

Using Online Resources



MISSOURI
S&T

Dave Westenberg
Associate Professor of Biology Missouri S&T

Using Available Online Resources to Facilitate the Flipped Classroom and Increase Student Engagement

Presentation Outline

- > Defining The Flipped Classroom
- > Online Resources
- > Examples

The Flipped Classroom Defined

- > The **flipped classroom** is a pedagogical model in which the typical lecture and homework elements of a course are reversed. Short video lectures are viewed by students at home before the class session, while in-class time is devoted to exercises, projects, or discussions.
- > From Educause.edu

Flipped Classroom vs. Flipped Learning

- > Flipped Learning requires four pillars:
- > Flexible Environment
- > Learning Culture
- > Intentional Content
- > Professional Educator
- > From the Flipped Learning Network.
FlippedLearning.org

My Motivation

- > Observations
- > Lab students not well prepared
- > Distracted during in-lab demonstrations
- > Limited opportunity for creativity
- > How to improve preparation
- > How to enable creativity

- > Lecture students most engaged in review session
- > How to simulate in classroom

My Approach

- > Record lab presentations and demonstration
- > Explain background
- > Show techniques
- > Students choose techniques, plan own experiments
- > Resulted in better prepared, engaged participation
- > How about the classroom?
- > Don't just flip to flip

Online Resources in Biology

- > Howard Hughes Medical Institute
 - Holiday Lectures
 - BioInteractive
- > iBiology
- > TED Ed
- > National Center For Case Study Teaching

Ted Ed – Ed.Ted.Com



Watch

Think

Dig Deeper

Discuss

Customize This Lesson

88

Create and share a new lesson based
on this one.

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NEW ON IBIOLOGY

out of the cell

Simple Sugar → Acetyl-CoA → Amorpho-4,11-diene → Arachidonic acid

Acetyl-CoA → HMG-CoA → Mevalonate → Mevalonate-P → Mevalonate-PP → PP → DMAP → ERG19 → FPP → ERG20 → OPP → FPP → Met → Met-P → ERG29 → Squalene → ERG17,11,16,25,2,3,5,4 → Diacylglycerol

ERG10, ERG13, HMGCR, ERG12, ERG8, ERG19, ERG20, ERG29

Ro, 2006. *Nature* 440:9

[Jay Keasling: Engineering Microbes to Solve Global Challenges](#)

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Educator Resources (for educators only)

SEARCH

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National Center for Case Study Teaching

Sciencecases.lib.buffalo.edu



NATIONAL CENTER FOR
CASE STUDY TEACHING IN SCIENCE

Site Search

ABOUT | CASE COLLECTION | TRAINING | TEACHING RESOURCES

FEATURED CASE

En Garde! Animal Structures and What They Mean

D. Parks Collins, Mitchell Community College

[VIEW CASE >](#)



ABOUT

The mission of the National Center for Case Study Teaching in Science (NCCSTS) is to promote the nationwide application of active learning techniques to the teaching of science, with a particular emphasis on case studies and problem-based learning.

[Learn More >](#)

CASE COLLECTION



Our peer-reviewed collection contains over 602 cases in all areas of science.

[Learn More >](#)

VIDEOS ON CASE TEACHING

The National Center for Case Study Teaching in Science has produced two videos that demonstrate how to teach science using case studies in classroom discussions and small group learning.

[Learn More >](#)

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Howard Hughes Medical Institute

www.hhmi.org/bioInteractive

The screenshot shows the BioInteractive website homepage. At the top, the HHMI BioInteractive logo is displayed, followed by navigation links for OUTREACH, ABOUT, BLOG, and HELP. Below the header is a search bar with the placeholder text "Search hundreds of free science education resources" and a magnifying glass icon. Two social media links are present: "Subscribe to BioInteractive News" with an envelope icon and "Like BioInteractive on Facebook" with a Facebook icon. The main content area features two large images: one showing a close-up of a green, textured surface (possibly a microorganism or plant) against a dark background, and another showing a landscape with a hexagonal grid overlay and the text "PATTERNS AND PROCESSES IN ECOLOGY".

OUTREACH ▾ ABOUT ▾ BLOG ▾ HELP ▾

hhmi | BioInteractive

Topics ▾ Resource Types ▾ Collections ▾

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PATTERNS AND PROCESSES IN
'ECOLOGY'

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Selecting online resources

- > Focus on learning objectives

Microbial Evolution



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Learning Objectives

- > Describe evidence for evolution of microbial diversity.
- > Predict the outcome from exposing microorganisms to various environmental factors.
- > Explain the impact of microorganisms in elemental cycles.

Early life

> Pre-Watch

- Changing Planet: Past, Present, Future.
- Sections 15 to 27

OUTREACH > ABOUT > BLOG > HELP >

hhmi | BioInteractive Topics Resource Types Collections

Search hundreds of free science education resources

Changing Planet: Past, Present, Future

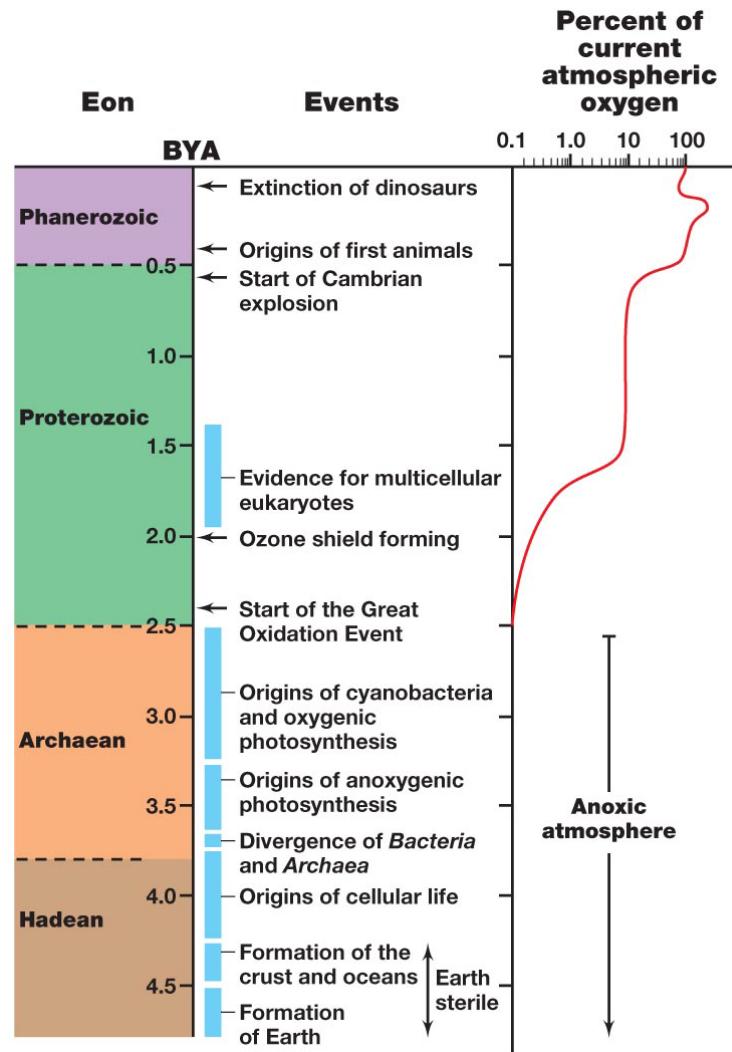


Summary

Has Earth changed over deep time? How did Earth shape life and life shape Earth? What does Earth's climate in the distant past tell us about the future?

