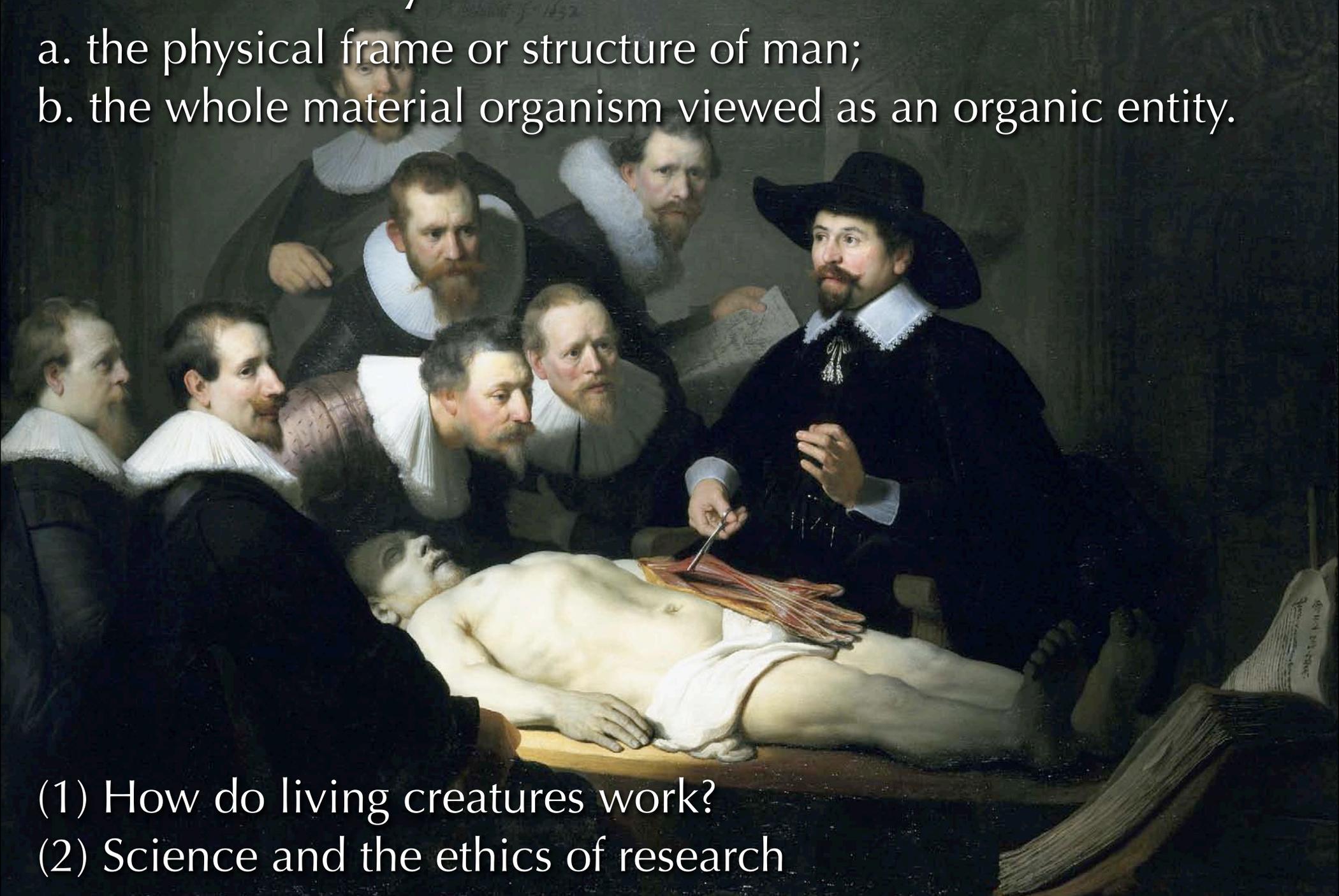


# Cell Theory

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

# History of Human Dissection

Advertisements for Bodyworlds removed due to copyright restrictions.

See: <http://www.bodyworlds.com>



# Aristotle:

# Matter vs. Form



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

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

# Actual vs. Potential

# Johann Blumenbach

*bildungstrieb*  
“formative pressure”

Photos of the developmental stages of a duck, from embryo to duckling, removed due to copyright restrictions.



