

The Microbiologists Social: a Scientist Portrayal Activity That Increases Student Comprehension about Concepts in Microbiology

Resource Type: Curriculum: Classroom

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Abstract

The Microbiologists Social enhances student comprehension about specific topics and concepts through character portrayals that place major microbiological discoveries within a historical context. Students randomly select the name of a microbiologist and portray that individual "in character" during an assigned period. Students also create and distribute a one-page handout to their peers. Student familiarity with scientists and their respective professional contributions is assessed through the character portrayal, student-generated handouts, exam responses, and preactivity and postactivity survey responses. This activity encourages independent research, develops critical thinking skills, fosters classroom discussions, reinforces public speaking skills, requires peer instruction, and promotes collegiality.

Activity

Invitation for User Feedback. If you have used the activity and would like to provide feedback, please send an e-mail to MicrobeLibrary@asmusa.org. Feedback can include ideas which complement the activity and new approaches for implementing the activity. Your comments will be added to the activity under a separate section labeled "Feedback." Comments may be edited.

INTRODUCTION

Learning Objectives.

At the completion of this activity, students will be able to name or identify several scientists and describe their contributions to microbiology.

Background.

No prerequisite knowledge is required by students. As stated previously, the preactivity survey is valuable because it identifies what students know about each scientist. The author administers the preactivity survey on the first day of class because the first full lecture addresses historical milestones; administering the survey before the lecture or assigned readings eliminates bias from the data set. The primary course audience where this activity has been used includes students in preprofessional curricula and allied health-related majors. Students in this course generally possess a limited background in biology and experience difficulty mastering concepts associated with biochemistry, molecular biology, biotechnology, and immunology.

PROCEDURE

Materials.

No special materials are needed. In past courses, the author selected scientists that were described in the following resources:

- **American Society for Microbiology.** 1999. Significant events of the last 125 years. <http://www.asm.org/index.php/membership/significant-events-of-the-last-125-years.html> This website provides a time line and brief description of microbiology-related discoveries and milestones.
- **Atlas, R. M. (ed.).** 2000. Many faces, many microbes: personal reflections in microbiology. ASM Press, Washington, D.C.
- **Baker, P. (producer).** 1999. Intimate strangers: unseen life on earth. Four-part science documentary produced by Baker and Associates in association with Oregon Public Broadcasting.
- **Chan, A.** 2003. <http://www.microbes.info/index.html>. Provides useful and interesting microbiology information resources (includes many history articles and links).
- **Needham, C., M. Hoagland, K. McPherson, B. Dodson.** 2000. Intimate strangers: unseen life on earth. ASM Press, Washington, D.C.
- **Nester, E. W., C. E. Roberts, N. N. Pearsall, D. G Anderson, and M.T. Nester.** 2001. Microbiology: a human perspective, 3rd ed. McGraw-Hill, St. Louis, Mo.
- **Nobel Foundation.** 2003. Nobel e-Museum. <http://www.nobel.se>. Official website of the Nobel Foundation.

Students are free to use any materials they wish for their costumes or props. Students are also encouraged to identify additional resources that offer specific details pertinent to the assigned microbiologist.

Student Version.[Student Handout \(PDF\)](#)[Student Handout \(HTML\)](#)**Instructor Version.***Preactivity:*

Before the activity is described and assigned, distribute to all students a nongraded survey listing several names of microbiologists with historical significance. This step generally should take no longer than 10 minutes to complete. The author of this activity typically distributes this survey on the first day of class before any lectures or assigned readings raise awareness about select scientists, but the survey could be disseminated at a later date.

The purpose of the preactivity survey is to identify what each student knows about various microbiologists. Students must indicate their familiarity with each name on a scale from one to four and are required to write the contribution of the scientist if they express high familiarity (score of four). Students are quite honest with their responses because the survey is nongraded and not shared with other classmates. The survey is an enlightening tool for the instructor because it accurately reveals each student's familiarity with the microbiologists before the activity begins. The survey can be modified by instructors, but it should include at a minimum all possible names of scientists that may appear in the social as well as several names that will be described in lectures or the course text. It is useful to include a few additional names of microbiologists who will not be discussed through lectures or the social, and the names of individuals that have no microbiological or scientific significance. Once the survey is collected, the instructor should refrain from sharing any information associated with the survey.

