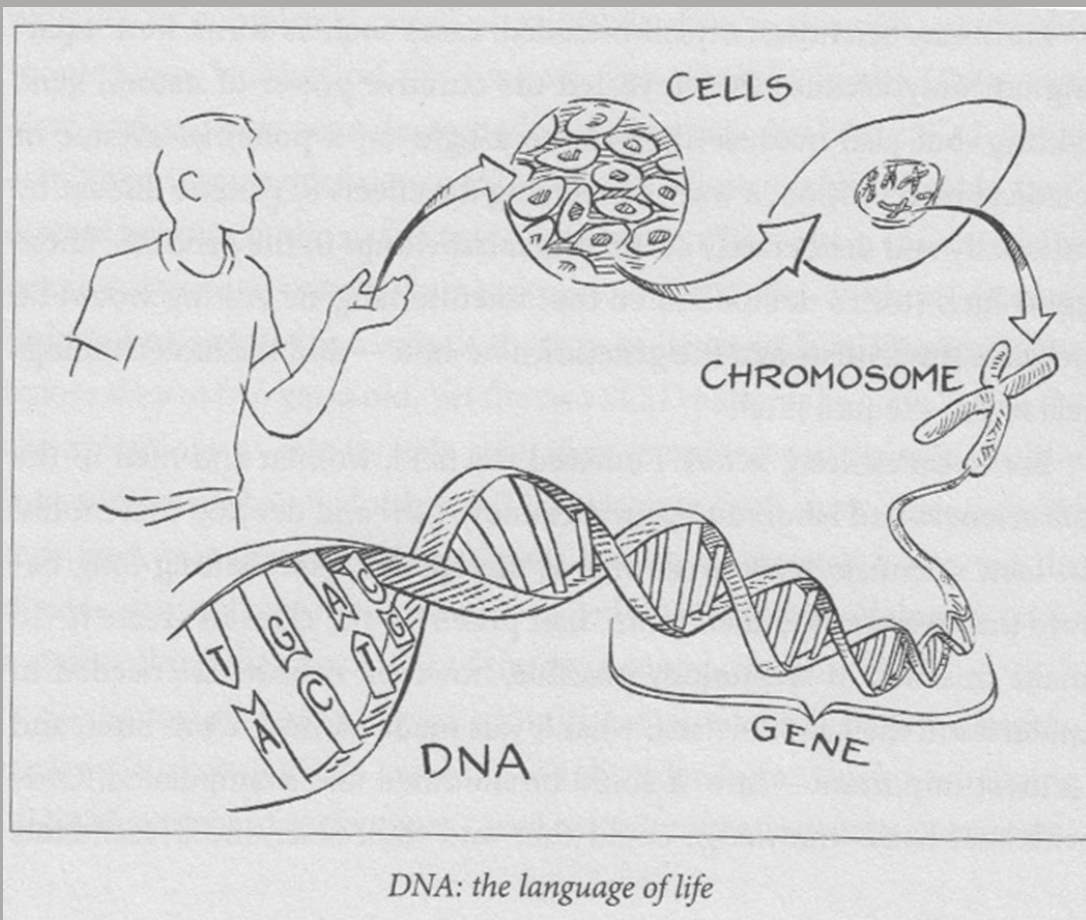
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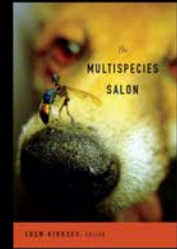
ACCELERATIONISM

Futurity and Futures

CRISPR NOW



Drawings by Jeffery Mathison from *A Crack in Creation: Gene Editing and the Unthinkable Power to Control Evolution* (2017)



"The Multispecies Salon is an ambitious, important book, an excellent read, full of energy and imagination."
— George Marcus