D. Johann Friederich Blumenbach  
der Med. Prof. ord. zu Göttingen  
über  
den Bildungstrieb  
und das  
Zeugungsgeschäfte.



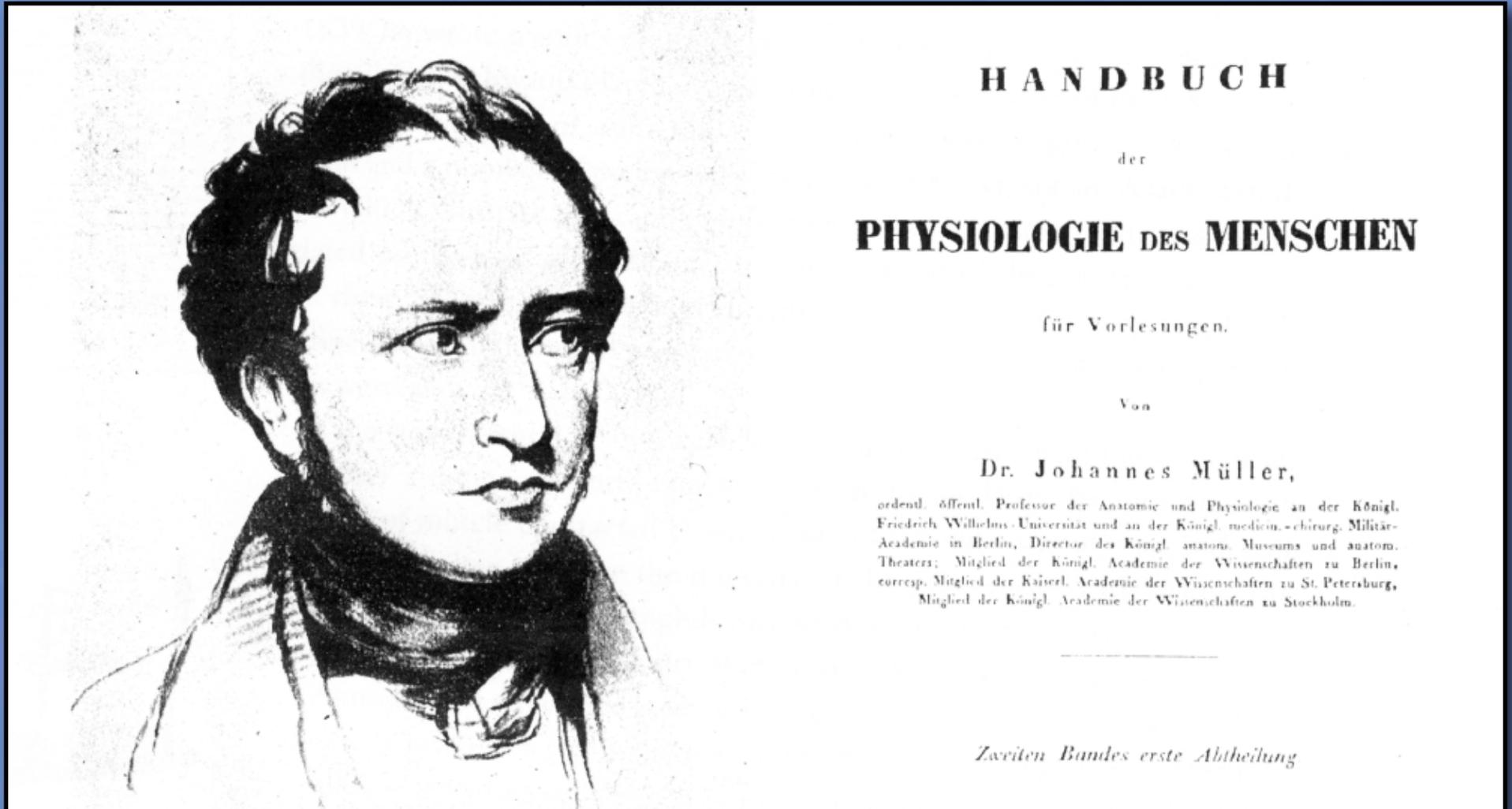
Göttingen,  
bey Johann Christian Dieterich, 1781.