The survey also may be used to help instructors compile a list of scientists for the social. Instructors may want to choose scientists that are not familiar to any of the students or may choose to include scientists in the social that are not included in the assigned readings or lectures. Instructors may compare student responses from this survey to the postactivity survey to reveal whether students learned about specific microbiologists or concepts through this activity or traditional lectures.

[Preactivity Survey \(PDF\)](#)[Preactivity Survey \(HTML\)](#)*Assigning the Activity:*

On the day that the activity is assigned, students draw randomly from a collection of invitations. The student records the name of the scientist as well as the time, date, and location of the Microbiologists Social on the student guidelines handout. After the student records his or her name on the invitation's RSVP line, the card is returned to the instructor. The guidelines are discussed briefly, and students are shown the rubric that is used for grading the activity. Examples of past handouts are made available. This step generally takes no longer than 10 to 15 minutes for a class enrolling 24 students.

[Example Invitations \(PDF\)](#)[Student Handout \(PDF\)](#)[Student Handout \(HTML\)](#)

In general, no more than 2 weeks are needed for students to prepare for this assignment. It is a superb activity for the beginning of the semester because it helps students to get to know their peers early in the semester, and the activity raises their awareness about several scientists whose contributions will be discussed throughout the semester.

On the Day of the Activity:

One lecture period is reserved for implementation of the activity. Students may be asked to arrive to class in costume with their handouts, or one may reserve 5 minutes for students to prepare for the social. Foods with microbiological connections are provided to help foster mingling and dialogue. The student-generated handouts are submitted before the social and placed on a table or bench for collection by students at the completion of the activity. This allows each student to collect all handouts quickly at the end of the social rather than attempting to keep track of which handouts are needed during the social. This approach also forces them to engage in dialogue and prevents them from simply looking at each others handouts.

To assess each student's portrayal and comprehension of their character, the instructor assumes the role of a reporter for a science magazine, news agency, or campus newspaper. With a digital camera, the instructor can quickly document the costumes or supporting resources used by each student. As a reporter, the instructor can ask a variety of questions to each student and move quickly through the group. Past experiences show that students are very forthcoming about their portrayals and generally work best in small groups of four to eight participants. One 50-minute period is adequate for a group of 24 students to complete the social.

Safety Issues.

No safety issues are noted.

ASSESSMENT AND OUTCOMES**Suggestions for Assessment.**

Multiple assessment methods can be used for this activity. Student familiarity with scientists and their respective professional contributions has been assessed through the character portrayal, student-generated handouts, exam responses, and preactivity and postactivity survey responses.

The student portrayals and student-generated handouts serve as valuable means for formative assessment. They reveal the student's understanding about the scientist and lead students to communicate this comprehension through written, verbal, and visual approaches. A suggested rubric, which allows the instructor to evaluate the portrayals and handouts objectively, is attached to the assignment guidelines.

Student comprehension also can be assessed by traditional lecture exams. In the author's classes, students are encouraged to

use the handouts as study aids for course exams. Multiple choice, short answer, and essay questions are developed from the handouts and discussions. In past offerings, each student also has been asked to develop five multiple choice questions and two essay questions for use or modification on exams. This allows the instructor to select several representative questions that can be used to assess individual comprehension and the efficacy of peer-to-peer instruction. In general, students show strong achievement with questions pertaining to the Microbiologists Social. For example, the average grade for responses to questions specifically about scientists portrayed during the social was significantly higher than the overall exam average during a Summer 2000 microbiology course taught by the author ($P = 0.017$).

