

Photo of Watson, Crick, and a model of the double helix removed due to copyright restrictions.

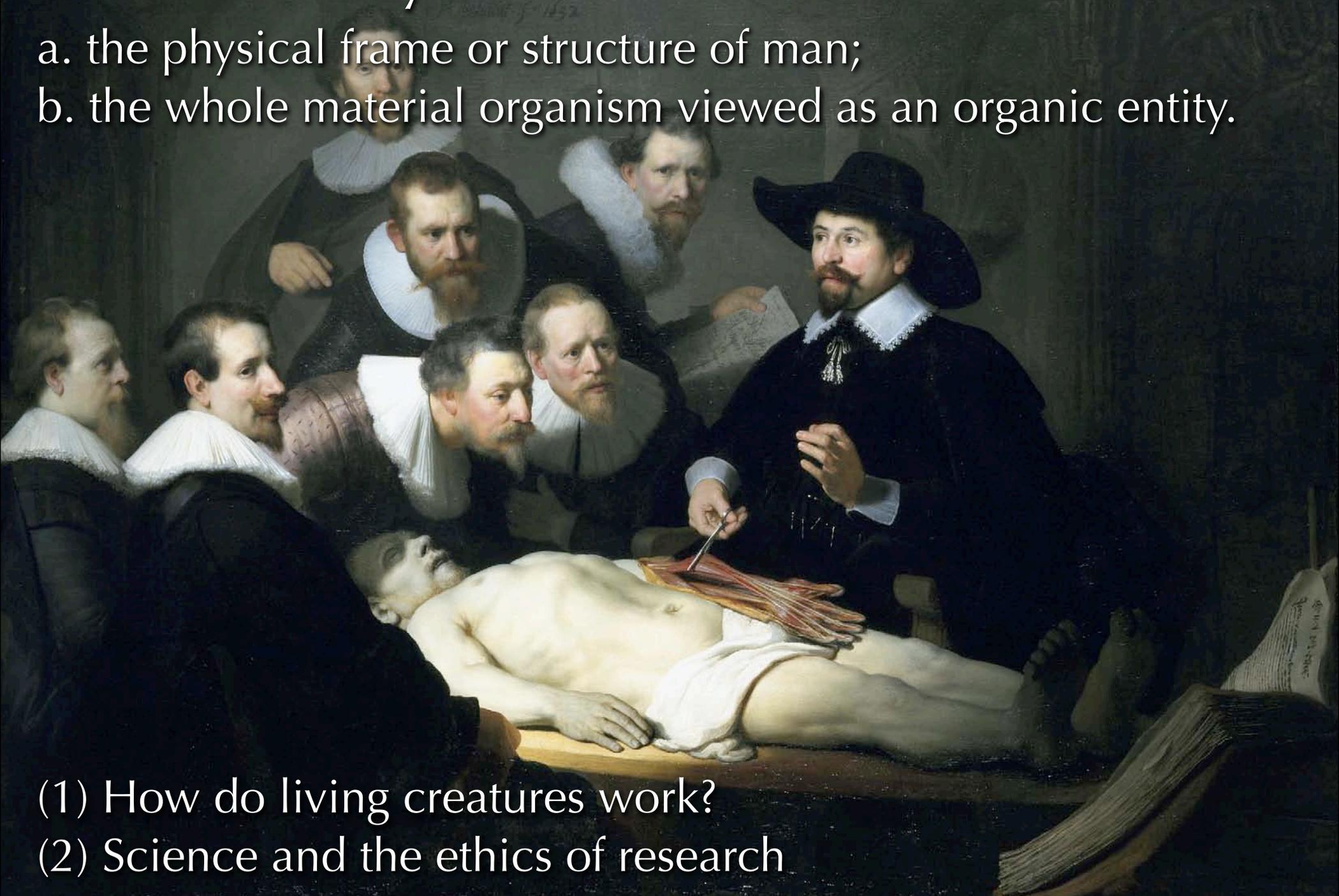
See: <http://www.sciencephoto.com/media/222783/view>

# Models of Inheritance and Genetics

## STS.003, Fall 2010

# Unit 4: Body

- a. the physical frame or structure of man;
- b. the whole material organism viewed as an organic entity.