Stockton-Hough  
LIBRARY.

# Studies of Hydra: Regeneration

Photo of a hydra removed due to copyright restrictions.

# Vitalism and “Romantic Science”



Johannes Muller, Professor of Physiology  
University of Berlin, 1833-1858



## Romanticism and Spontaneous Generation

Organic Life beneath the shoreless waves  
Was born and nurs'd in Ocean's pearly caves  
First forms minute, unseen by spheric glass,  
Move on the mud, or pierce the watery mass;  
These, as successive generations bloom,  
New powers acquire, and larger limbs assume;  
Whence countless groups of vegetation spring,  
And breathing realms of fin, and feet, and wing.

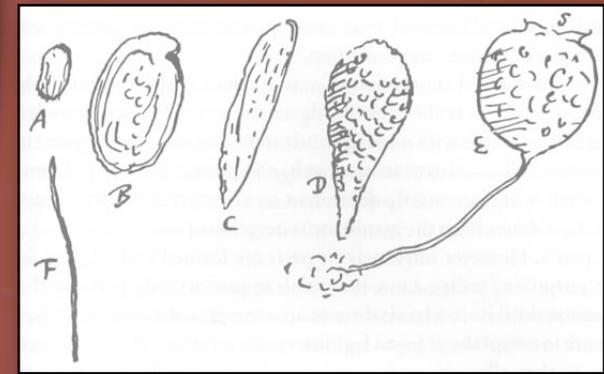
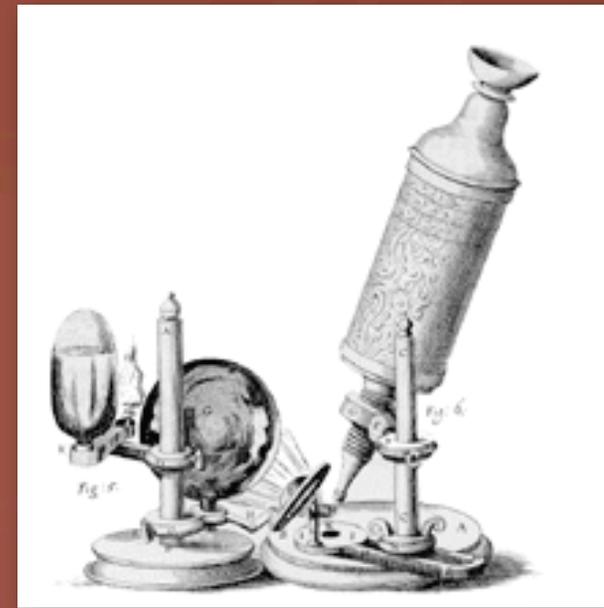
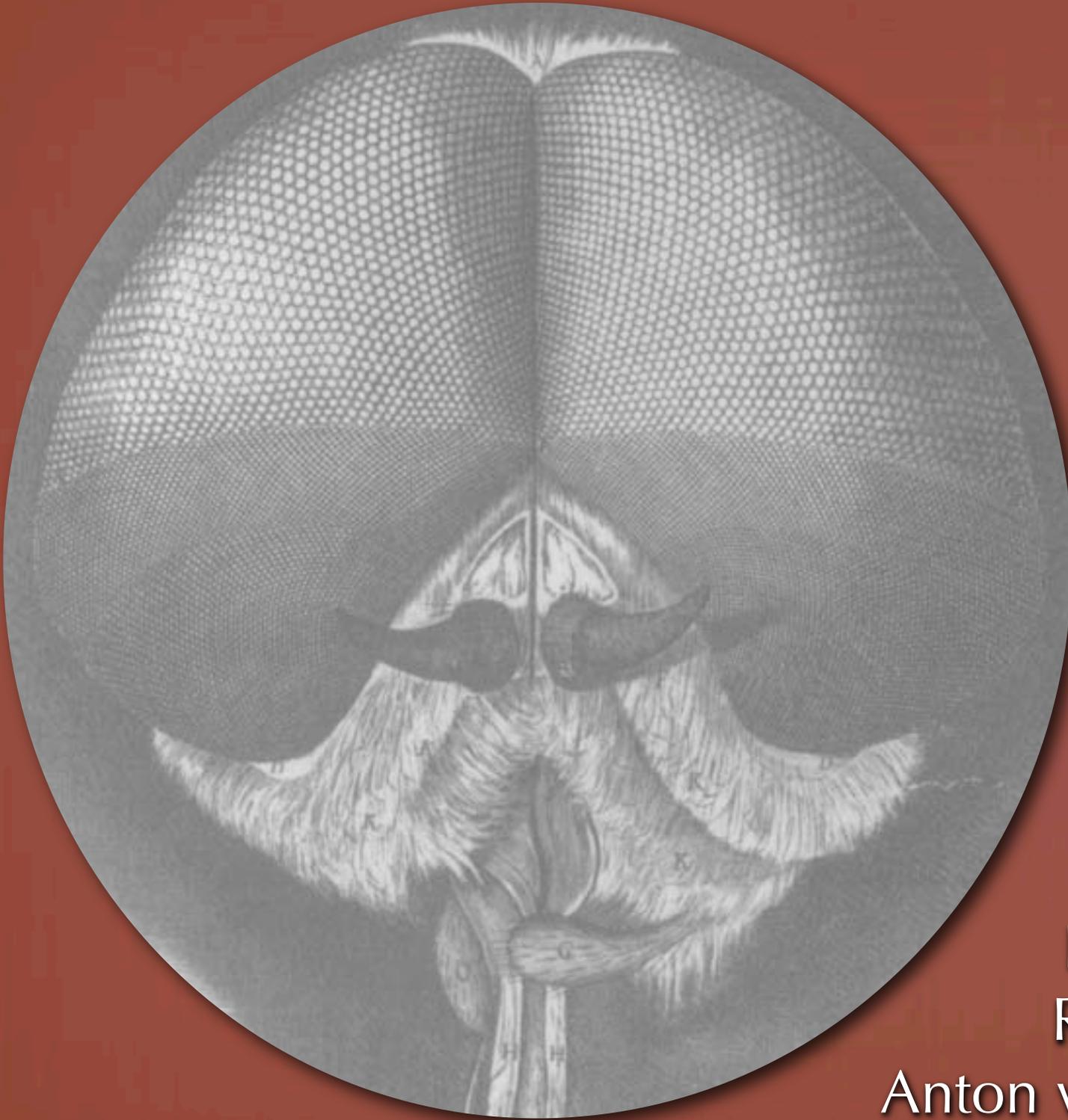
-- Erasmus Darwin, 1803