A precourse–postcourse survey helps me to determine whether the social is more effective as a learning tool than traditional lecture approaches or assigned readings. Results from postactivity surveys administered after the completion of the same Summer 2000 microbiology course suggested that students understand and recall significantly more scientists and concepts learned through the Microbiologists Social than scientists and concepts learned solely through instructional resources such as texts, lectures, and videos ($P < 0.001$). Precourse and postcourse responses about the scientists portrayed in the social ($n = 16$) were compared against the scientists only described through course resources ($n = 31$) using the paired t test. In the survey, students ranked their name recognition and familiarity with each scientist using a four-point system. If the student scored a scientist as a “four,” the student was requested to name the scientist’s specific contribution to microbiology. At the beginning of the semester, the relative familiarity level with scientists that were eventually portrayed in the social was indistinguishable from the relative familiarity level with scientists eventually described only through course resources (1.13 ± 0.15 versus 1.16 ± 0.1 ; no significant difference). The familiarity of students with all scientists (irrespective of learning source) significantly increased after the course was completed ($P < 0.001$). However, the relative familiarity of students with scientists that were portrayed in the social was significantly higher than scientists presented solely through course resources (2.9 ± 0.43 versus 1.86 ± 0.23 ; $P < 0.001$). Additionally, the percentage of responses that conferred a rank of “four” and correctly identified the scientist’s contribution was higher for scientists portrayed in the social than scientists presented solely through course resources (33.0% versus 6.0%).

Students also identified this activity in course evaluations as a very effective learning tool.

Field Testing.

The author has used this activity at two institutions for microbiology and other science courses over the past 3 years. Additionally, at least two other educators have used this activity in their microbiology courses. In all cases, student responses and feedback from the educators have been very favorable.

In a microbiology course survey during Summer 2000, students were asked to identify components of the course that were “effective” and “should be provided during future course offerings.” Among 16 respondents, seven students made specific comments about the Microbiologists Social activity. All comments reflected favorable opinions about the activity.

- "The social aided my studies."
- "I learned a lot from the social."
- "I especially liked the social. [It] was very unique."
- "The social was a good learning tool. It let us interact with each other and made it easier to learn."
- "I think the social was a very good idea and should be left (the way it is)."
- "I like the fact that the social was done in small groups instead of one person standing in front of the class."
- "The social was fun."

Student Data.

[Example Student Handouts](#): David Baltimore and Alice Evans.

SUPPLEMENTARY MATERIALS

Possible Modifications.

Modifications for large classes: in lecture courses where more than 24 students are enrolled, an instructor may opt to implement this activity during lab where sections generally do not exceed 24 students. Alternatively, one may reserve two or more lecture periods and assign only a portion of the students for a particular presentation day. In this latter scenario, half the students are “in character” whereas the other half of the students can focus solely on the microbiologists that are portrayed.

Modifications for quiz and exam questions: instructors may ask each student to prepare a set of multiple choice or essay questions about their microbiologist. These questions could be compiled into a useful test bank for students or modified by the instructor for use in quizzes or exams. The author typically uses several questions pertaining to different scientists to avoid bias or concentration toward a limited number of microbiologists. Attendance is mandatory during this activity, and the author has not experienced problems regarding this requirement. Nonetheless, the handouts that are generated by each student can foster independent learning by classmates who are absent on the day of the social.

Modifications for other courses: this assignment has been implemented by the author in other science courses including introductory biology (enrolling 75 to 100 students) and immunology (5 to 10 students).

References.

American Society for Microbiology. 1999. Significant events of the last 125 years. <http://www.asm.org/MemberShip/index.asp?bid=16731>.

“HELLO! MY NAME IS...”
HANDOUT AND PRESENTATION GUIDELINES
FOR THE MICROBIOLOGISTS SOCIAL

MY MICROBIOLOGIST’S NAME IS

_____.

THE SOCIAL WILL BE HELD AT _____ ON _____ IN

_____.

ASSIGNMENT PURPOSE. Microorganisms affect our lives every day through the food we eat, the air we breathe, the water we drink, and the items we contact. Without an understanding of microorganisms, we would not be able to grow plants more efficiently, prevent and cure diseases, or produce food products. Many microbiologists have contributed immeasurably to our understanding of the biological world, yet so few people are familiar with who they are, what they did, and how they did it. Texts often portray microbiology as a collection of facts, but the concepts conveyed in these books were founded upon fundamental research by hardworking and astutely observant individuals. This exercise is meant to help students learn more about the historical context of major discoveries in microbiology. Specifically, students will prepare a handout (a one-page front-and-back document) about a microbiologist and attend a microbiological social “in character”! Students will exchange information about each other to learn about the contributions of several famous microbiologists. This exercise will encourage independent research, develop critical thinking skills, foster class discussions, reinforce public speaking skills, and promote collegiality.