- (1) How do living creatures work?
- (2) Science and the ethics of research

# OVERVIEW

- Genetics from the 19th to the 21st centuries
- Highlights
- Controversies

Photo of Dolly the sheep removed due to copyright restrictions.

# Aristotle:

# Matter vs. Form



Photo courtesy of [mattfoster](#) on Flickr.

Photo courtesy of [davidjthomas](#) on Flickr.

# Actual vs. Potential

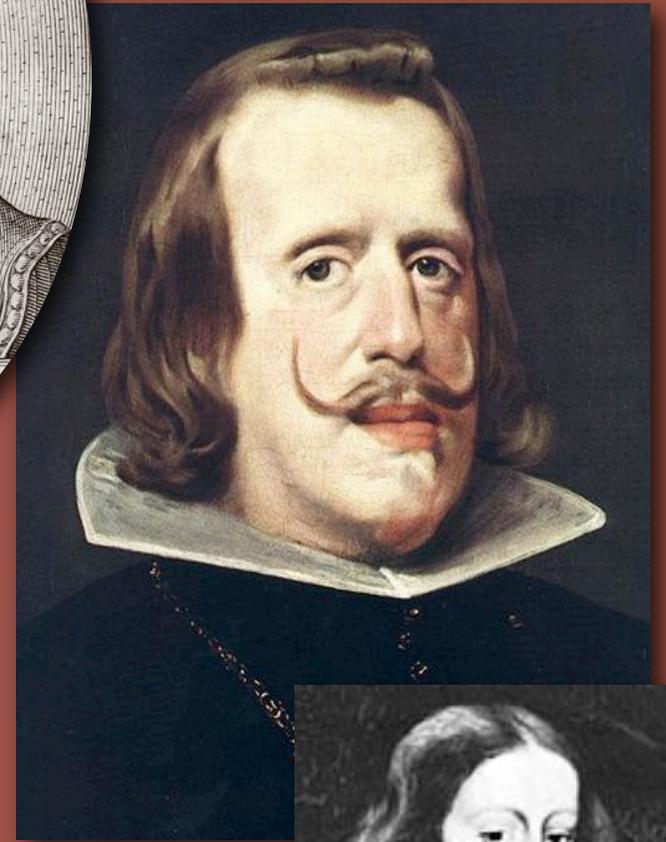
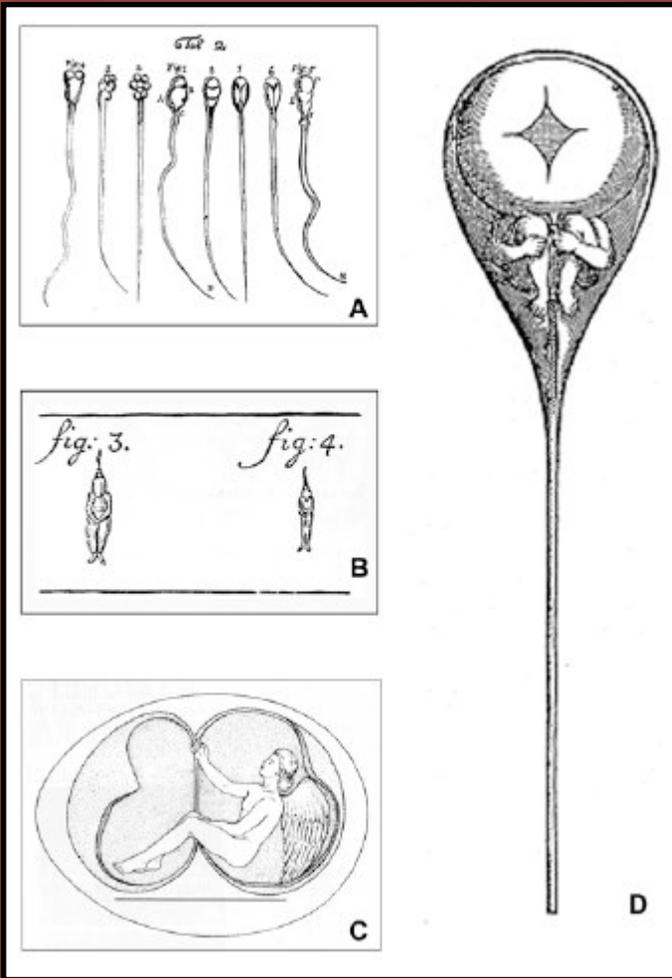
# Intuitive Notions and Experience with Heredity

Chart demonstrating that modern, domestic dog breeds are descendants of grey wolves removed due to copyright restrictions.