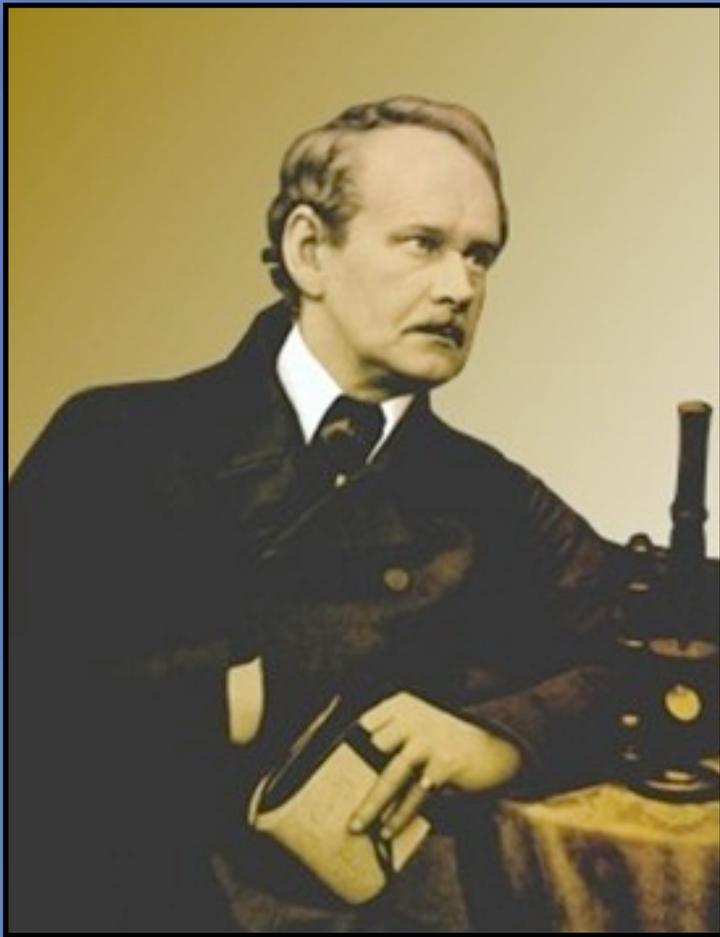
Lazzaro Spallanzani  
(1729-1799)

## Experiments on Spontaneous Generation

Diagram of spontaneous generation experiments  
removed due to copyright restrictions.