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History of the Earth



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Studying life over time

- > How do we know certain organisms are related to each other?
- > How do we identify common ancestors?

Fossil record of microbes?

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Cross section of stromatolite



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Stromatolites

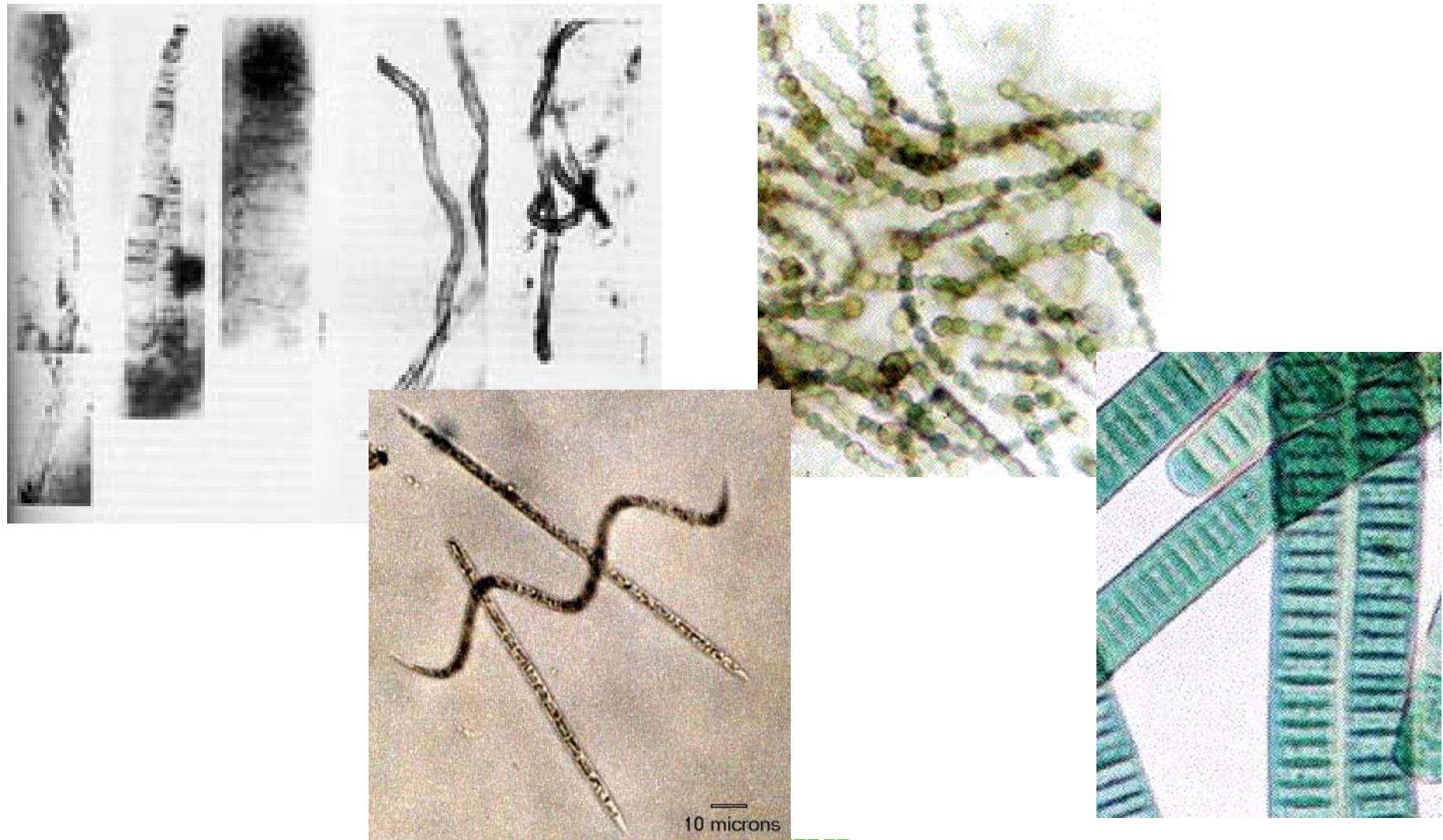
- > Fossilized microbial mats of filamentous prokaryotes and trapped sediment
- > Found in rocks 3.5 billion years old or younger
- > Comparisons of ancient and modern stromatolites
 - Anoxygenic phototrophic filamentous bacteria formed ancient stromatolites
 - Oxygenic phototrophic cyanobacteria dominate modern stromatolites