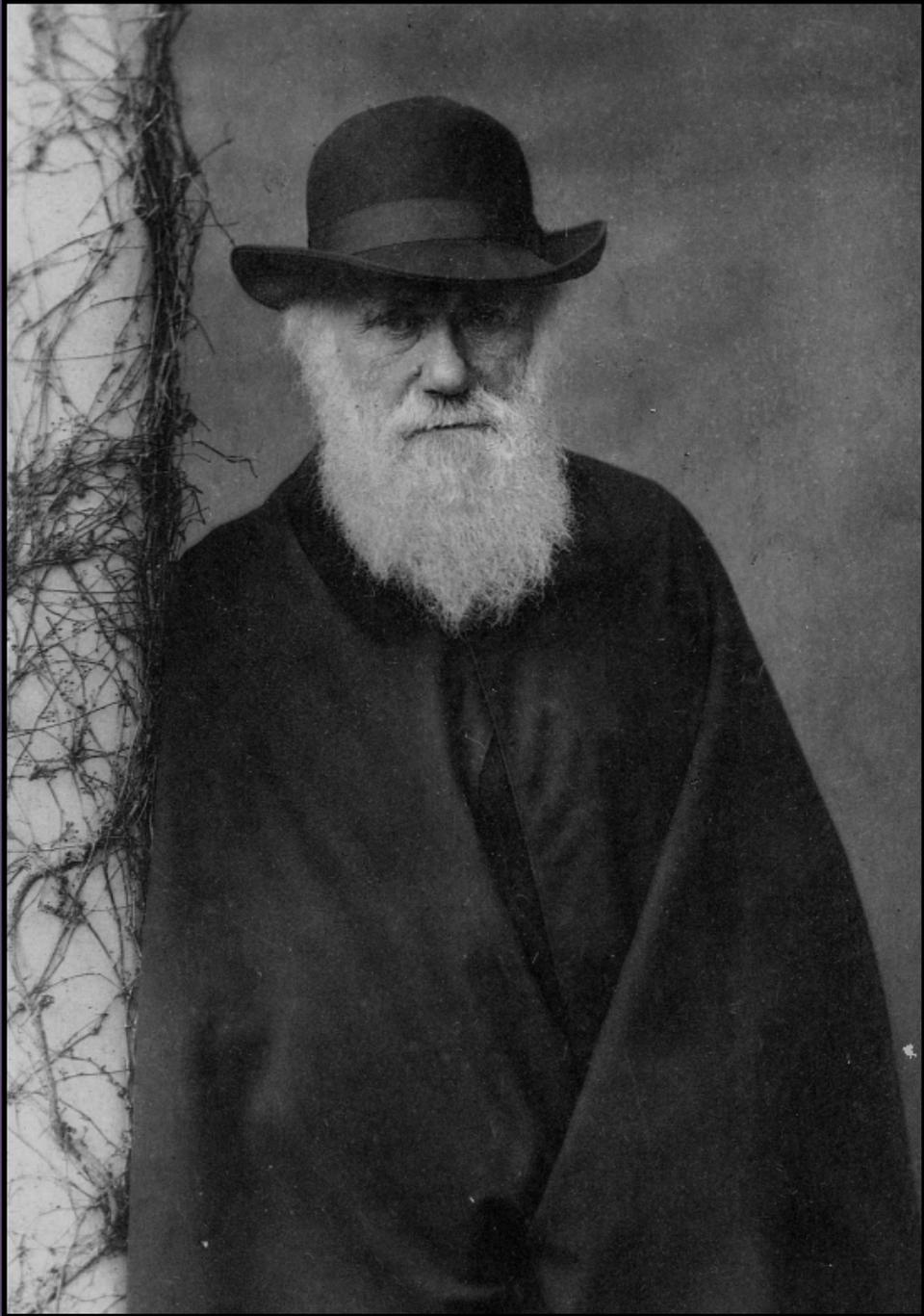
Domesticated  
Animals

Information is passed  
between generations

Variation always  
occurs



Popular Knowledge of Heredity:  
Hapsburg Noses and Lips



Charles Darwin,  