Early Microscopy:  
Robert Hooke and  
Anton van Leeuwenhoek



Matthias Schleiden,  
Structure of Plants, 1838

# Theodor Schwann: Cell Theory



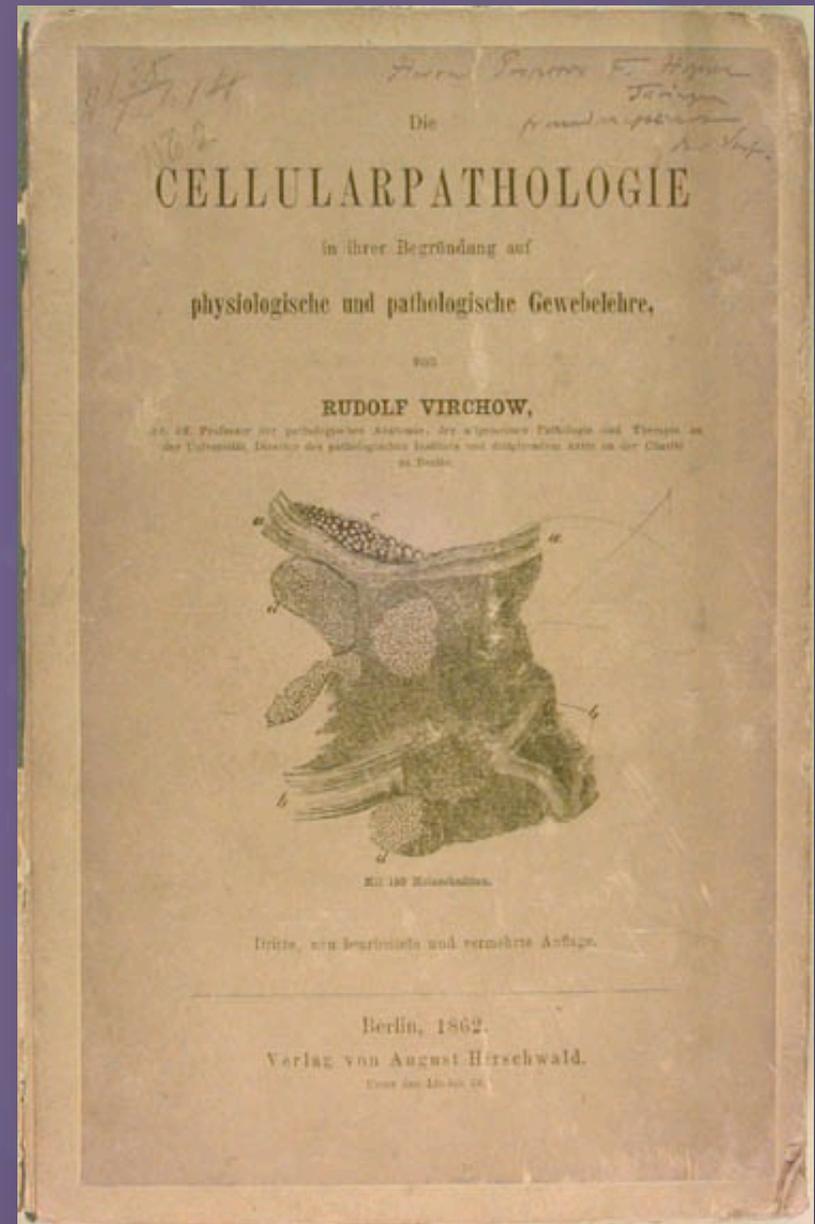
*Microscopic Researches into Accordance in the  
Structure and Growth of Animals and Plants (1839)*

# Berlin Physical Society, 1845

“there are no force in organisms other than physicochemical forces”



Rudolf Virchow,  
*Cellular Pathology*





Images of sodium, potassium, magnesium, and iodine removed due to copyright restrictions.

