


**Science of Microbes**

**Activity 7**  
**Milestones in**  
**Microbiology**

PowerPoint Slides and  
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### Science of Microbes

Milestones in Microbiology is the seventh lesson in the unit, *The Science of Microbes*. It addresses National Science Education Content Standards related to Inquiry and Life Science. See the downloadable lesson PDF (web address below) for a complete list of the standards addressed.

In this activity, students will learn about six major milestones in the history of microbiology and decide the order in which these events most likely occurred. The activity will demonstrate that scientific discoveries often are based on the previous work of others and/or the development of new technologies.

Viewing this presentation fulfills part of the requirements for completing the short course on *The Science of Microbes*, offered on BioEd Online for professional development contact hours. *The Science of Microbes Teacher's Guide* may be obtained in its entirety from the Center for Educational Outreach at Baylor College of Medicine (1-800-798-8244). You can download a PDF of this lesson and other lessons from the Science of Microbes unit (including a unit pre/post assessment) from [www.bioedonline.org](http://www.bioedonline.org) or [www.K8Science.org](http://www.K8Science.org).

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## Materials for Each Group of Students



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### Materials for Each Group of Students

When preparing for this activity, you will need to make 6 copies of each of the accompanying 4 student sheets on cardstock. Cut out the Discovery Readings, and make sure that each group of four students has a set of the 6 different cards as well as a copy of the Timeline student sheet.

Each group of four students should receive the following supplies.

- One set of prepared Discovery Readings cards
- 4 highlighters of different colors
- At least one pair of scissors
- Paper clips
- Transparent tape
- One copy of the Timeline student sheet
- Group concept map (ongoing)

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**Image Reference:**

Denk, J. (2009). Materials for activity 7. Baylor College of Medicine. Houston, TX.

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## Safety Considerations

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- Follow all instructions.
- Begin investigation only when instructed.
- Have a clear understanding of the investigation in advance.
- Wash hands thoroughly after the investigation.



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### Safety Considerations

It is important that students always think about safety when conducting a science investigation. This slide may be used to review safety with your class before starting the activity. Also, keep the following points in mind.

- Always follow district and school safety guidelines.
- Have a clear understanding of the investigation in advance (practice any investigation with which you are not familiar).
- Continually monitor the area where the investigation is being conducted.

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## Discoveries and Inventions

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- How might one discovery or invention lead to another?
- Can you think of an example in which one discovery or invention led to others?



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### Discoveries and Inventions

Begin by asking students to name examples in which one discovery or invention enabled others to be made. You may want to prompt them with questions such as the following.

*What do you think came first, widespread use of books to communicate knowledge or the printing press? What is the relationship between telescopes and the outermost planets of our solar system?*

Try to use prompts that are appropriate to your students' age range and knowledge level, while also referring to inventions that are relevant to their everyday lives. Discuss students' ideas and input, making sure they understand how one invention or discovery can open the door to several others.

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#### Image Reference:

Australian cart. Retrieved 11-09-2009 from <http://en.wikipedia.org/wiki/Carts>.

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## Discovery Readings

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- Each Discovery Reading summarizes an important scientific discovery.
- Read each article, and use your highlighter to mark words that may hint at the order in which the different discoveries occurred.
- After you finish each article, pass it to another group member, so he or she can underline (with a different highlighter) the portions that provide clues.
- Continue until all members of the group have read and marked all of the articles.



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### Discovery Readings

Pass out the prepared Discovery Readings, making sure that each group of four students receives all of the readings, and that each student in each group has a different color highlighter. Instruct the students to read all six Discovery Readings. As they read, remind students to look for clues that help them decide the order in which events described in the readings occurred. If a student agrees with the highlighter marks from another student, instruct him or her to draw a second highlighter line above or below the mark.

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## What Do the Clues Tell You?

- Within your group, discuss the clues that your team found in each reading.
- Using the clues, decide as a group the historical order for the readings.
- At the bottom of each reading, list the clues that were most important in helping you to determine the historical order.