*Variation of Plants and  
Animals under  
Domestication* (1868)

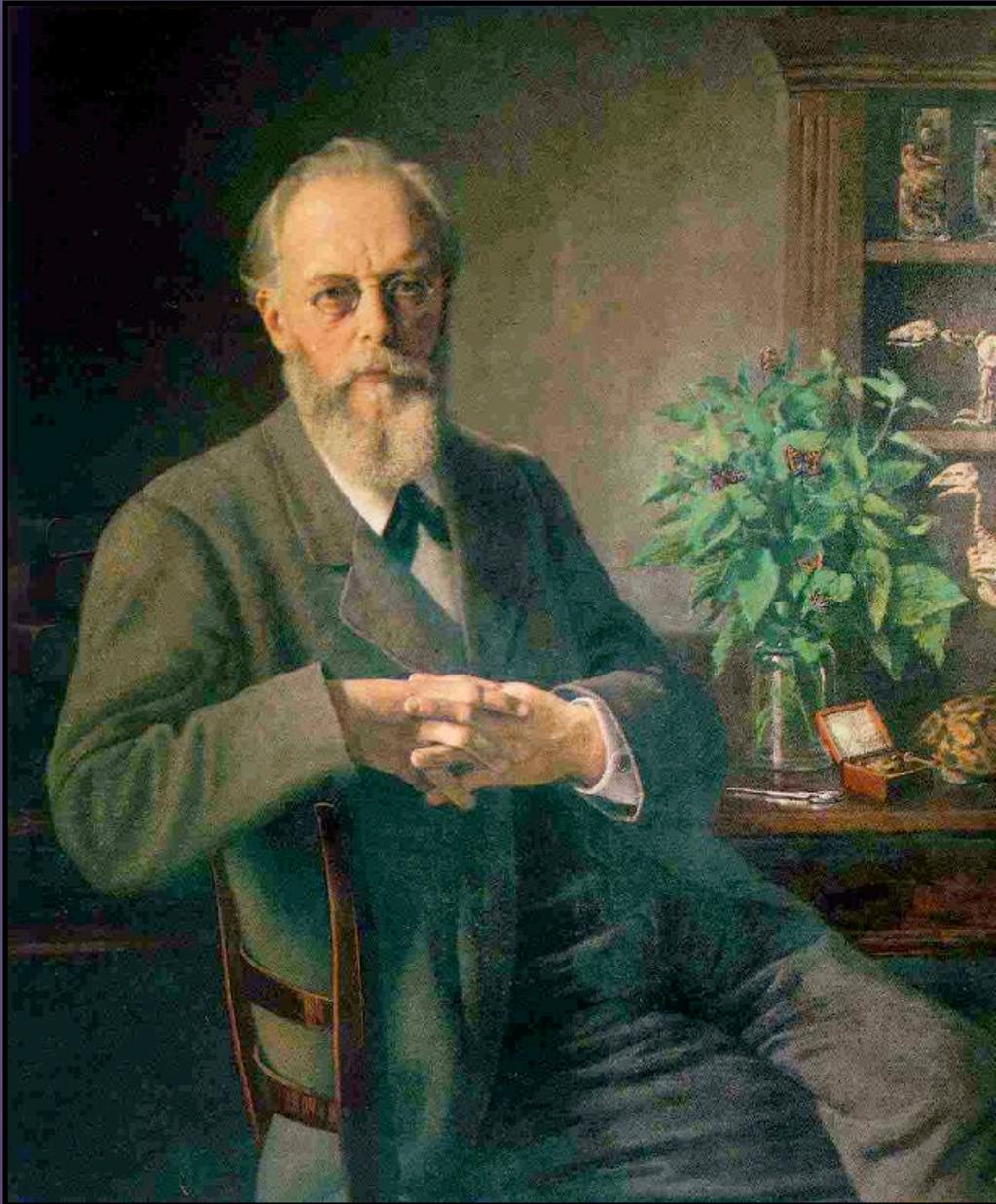
Pangenesis

Gemmules  
Blending inheritance



Gregor Mendel  
1865





August Weismann

Germ cells  
vs.  
Somatic cells

(1883)