# Humphrey Davy Electrochemistry and Elements

# Michael Faraday



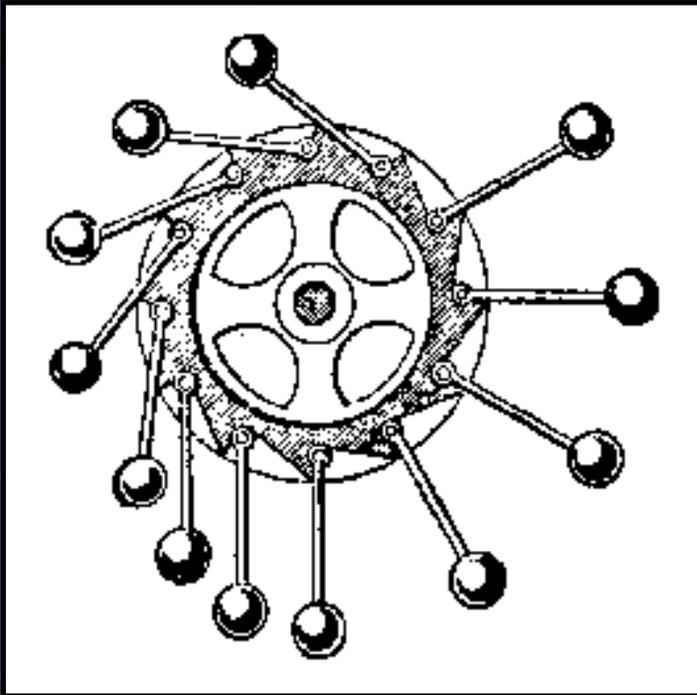
Image of benzene experiments due to copyright restrictions.

Friedrich Wöhler, 1828

Ammonium Cyanate  $\longrightarrow$  Urea

Image of a German stamp  
commemorating Friedrich  
Wöhler removed due to  
copyright restrictions.





# Hermann Helmholtz

Animal Heat, Vitalism,  
and Perpetual Motion

“The animal body therefore does not differ from the steam-engine as regards the manner in which it obtains heat and force”

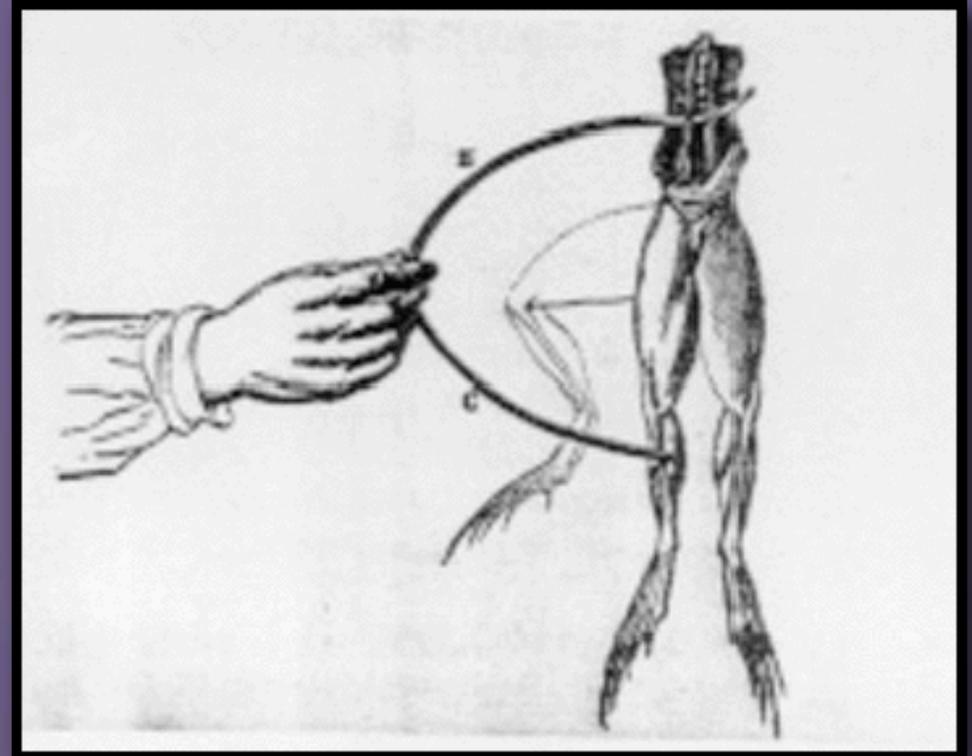


Illustration of Pasteur's experiment to disprove spontaneous generation removed due to copyright restrictions.