ADAM ZARETSKY



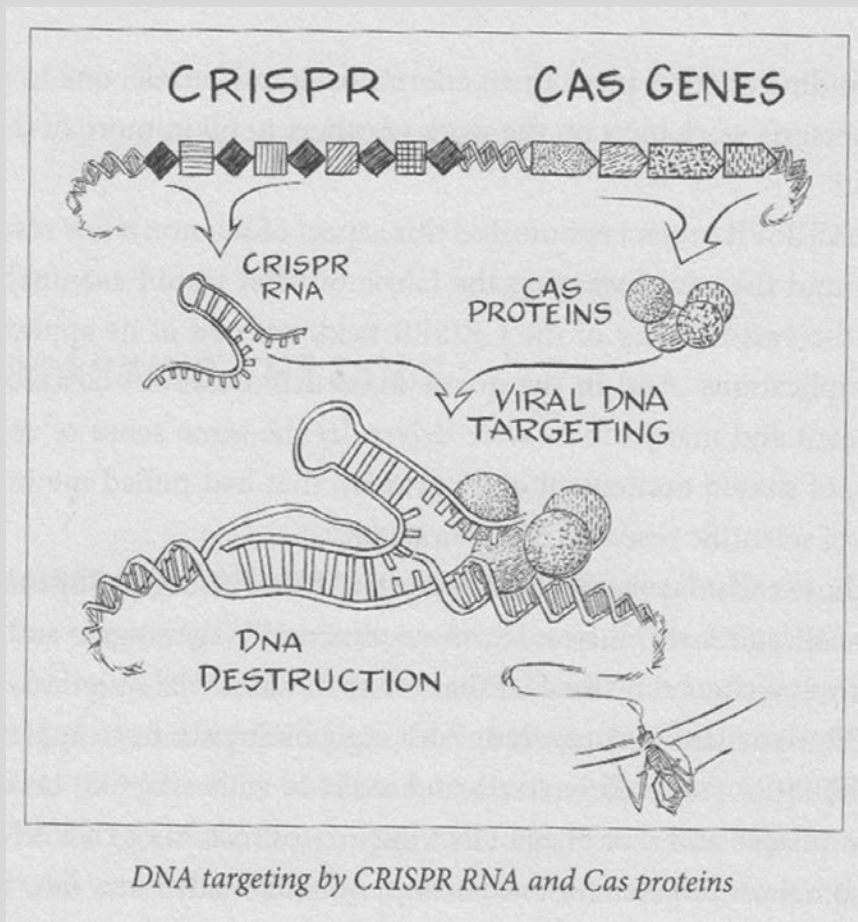
Responding to a call for "wild artists" by the curators of the Multispecies Salon, Adam Zaretsky gave the questions orbiting around the exhibit a whimsical and provocative twist. Zaretsky who describes himself as a "demented naturalist", was already widely renowned for framing microbes, insects and plants as creative agents.

Years before the Salon, at the Salina Art Center in Kansas, he installed The Workhorse Zoo - juxtaposing "great hopes invested in the products of genetic engineering" with "biophobic visions of anti-

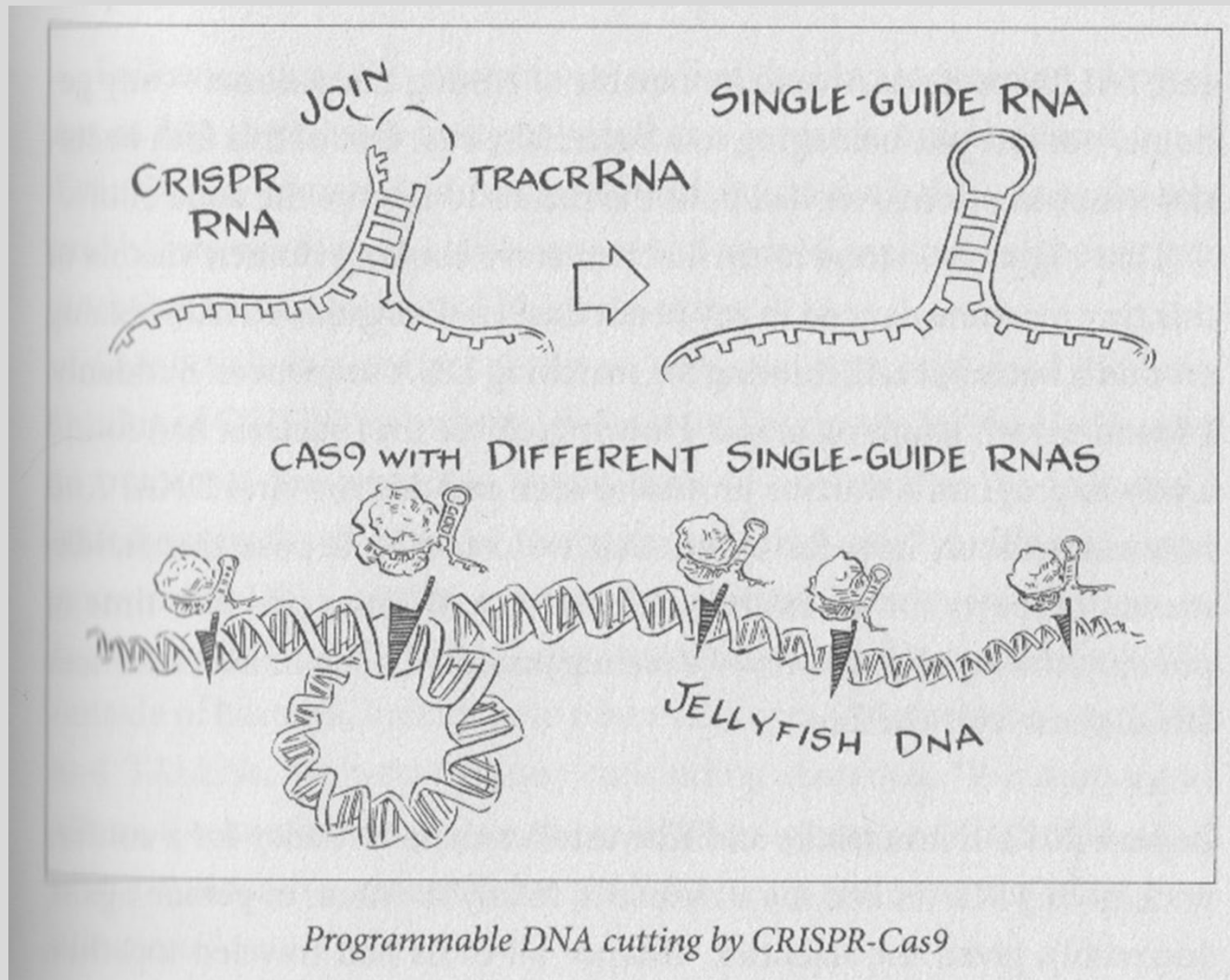
Left: Adam Zaretsky, Artist Page, from Eben Kirksey's Site for the Multispecies Salon, a book and exhibition, 2016