### THE DISCOVERY OF PENICILLIN

An Englishman named **Alexander Fleming** was studying *Staphylococcus*, a bacterium that causes skin and other diseases. Scientists already had studied many different bacteria, and Fleming was about to make an important new contribution. Before going on vacation, he started some cultures of *Staphylococcus* on agar plates. He had opened the plates several times to study them, which exposed the plates to the air. When Fleming returned, he discovered that one plate was full of *Penicillium*, a common green mold, and that no bacteria were growing near the mold. He grew more *Penicillium* in a liquid culture and added a few drops to a different *Staphylococcus* culture. He discovered that the mold destroyed the bacteria. His work laid the foundation for the development of modern antibiotics, such as penicillin.

...no bacteria were growing near the mold.



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### What Do the Clues Tell You?

After the students have finished reading and highlighting clues, instruct them to discuss the readings within their groups and determine the historical order for the readings. To aid in their decisions, have students write the most important clues from each reading on the lined section beneath the text.

Distribute one copy of the Timeline sheet to each group. Instruct students to cut out the three strips and tape them, end to end, in chronological order to create one long timeline strip. Then have students paperclip each reading onto the timeline in historical order.

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## Time to Share!

- Present your timeline to the class.
- Are there any differences between your timeline and the timelines of other groups?
- As a class, discuss any differences, and how each group decided on the sequence of events.
- Give an example of how one discovery or invention enabled a subsequent discovery or invention.

1600s

1881

1884

1890s

1929

1930s



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### Time to share!

Have each student group present its timeline to the rest of the class. Afterward, lead a class discussion about any differences between groups' timelines. Ask students to explain why and how they chose the order they did, and allow them to present their arguments. As the discussion winds down, try to lead the students toward consensus.

Revisit each set of clues with the class. Lead students to the appropriate conclusions by asking questions, such as, *Why did every group place the same article first on the timeline? What is the most logical second event?* Have students discuss how each event contributed to the discovery or invention in the subsequent event, and help them understand the importance of each event in historical context. Emphasize the critical nature played by new tools and techniques in advancing scientific research.

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## Examining the Timeline

- 1600s: A New World
- 1881: A Culture Medium
- 1884: Mechanisms of Disease
- 1890s: Contagious Living Fluid
- 1929: The Discovery of Penicillin
- 1930s: Seeing Viruses

1600s

1881

1884

1890s

1929

1930s



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### Examining the Timeline

This slide provides the actual sequence of events described in the readings. Have students compare their timelines and identify any differences between their proposed ordering and the actual sequence. For example, it may be difficult for students to decide whether "The Discovery of Penicillin" or "Contagious Living Fluid" should appear first on the timeline, so once they have seen the correct order, ask, *What additional information might have helped you to decide the order of these two readings?*

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## Timing is Everything

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- Now that you know the year of each discovery, calculate the amount of time between these events.
- Why do you think some discoveries happened close together in history, while others occurred much further apart?



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### Timing Is Everything

Ask your students to calculate the times between different discoveries. Then, lead a class discussion about possible reasons for the varying time periods between events, and about the effect of new technologies on scientific discovery.

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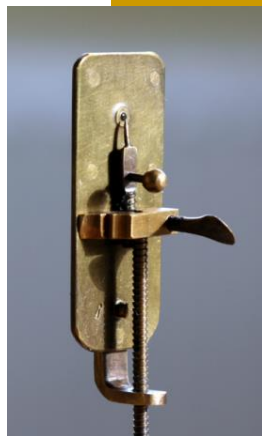
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## Extension

- Watch this video clip as Bill Nye discusses the discovery of microorganisms and see the first microscope.



Replica of Leeuwenhoek's first microscope.



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### Extension

Show the last three minutes of this video clip from YouTube to see Bill Nye discuss the discovery of microorganisms and see a working facsimile of the first microscope.

25 Discoveries that Changed Our World, Part 4 of 11 (skip to 4:37).

<http://www.youtube.com/watch?v=qioMNC9vcwo>

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Werther, J. Leeuwenhoek Microscope. Retrieved on 11-10-2009 from [http://en.wikipedia.org/wiki/File:Leeuwenhoek\\_Microscope.png](http://en.wikipedia.org/wiki/File:Leeuwenhoek_Microscope.png).

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