Modern, living stromatolites



<http://cas.bellarmine.edu/tietjen/Evolution/stromatolites2.htm>

Stromatolite fossils and extant microbes

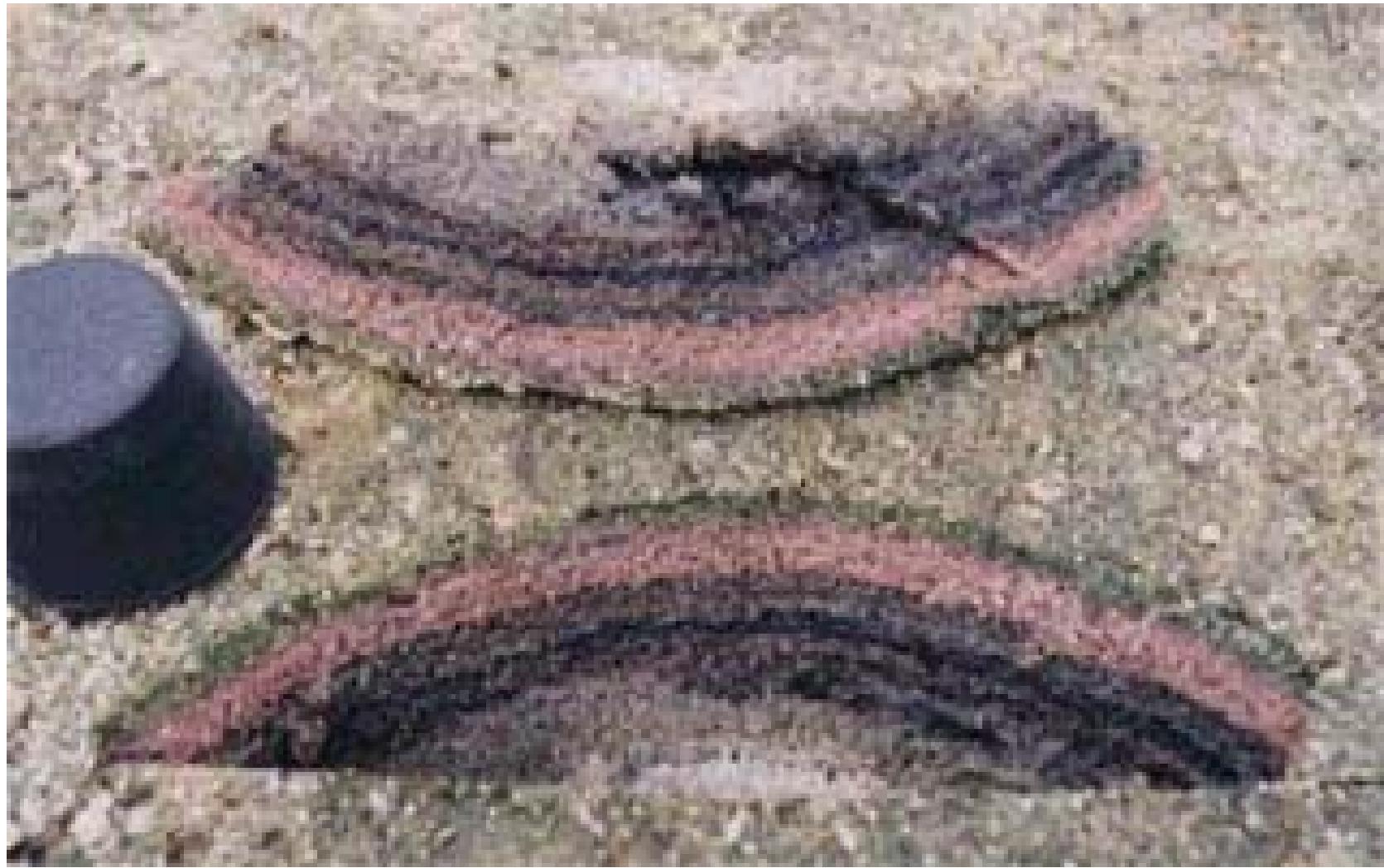


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How do stromatolites form?

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Microbial Mats



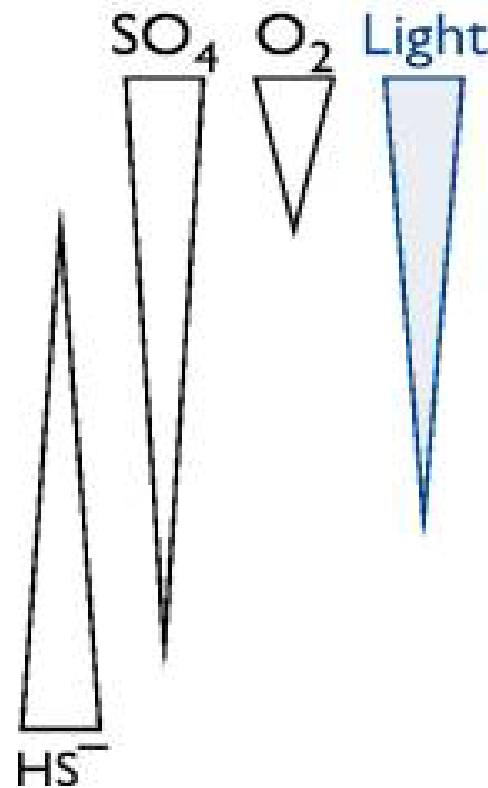
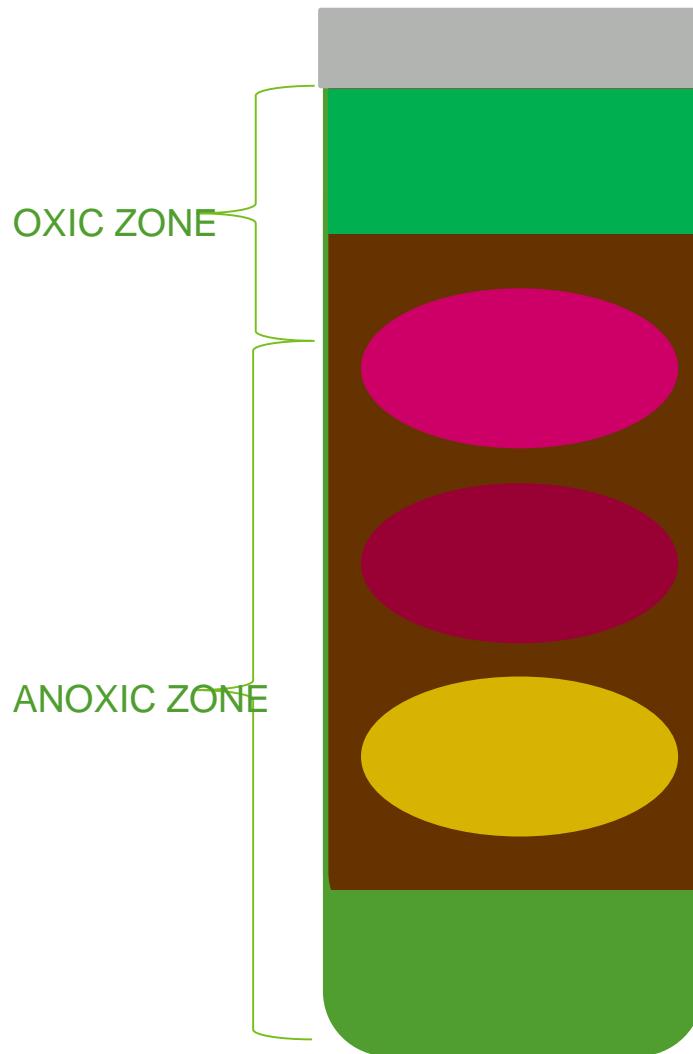
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Microbial Mats

- > What factors might be responsible for the layering effect?