Wilhelm Johannsen

“genes”

(1909)

# Bacteriophage

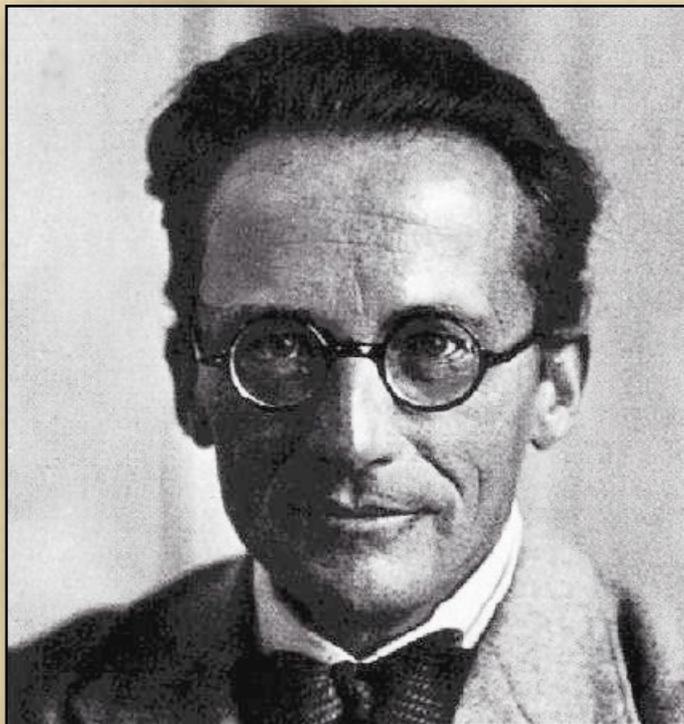
# Hersey-Chase 1952 DNA Carries Genetic Information

Photo of a bacteriophage removed due to copyright restrictions.

Illustration of the Hersey-Chase blender experiment removed due to copyright restrictions.

See: <http://bit.ly/kreyR2>

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# WHAT IS LIFE?

*The Physical Aspect of the  
Living Cell*

BY

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ADVANCED STUDIES

*Based on Lectures delivered under the auspices of  
the Institute at Trinity College, Dublin,  
in February 1948*



4339

CAMBRIDGE

AT THE UNIVERSITY PRESS

1948

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See: <http://www.sciencephoto.com/media/222783/view>

“the structure has novel features which are of considerable biological interest” -- 1953

# The Code of Life?

Illustration of DNA within a cell removed due to copyright restrictions.

Crick, 1957:  
"Central Dogma"

RNA, 1960

		Second Position								
		U		C		A		G		
First Position (5' end)	U	UUU	Phe	UCU	Ser	UAU	Tyr	UGU	Cys	U
	UUC		UCC			UAC		UGC		C
	UUA	Leu	UCA			UAA	Stop	UGA	Stop	A
	UUG		UCG			UAG	Stop	UGG	Trp	G
C	CUU	Leu	CCU	Pro	CAU	His	CGU	Arg	U	
	CUC		CCC		CAC		CGC		C	
	CUA		CCA		CAA		CGA		A	
	CUG		CCG		CAG		CGG		G	
A	AUU	Ile	ACU	Thr	AAU	Asn	AGU	Ser	U	
	AUC		ACC		AAC		AGC		C	
	AUA		ACA		AAA		AGA		A	
	AUG		ACG		AAG		AGG		G	
G	GUU	Val	GCU	Ala	GAU	Asp	GGU	Gly	U	
	GUC		GCC		GAC		GGC		C	
	GUA		GCA		GAA		GGA		A	
	GUG		GCG		GAG		GGG		G	
										Third Position (3' end)

# Human Genome Project

Photo of President Bill Clinton talking about the human genome project removed due to copyright restrictions.