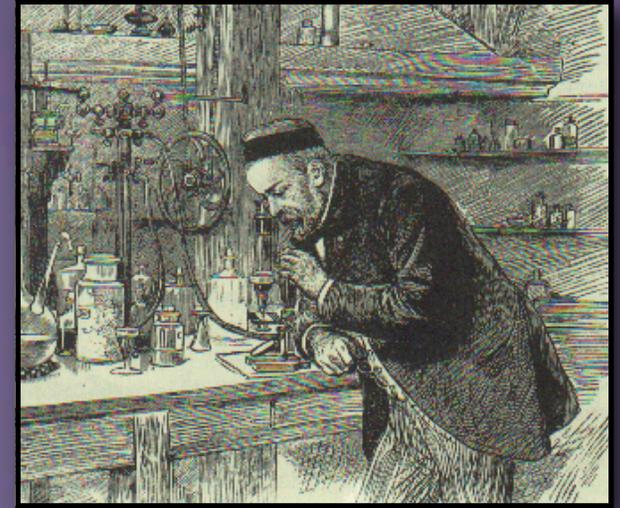


Image of a flask used by Pasteur removed due to copyright restrictions.

# Louis Pasteur

## Disproof of Spontaneous Generation

Yeast

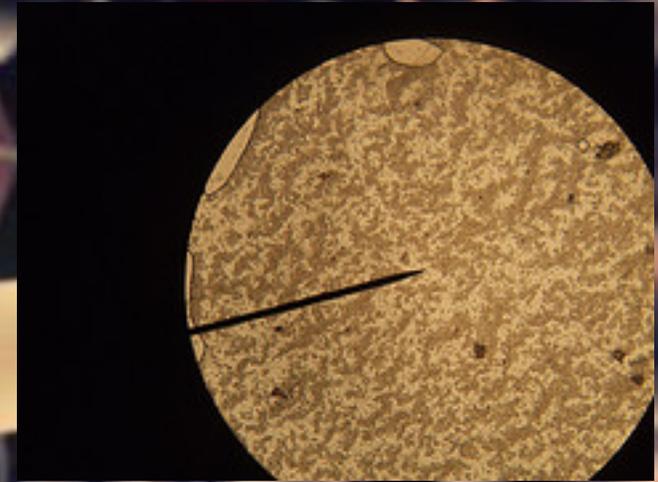


Photo courtesy of [tessawatson](#) on Flickr.

Photo courtesy of [ChristmasStockImages.com](#).

Fermentation: Wine, Beer, and Microbes



# Diseases of Silkworms: Bacteria



# Robert Koch, Studies of Anthrax, 1876



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

Image of anthrax removed  
due to copyright  
restrictions.

# Koch's Technology: Petri Dishes and Pure Cultures

Photo of a petri dish culture removed  
due to copyright restrictions.



# Koch's Postulates

Illustration showing how pure cultures are created removed due to copyright restrictions.

- Pathogen found in all victims
- Can be isolated and grown in pure culture
- Causes disease when infected into healthy animal
- Can be re-isolated from the new victims