Right: A Genetically modified embryo of Zebrafish injected with GMO algae from the Errorarium (2013) by Adam Zaretsky. For the project, Zaretsky experimented with whole genome re-programming using Zinc Finger Nucleases (ZFNs)



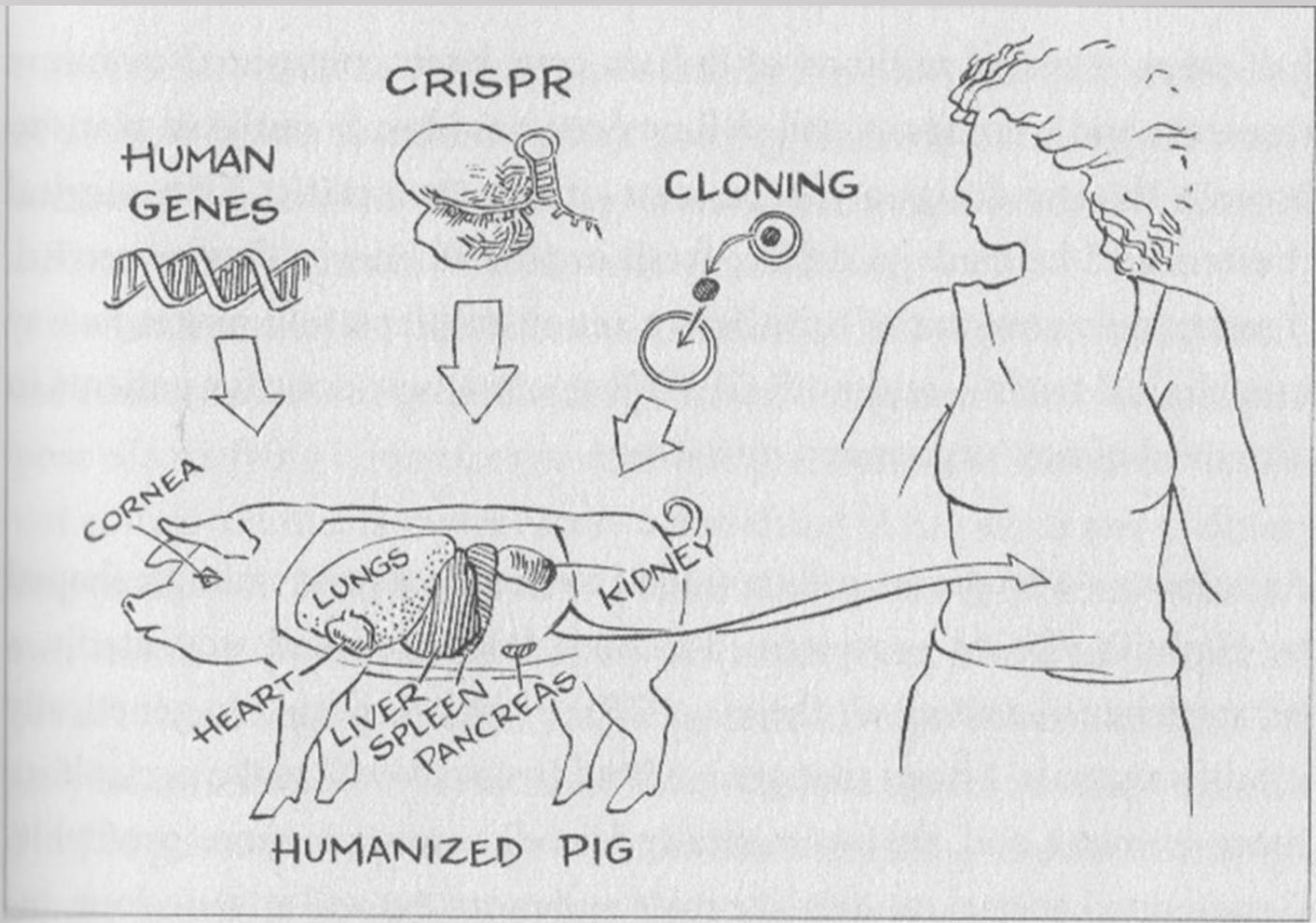


DNA targeting by CRISPR RNA and Cas proteins

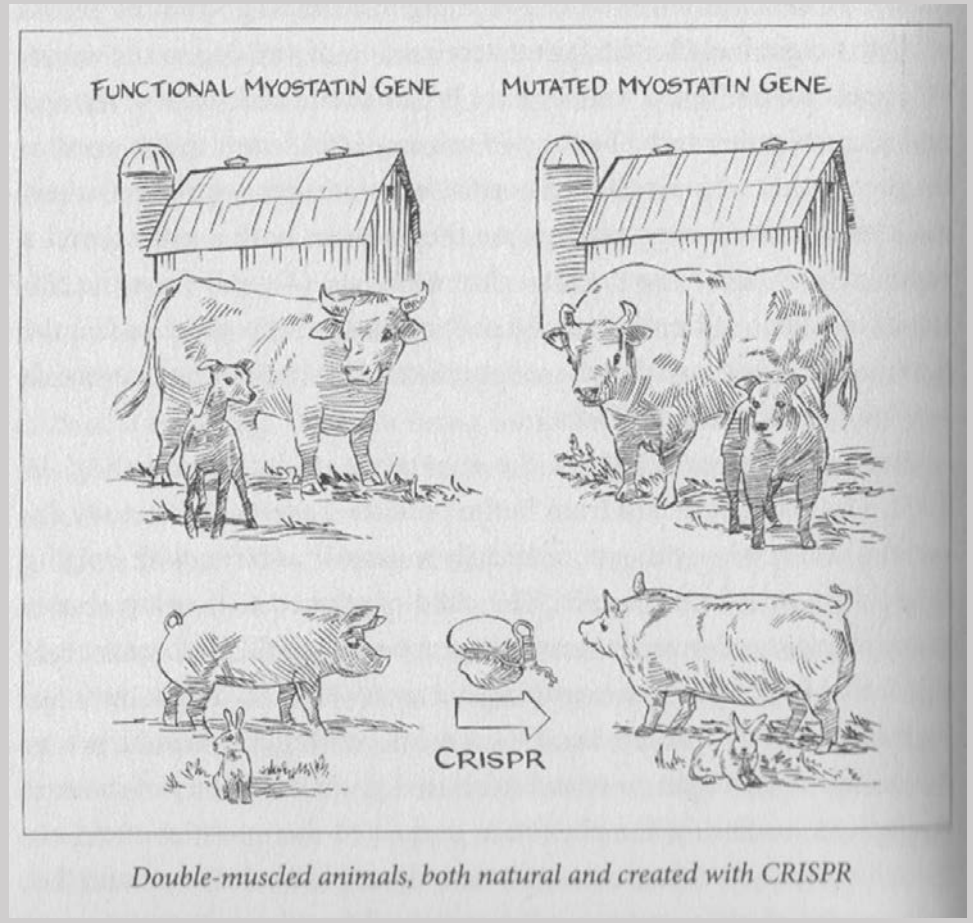


Programmable DNA cutting by CRISPR-Cas9

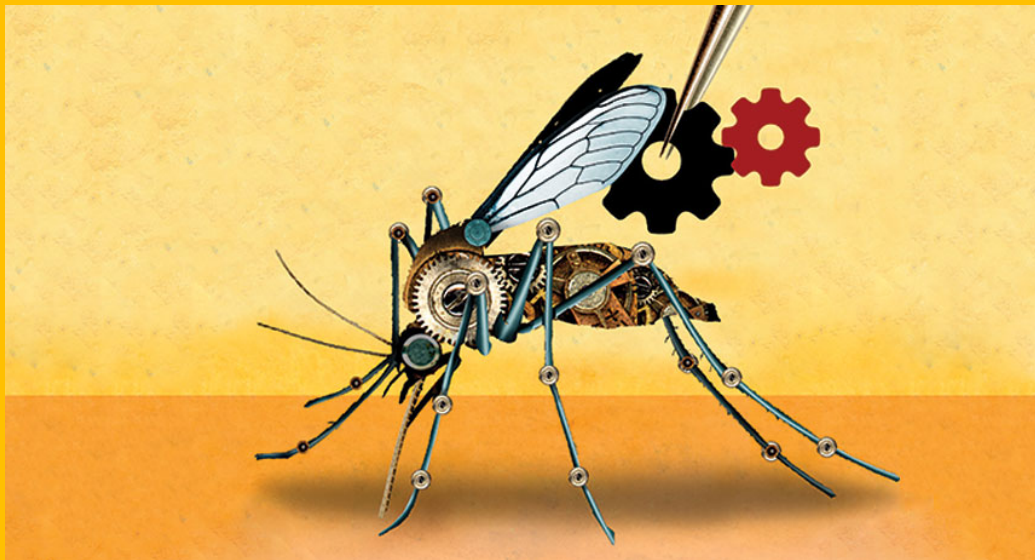