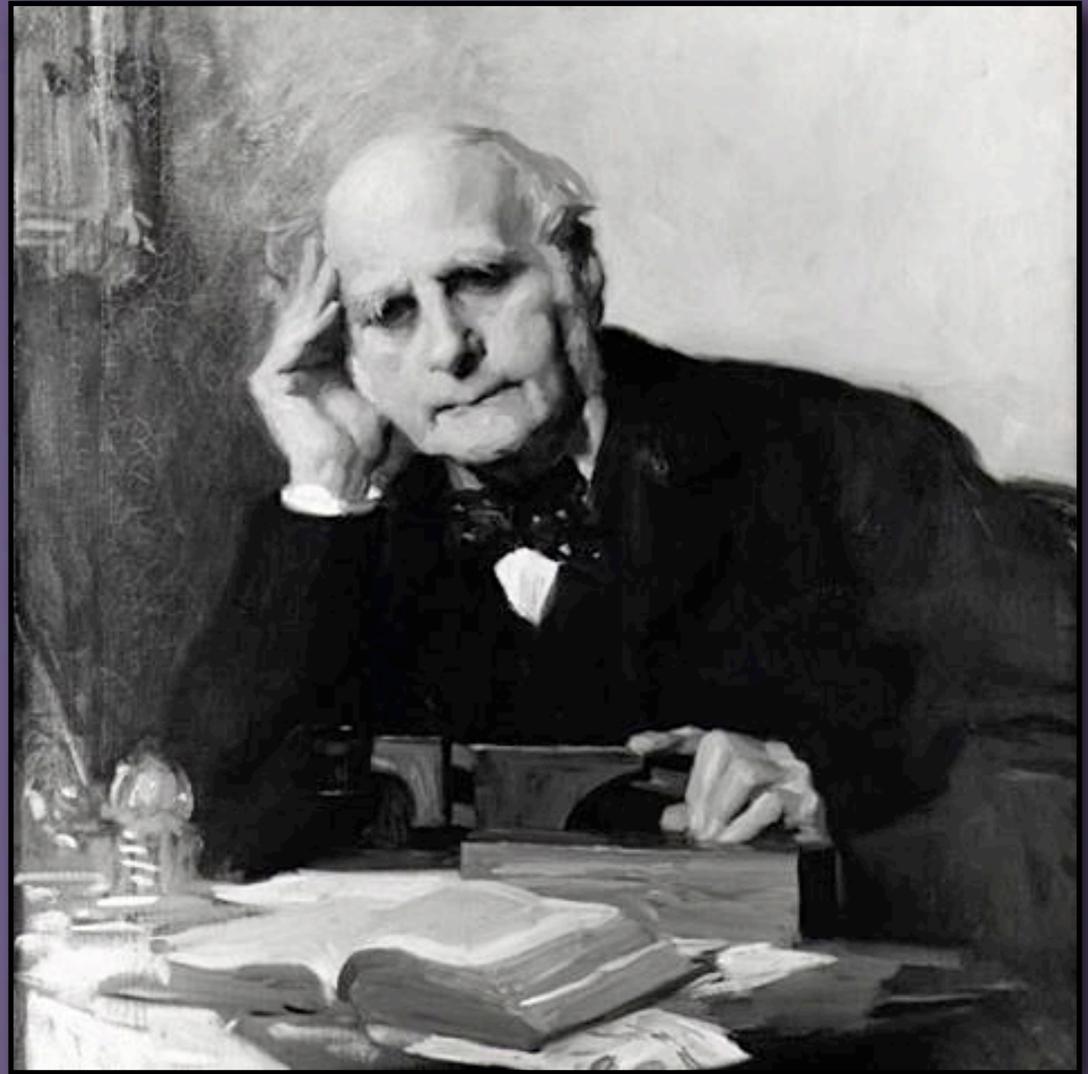
“Today, we are learning the language in which God created life. We are gaining ever more awe for the complexity, the beauty, the wonder of God's most divine and sacred gift. With this profound new knowledge, humankind is on the verge of gaining immense, new power to heal. Genome science will have a real impact on all our lives -- and even more, on the lives of our children. It will revolutionize the diagnosis, prevention and treatment of most, if not all, human diseases.”