Robert Koch, 1882  
*Mycobacterium tuberculosis*

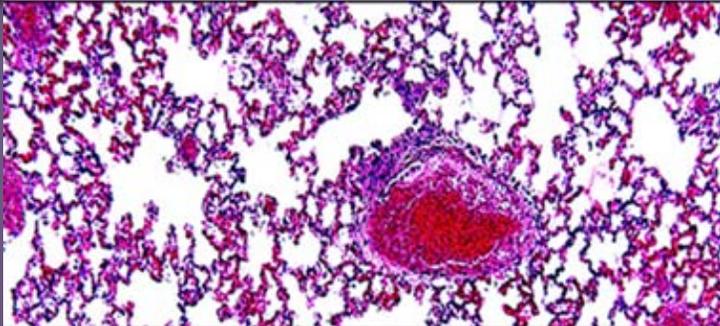


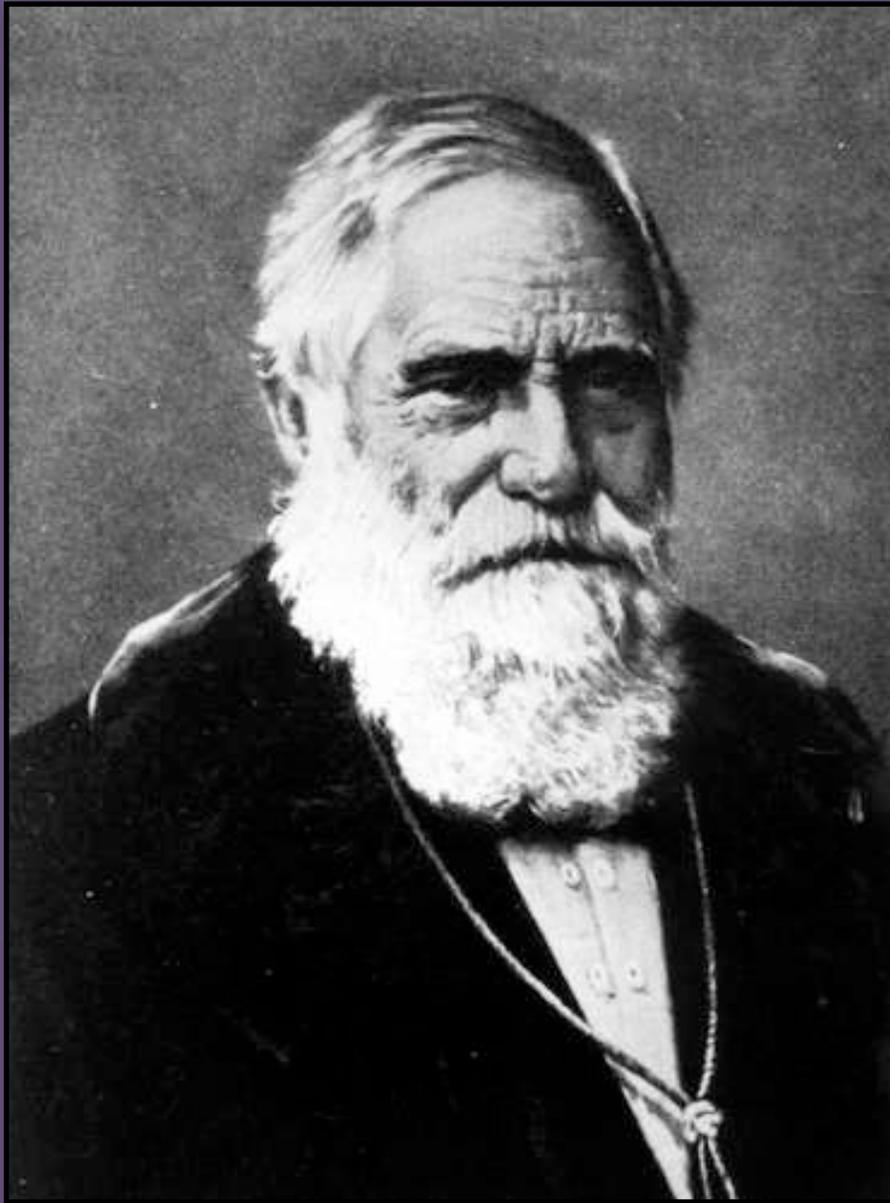
Photo courtesy of [AJC1](#) on Flickr.



Photo courtesy of [AJC1](#) on Flickr.

## Koch's Egypt Expedition: *Vibrio cholerae*, 1883





Max von Pettenkofer:

## Testing the etiology of cholera

“Even if I be mistaken, and this experiment that I am making imperils my life, I shall look death quietly in the face, for what I am doing is no frivolous or cowardly act of suicide, but I shall die in the service of science as a soldier perishes on the field of honor.” -- 1892

MIT OpenCourseWare  
<http://ocw.mit.edu>

STS.003 The Rise of Modern Science  
Fall 2010

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.