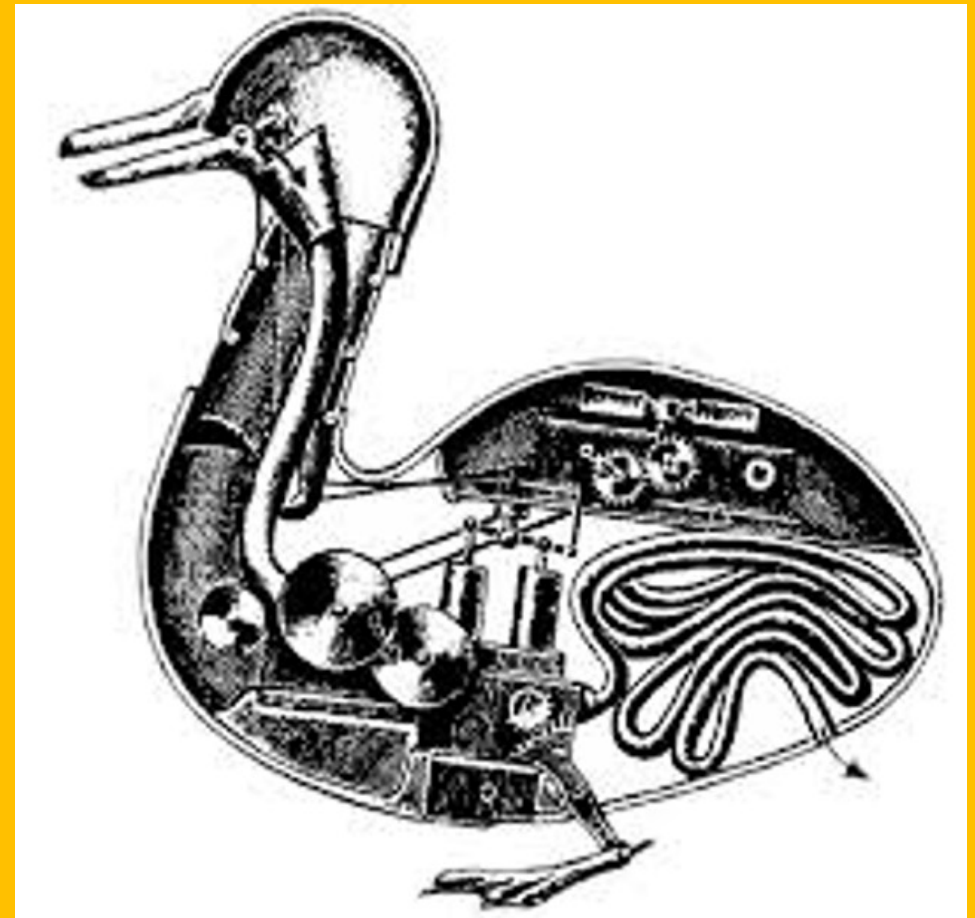
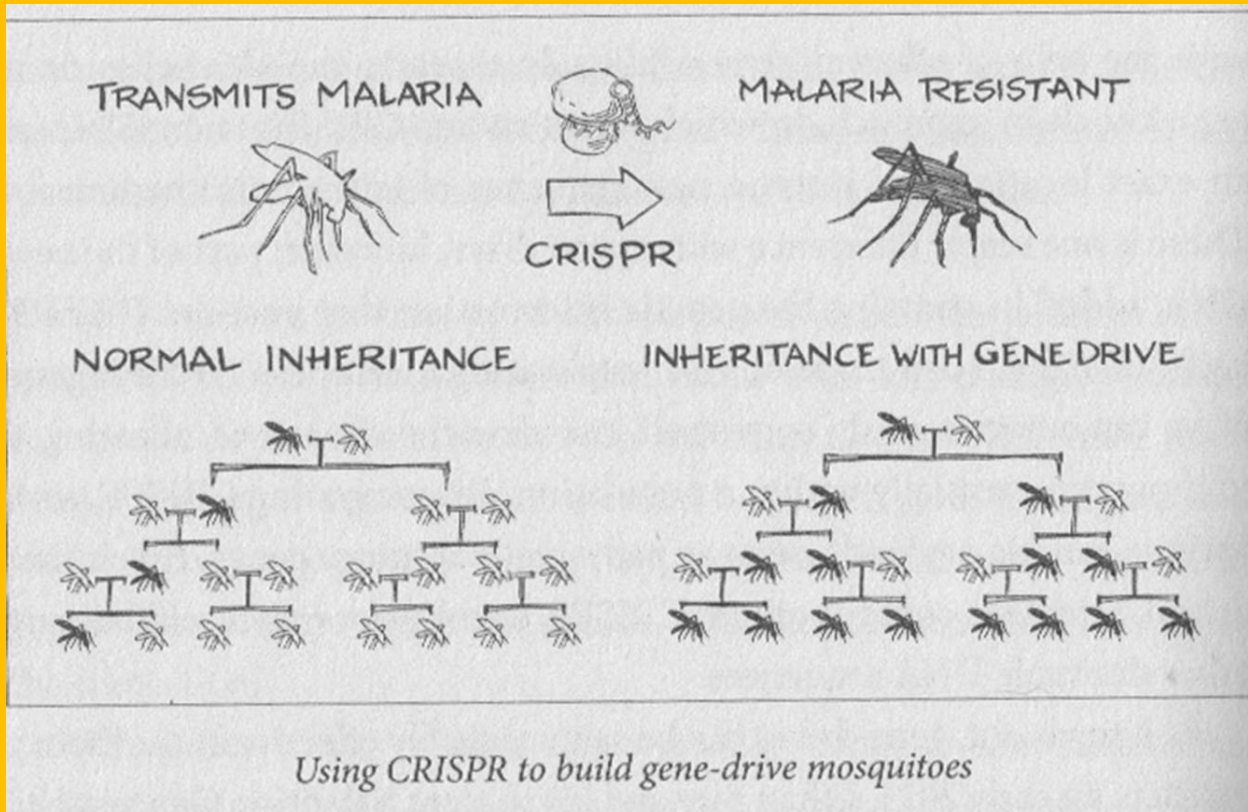
Drawings by Jeffery Mathison from *A Crack in Creation: Gene Editing and the Unthinkable Power to Control Evolution* (2017)