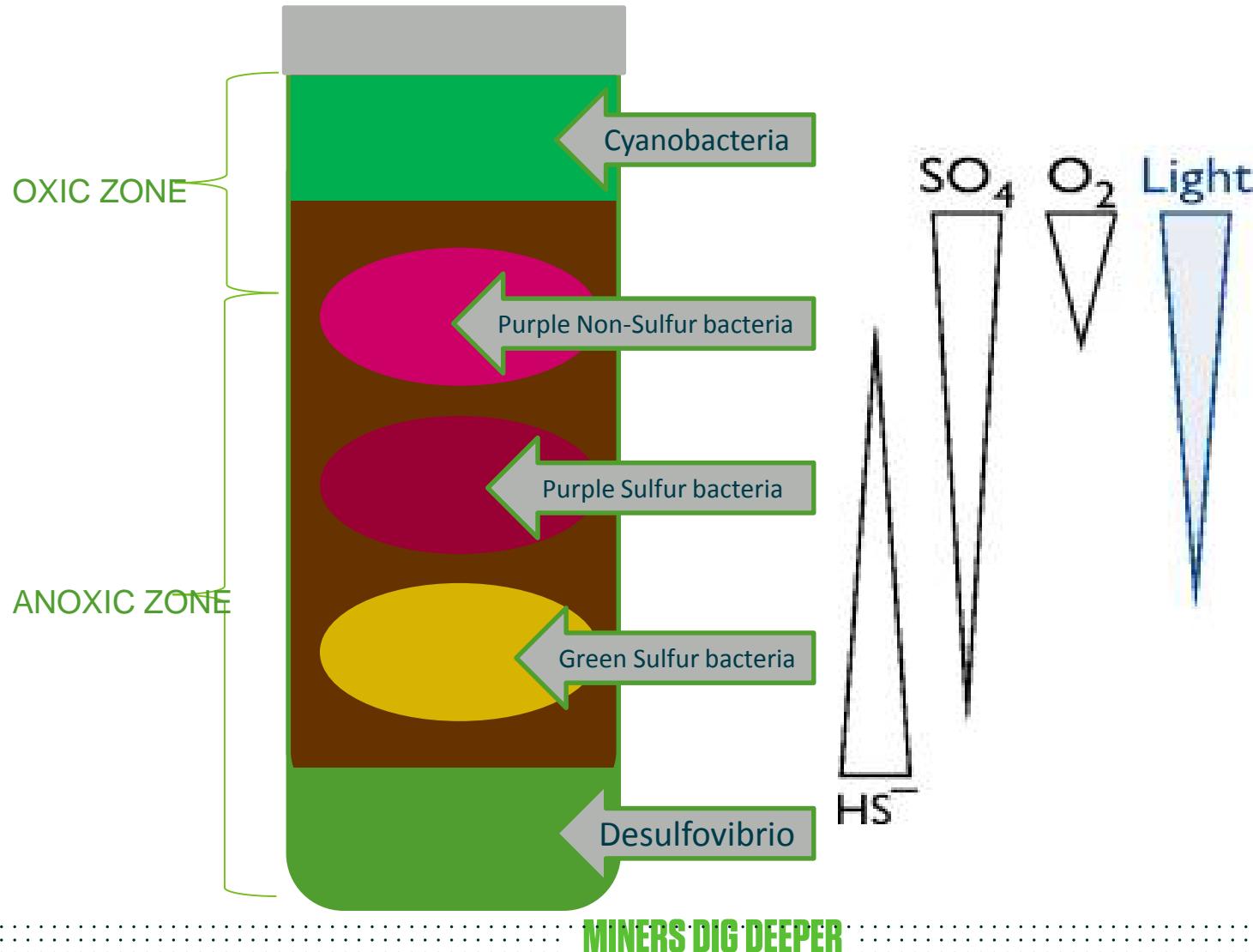


Winogradsky Column



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Winogradsky Column

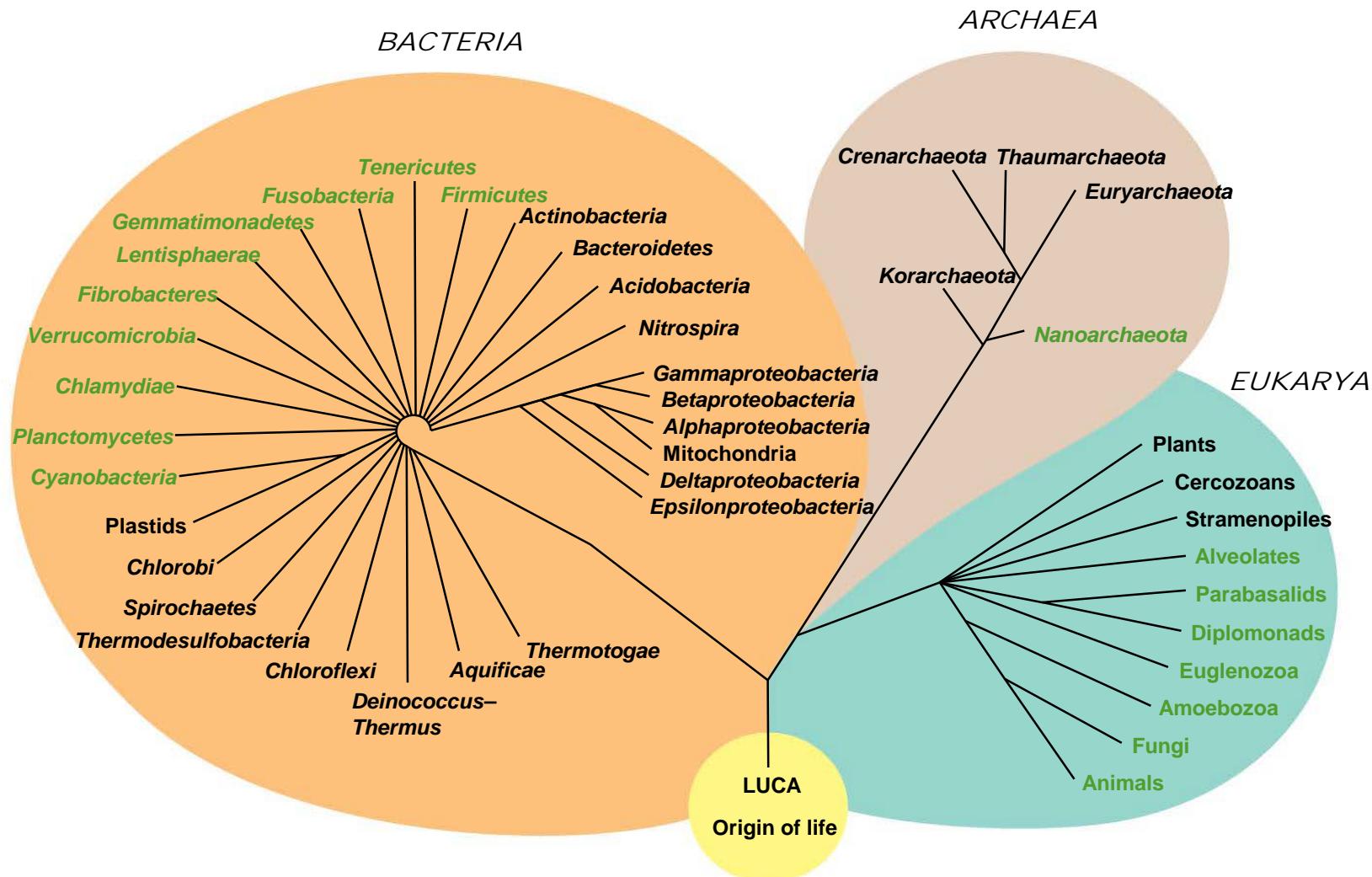


Winogradsky Column



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Tree of Life



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In Class Activity from BioInteractive

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Learning Objectives

- > experimental design
- > data analysis
- > differentiation and gene expression
- > microarrays as a research tool
- > embryonic development and the germ layers

Stem Cells and Diabetes - The Future

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Diabetes Research – What is Known

- > β cells are not generated from adult stem cells in the pancreas.
- > It is unlikely that a cure for diabetes will come from adult stem cells.
- > Embryonic stem cells have been shown to generate insulin-producing β cells.