-- Bill Clinton, 26 June 2000

# Eugenics?

Francis Galton (1883)

“the science of  
improving the stock”



“If a twentieth part of the cost and pains were spent in measures for the improvement of the human race that is spent on the improvement of the breed of horses and cattle, what a galaxy of genius we might create”

# SUPREME COURT OF THE UNITED STATES.

No. 292.—OCTOBER TERM, 1926.

Carrie Buck, by R. G. Shelton, her  
Guardian and Next Friend, Plaintiff  
in Error,

*vs.*

J. H. Bell, Superintendent of the State  
Colony for Epileptics and Feeble  
Minded.

In Error to the Supreme  
Court of Appeals of the  
State of Virginia.

[May 2, 1927.]

Mr. Justice HOLMES delivered the opinion of the Court.

This is a writ of error to review a judgment of the Supreme Court of Appeals of the State of Virginia, affirming a judgment of the Circuit Court of Amherst County, by which the defendant in error, the superintendent of the State Colony for Epileptics and Feeble Minded, was ordered to perform the operation of salpingectomy upon Carrie Buck, the plaintiff in error, for the purpose of making her sterile. 143 Va. 310. The case comes here upon the contention that the statute authorizing the judgment is void under the Fourteenth Amendment as denying to the plaintiff in error due process of law and the equal protection of the laws.

Carrie Buck is a feeble minded white woman who was committed to the State Colony above mentioned in due form. She is the daughter of a feeble minded mother in the same institution, and the mother of an illegitimate feeble minded child. She was eighteen years old at the time of the trial of her case in the Circuit Court, in the latter part of 1924. An Act of Virginia approved March 20, 1924, recites that the health of the patient and the welfare of society may be promoted in certain cases by the sterilization of mental defectives, under careful safeguard, &c.; that the sterilization may be effected in males by vasectomy and in females by salpingectomy, without serious pain or substantial danger to life; that

“Three generations of  
imbeciles is enough”

# Race?

Triangle plot of racial differentiation removed due to copyright restrictions.  
See: [Admixture Triangle](#).