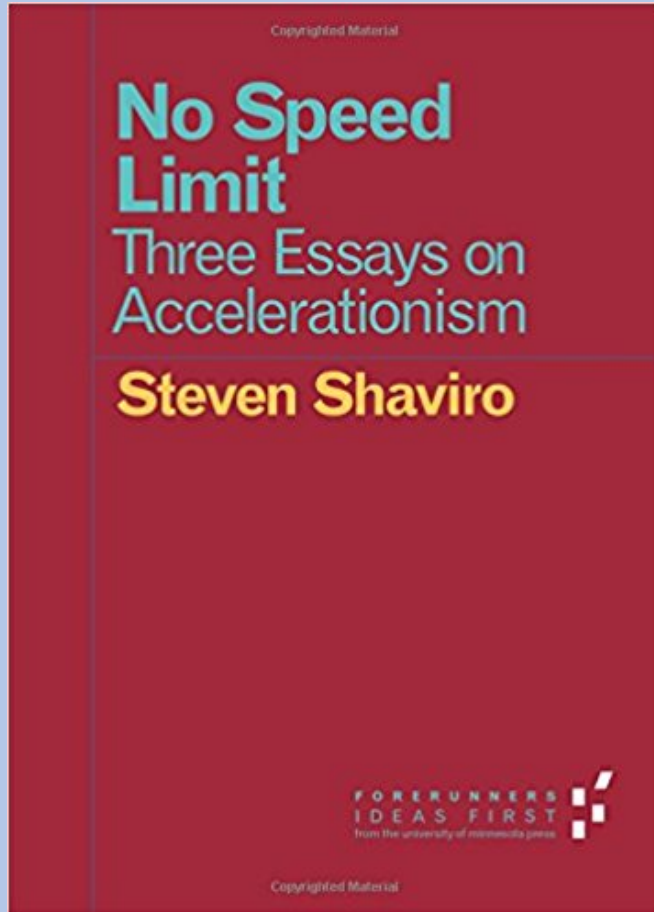
Xenotransplantation using humanized pigs