What Has Been Tried: Whole organ pancreas transplants

- > Problem: not enough organs to meet the demand
- > Problem: must take powerful immunosuppressants

What Has Been Tried: Injections of pancreatic islet cells

- > Problem: less than 8% of these transplants have been successful
- > Problem: immunosuppressants are required

Possible Next Step: Inject β cells into the patient's pancreas

- > Problem: There is much work to be done before this technique will be ready—if it is ever ready.

Possible Next Step: Activate β cells in the patient's own pancreas

- > Problem: There may be no β cells left in the pancreas of a patient to activate.

Possible Next Step

- > Provide type 1 diabetics with transplants of β cells derived from embryonic stem cells

What We Need to Know

- > What properties make embryonic stem cells unique?
- > Where do these cells come from?
- > How are they involved in the formation of the pancreas, β cells, and other tissues?



Where do they come from?

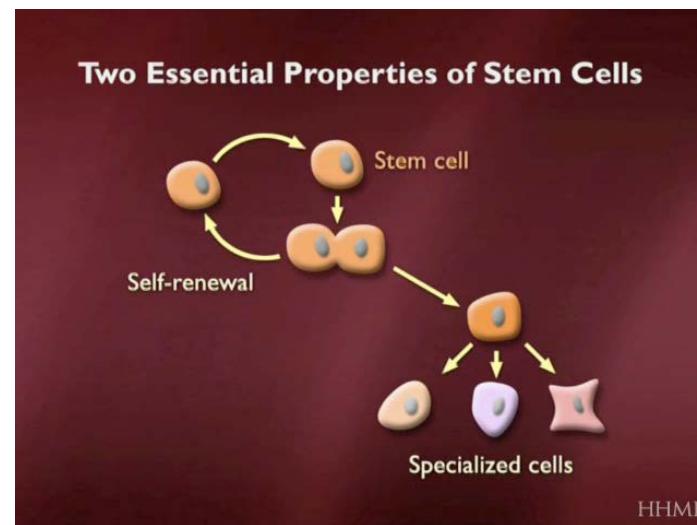


"Human Embryonic Development" animation is located on Disc One of *Potent Biology* DVD and here: http://www.hhmi.org/biointeractive/stemcells/human_emb_dev.html

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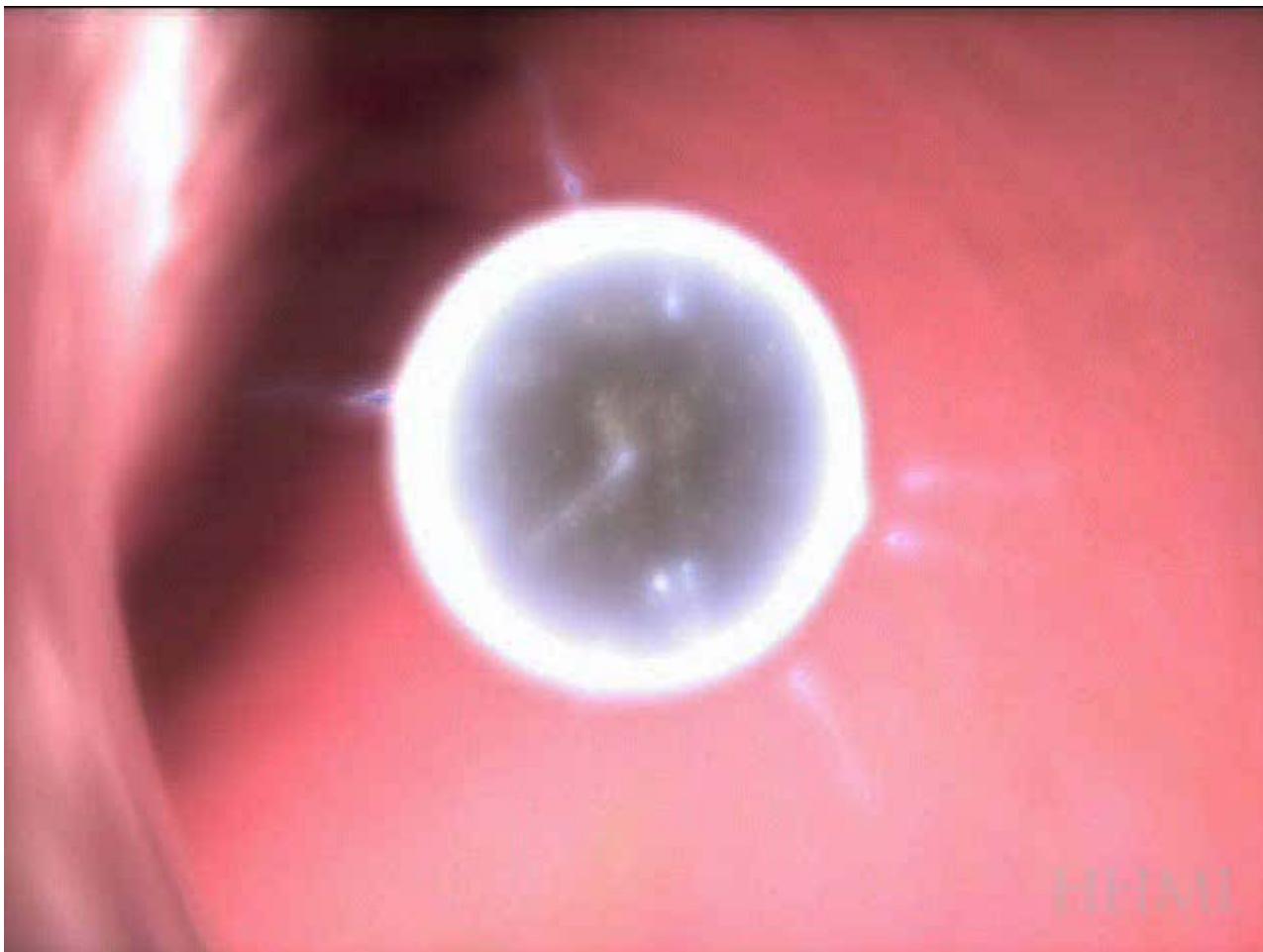
What makes them unique?