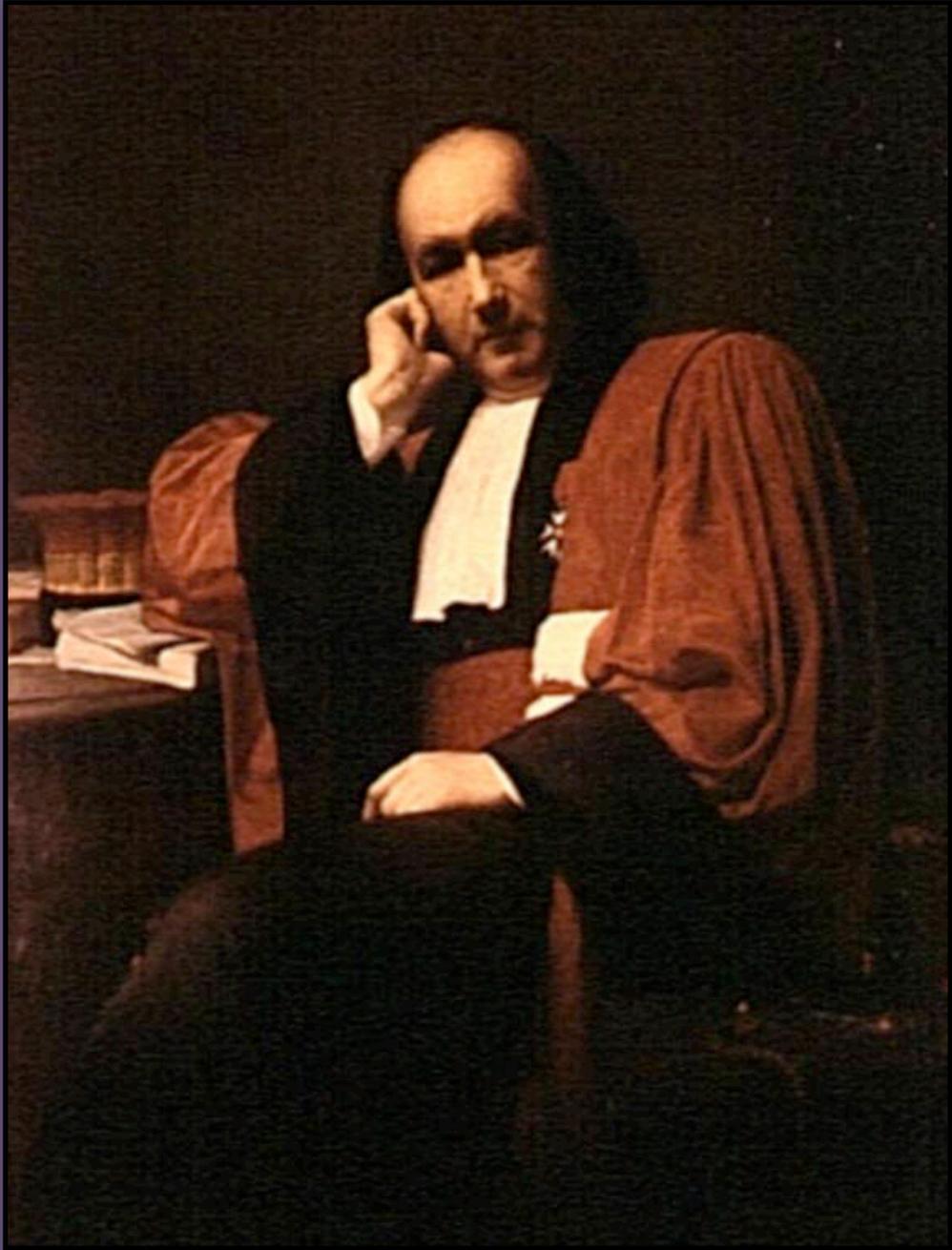
Cover of "Scientific American" (December, 2003) with the cover "Does Race Exist?" removed due to copyright restrictions.

"Races ... are thus rather like angels. Many people believe in them, devoutly. They can even tell you what properties they have. But the closer you try to examine them to discover their real nature, the more elusive they become."  
-- Jonathan Marks, 2005

# Determinism?

Cover of "Concrete Boot," a book in "The XYY Man" series by Kenneth Royce, removed due to copyright restrictions.

Cover of "Time" (September 23, 1998) removed due to copyright restrictions. The cover story is entitled "The IQ Gene?"



# Engineering?

Claude Bernard  
(1865)

“man can probably never act as easily on animal or vegetable, as on mineral, species”

# 1972: Paul Berg creates a recombinant virus

Photo of Paul Berg removed due to copyright restrictions.

Chart demonstrating the increase in global area of biotechnology crops from 1996 to 2003 removed due to copyright restrictions.

# 1990s: Routinization of genetically engineered commodities

Photo of a bottle of Hepatitis B Vaccine removed due to copyright restrictions.

Image removed due to copyright restrictions: See: [Synthetic Biology](#).

(1) “Bring Your Genes to MIT”: As part of freshman orientation, all incoming students are asked (but not required) to submit a cheek swab in August for genetic analysis. Geneticists will screen three alleles, related to folate, lactose, and alcohol metabolism. Students will be given their results and then join in faculty-led discussions of the science and meaning of modern genetics.

(2) Frustrated with the politicization of science in the United States, you move your reproductive biology lab from Boston to an unregulated overseas locale and set out to clone a human.

(3) Now that large sections of the human and Neanderthal genomes have been sequenced, you set out to use targeted mutation technologies to transform a human cell line into a Neanderthal cell line and then use somatic cell nuclear transfer to produce a living Neanderthal.

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STS.003 The Rise of Modern Science  
Fall 2010

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