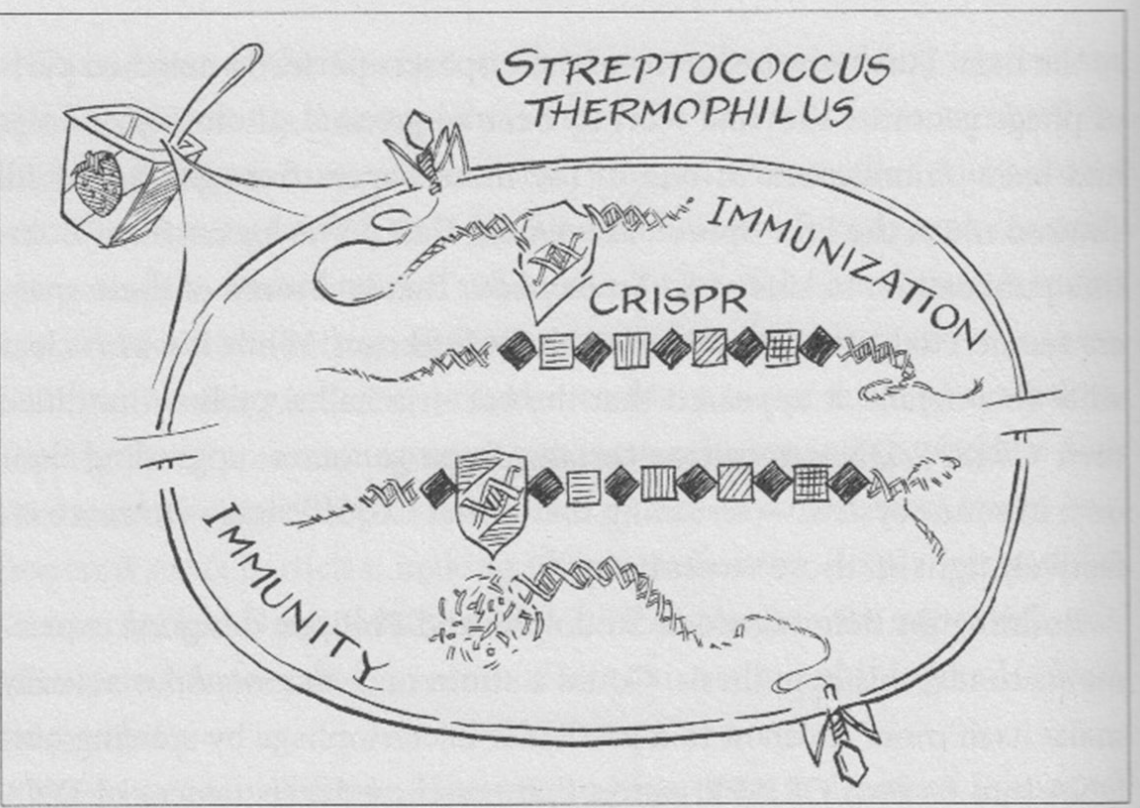
Double-muscling animals, both natural and created with CRISPR



Right: Jacques de Vaucanson, Animal Automaton or, Mechanical Duck, 1738
 Left: Michael Morgenstern, Illustration of Mechanical Mosquito, 2015, from "Gene drives spread their wings: CRISPR brings a powerful genetic tool closer to reality. Are we ready?" in *Science News*



A futurist, neo-classicist, and another futurist during WW 1.
Filippo Tommaso Marinetti, Achille Funi, and Antonio Sant'Elia



CRISPR: a molecular vaccination card

Umberto Boccioni, The Charge of the Lancers, 1915



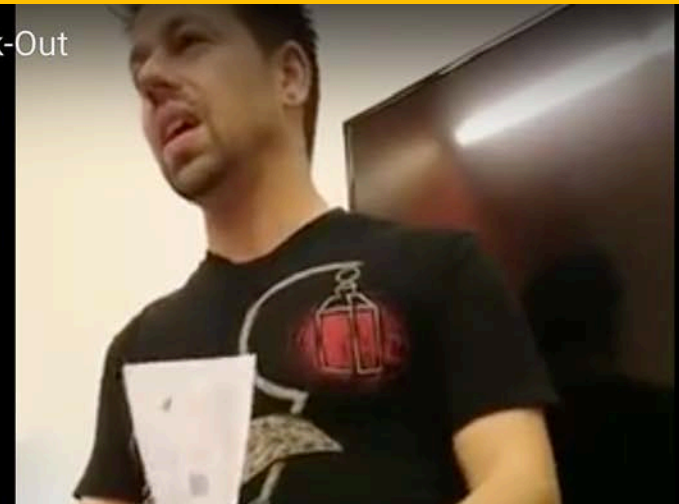
Drawing by Jeffery Mathison from *A Crack in Creation: Gene Editing and the Unthinkable Power to Control Evolution* (2017)



Josiah Zayner, PhD + CEO of The Odin and Biohacker who injected himself with CRISPR in a live video, February 2018