- > can regenerate an infinite number of times
- > can be grown in culture indefinitely
- > are classified as pluripotent
- > are able to differentiate into specialized cells as needed





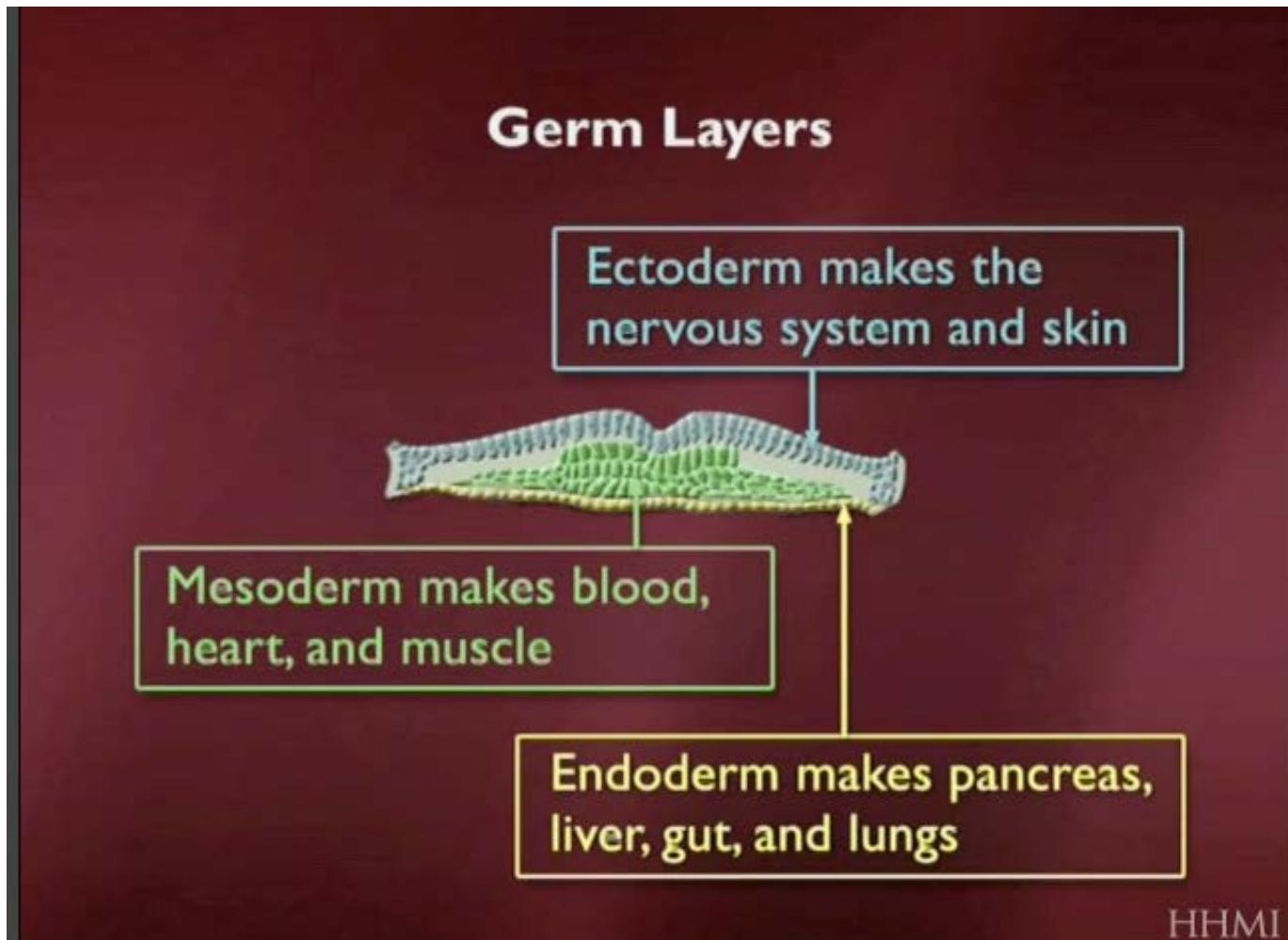
How are stem cells involved in the formation of the pancreas, β cells, and other tissues?



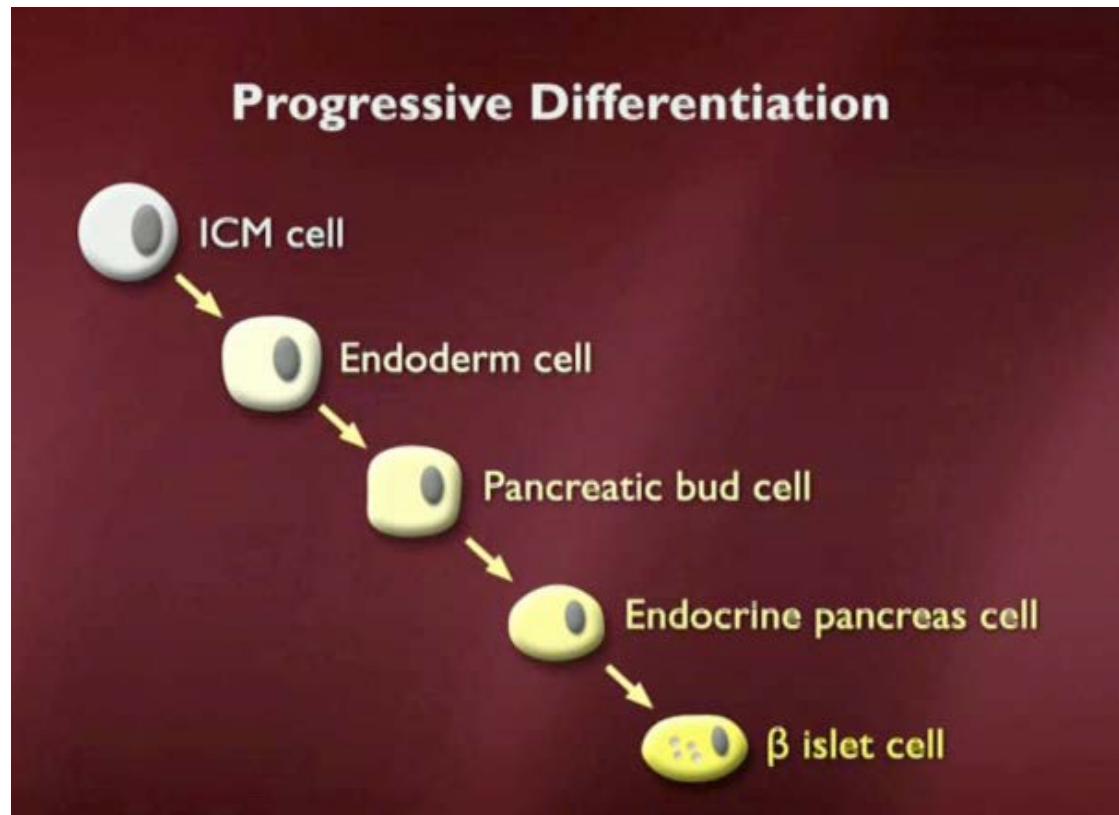
"Differentiation and the Fate of Cells" animation is located on Disc One of *Potent Biology* DVD and here: <http://www.hhmi.org/biointeractive/stemcells/differentiation.html>.