Antoni Sant'Elia, Città Nuova, 1914

DIY Human CRISPR Myostatin Knock-Out



Rewriting Life

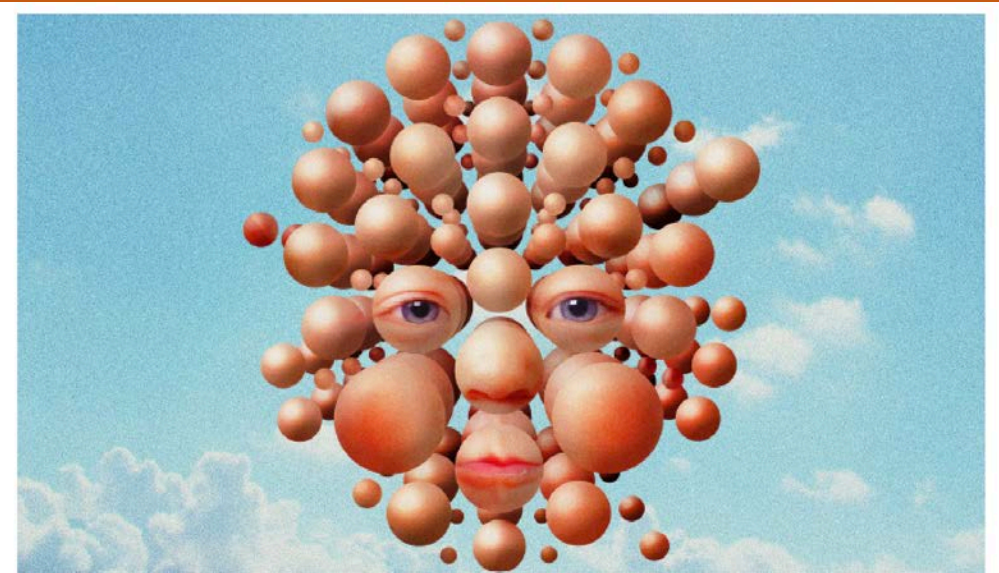
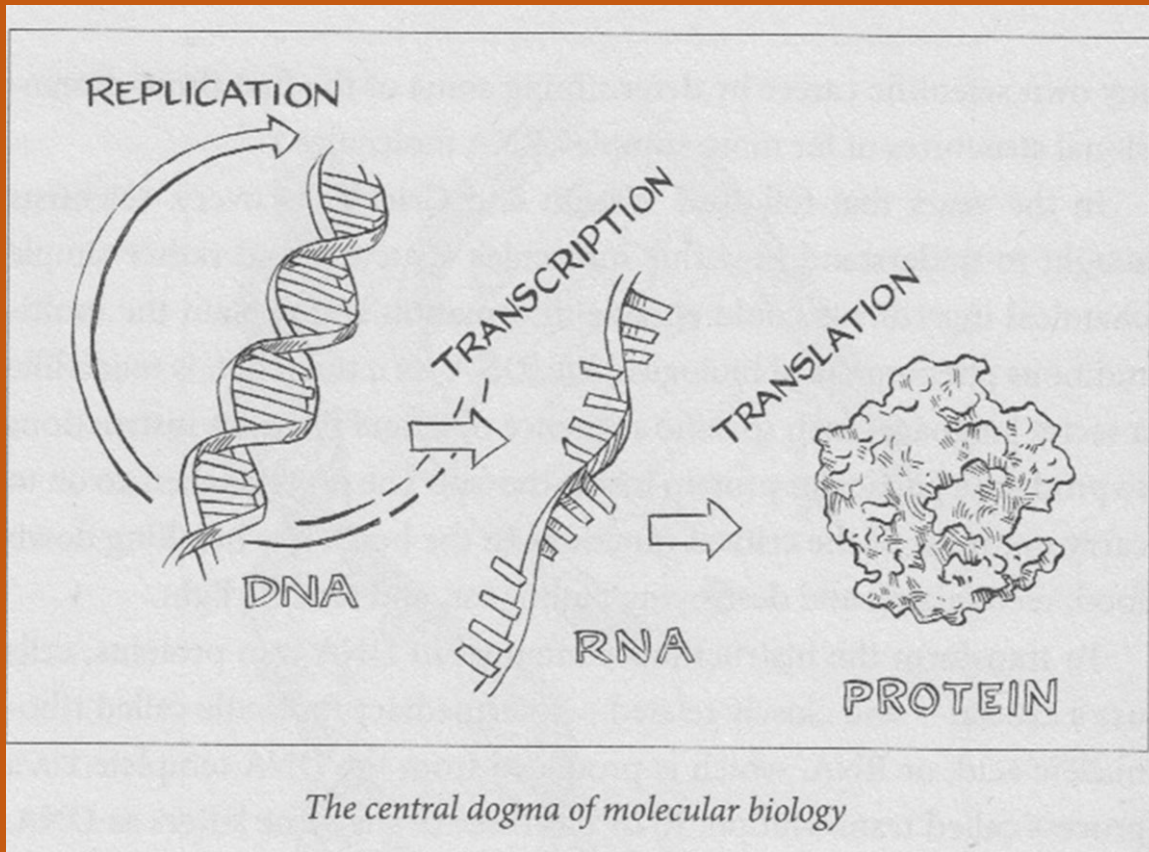
Top U.S. Intelligence Official Calls Gene Editing a WMD Threat

Easy to use. Hard to control. The intelligence community now sees CRISPR as a threat to national safety.

by Antonio Regalado February 9, 2016

**IT IS
2 MINUTES
TO
MIDNIGHT**





Rewriting Life

Engineering the Perfect Baby

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

by Antonio Regalado March 5, 2015

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A global observatory for gene editing

Sheila Jasanoff and J. Benjamin Hurlbut call for an international network of scholars and organizations to support a new kind of conversation.

Thank you.

Charissa N. Terranova, PhD
terranova@utdallas.edu
www.charissaterranova.com