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Germ Layer Differentiation

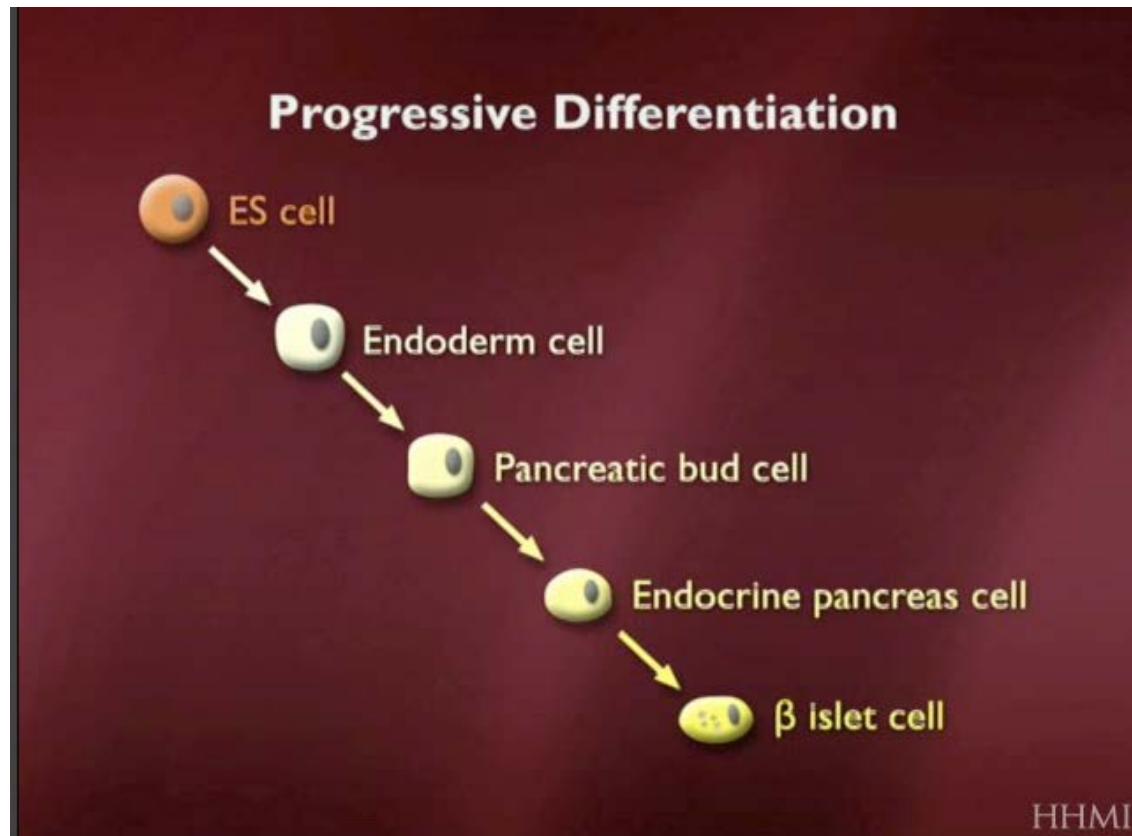


Forming Specialized Cells



Growth factors and other signals tell a stem cell when to differentiate and what type of cell to become.

Forming Specialized Cells

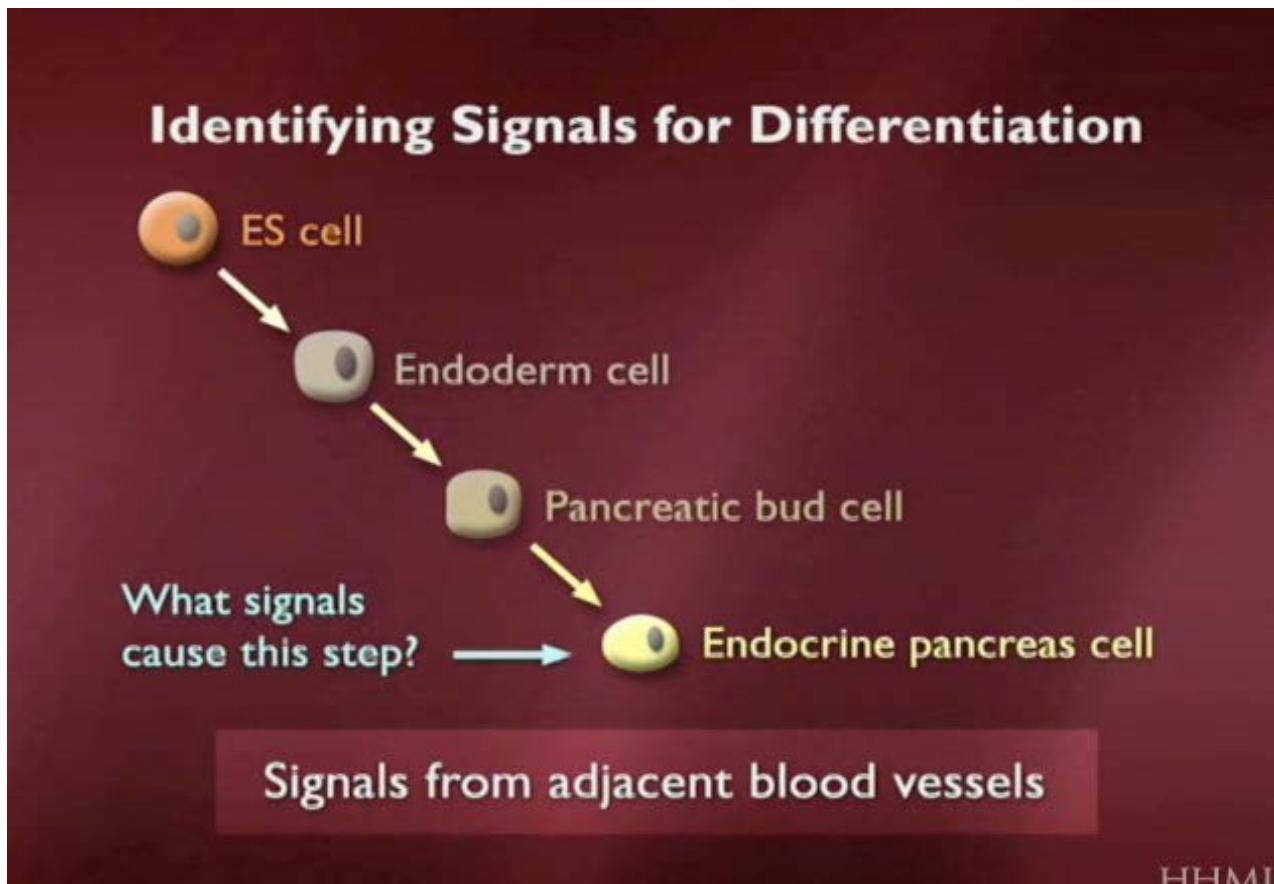


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The same growth factors and signals could be used to direct the differentiation of human embryonic stem cells grown in culture.

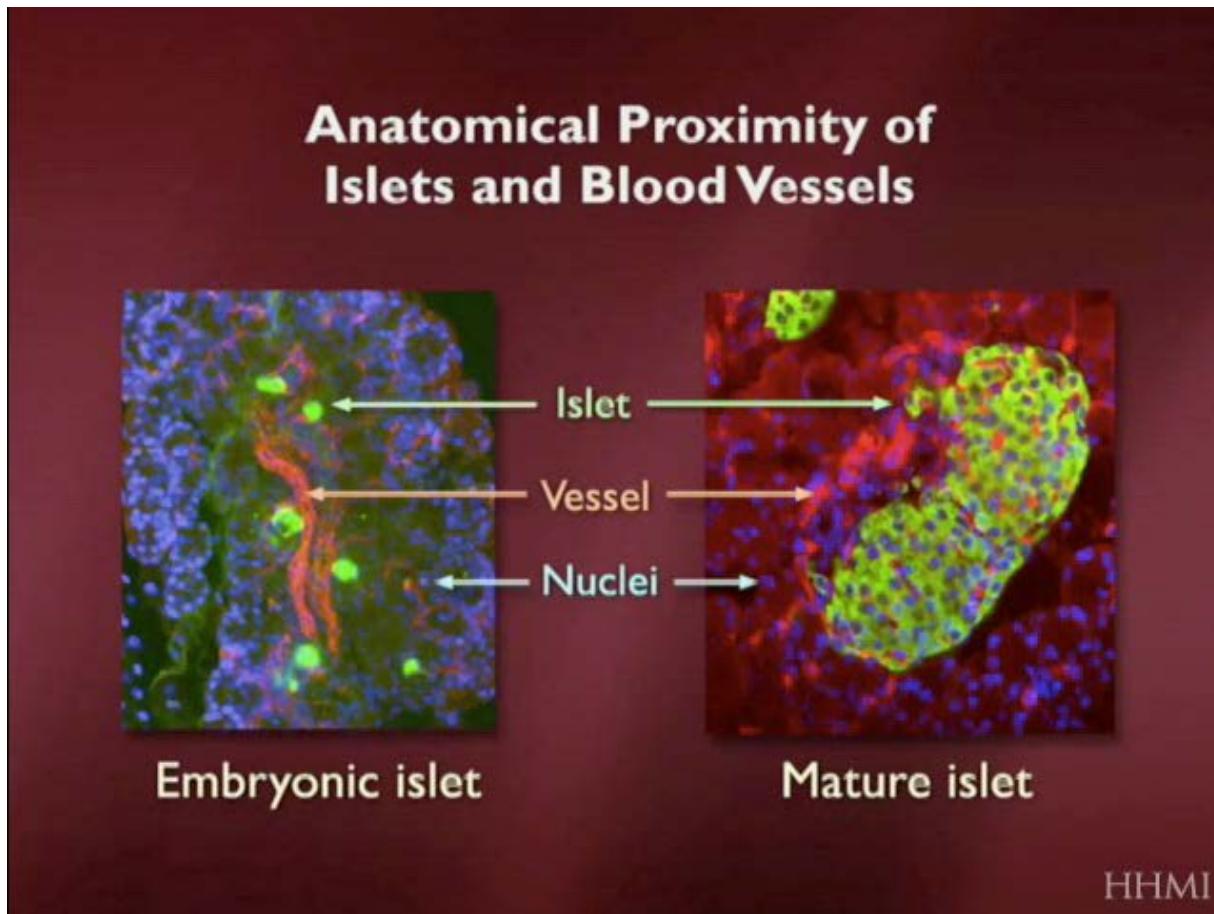


What is Known

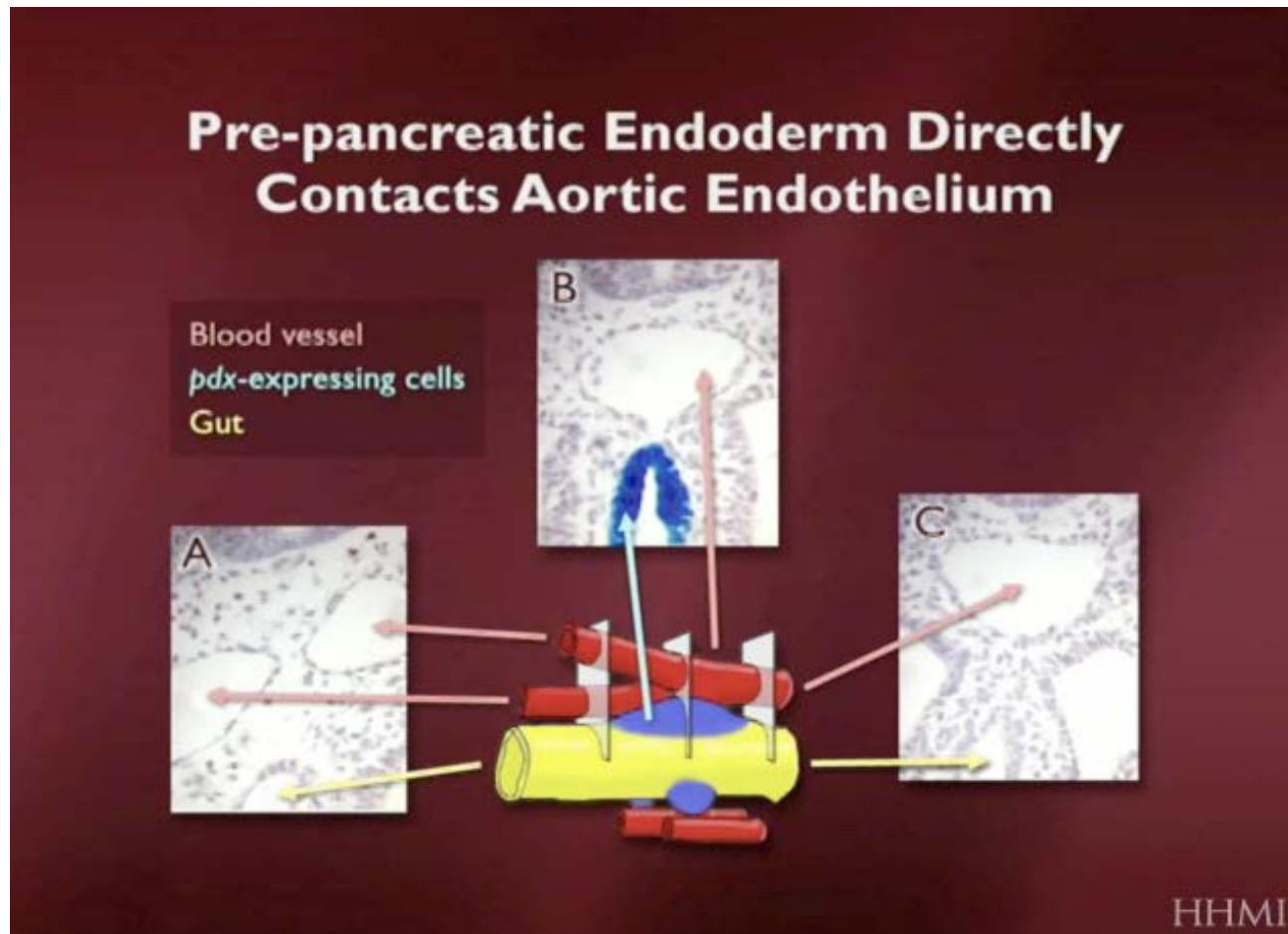


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Role of Location in Differentiation



Role of Location in Differentiation



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The Task:

- > Guiding cultured embryonic stem cells to become insulin-producing β cells

Questions?

Support Bacteria!



It's the only culture some people have!