My advice to you—***do not wait until the last minute to work on this assignment!!*** You will need time to acquire your resources, prepare the handout, and develop the role for your character.

WORK INDIVIDUALLY. This assignment must be completed individually. Do not solicit or receive assistance (other than typing services) from others. Organize your work before you begin.

SELECTING A MICROBIOLOGIST. The list of microbiologists who have impacted our understanding of the microbial world is enormous. I will allow you to randomly draw a selection from a pool of choices. If you have never heard of your choice...fantastic! This is an active learning project, so be prepared to learn something new. Some of the choices are still living and working scientists!

COLLECTING SOURCES AND INFORMATION. An infinite amount of information is available about these individuals. Excuses such as “I couldn’t find anything” or “I couldn’t find any magazines” are rubbish!

- Use your text, newspapers, magazines, or library resources to find information about your microbiologist. Additional resources such as other microbiology texts can be provided, and I can recommend suggested readings about your scientist.
- If the information is from a World Wide Web site, the site must be a legitimate source that publishes only peer-reviewed work. Many university courses and research facilities maintain updated online reference libraries.
- If you select a LIVING microbiologist, you must consult the instructor regarding email, fax, or phone contacts to the scientist. All communications MUST be preapproved and conducted with permission.

REFERENCES. You will need at least three (3) citations for your report, but more citations are better! Be sure to record all required information for each citation. Each component of the citation must be included in your report to receive full credit. A complete citation includes:

- ◆ the names of all authors,
- ◆ the publication date,
- ◆ the title of the work,
- ◆ the name of the book, newspaper, or periodical,
- ◆ editors (when applicable),
- ◆ the volume number (usually located on the table of contents page), and
- ◆ the inclusive page numbers (for newspaper articles, include the section number).

FORMAT FOR THE HANDOUT.

- The handout must be a one-page document (8.5” by 11”). You may use both sides of the paper. Carefully consider appearance, design, organization, and content.
- Each handout will be duplicated and distributed to classmates as a teaching tool. You may use color for the original handout submitted for a grade, but your classmates will receive the black-and-white copy.
- *Keep the text brief but informative.* You may partition the text into small manageable sections that a reader can quickly understand.
- Include visual aids. Because most people are visual learners, incorporate several helpful visual aids such as photographs, diagrams, drawings, original art, etc.
- Use a word processor to prepare your text. Hand-written submissions will not be accepted.
- Check your work to make certain no grammatical or spelling errors are present. Read your work before you submit your report!
- **DO NOT PLAGIARIZE!!! YOU CANNOT SIMPLY DOWNLOAD TEXT!!!** You will receive a ZERO for this assignment if you plagiarize work from another source.

CONTENT FOR THE HANDOUT. Regardless of design, make certain that the handout is informative. Anyone reading your handout should learn about your microbiologist easily without needing additional resources. Your handout should be written so that any student in the class can read it, understand its contents, and appreciate why your

microbiologist is significant. Remember that you are in character! Capture the essence of your microbiologist as best you can! Questions to address in your handout include:

- Who am I?
- Where am I from?
- When was I born?
- When did I die?
- What was my background and education?
- What were my contributions to microbiology?
- Why are my contributions significant?
- How did I design my experiments or make my discoveries?
- What was happening in the world around me when I was performing my work?
- What stories or vignettes are associated with me?

ATTENDING THE MICROBIOLOGICAL SOCIAL IN CHARACTER. Presentations will be made during a specified time in lecture or lab. Each person will “mingle” with fellow scientists and engage in informal conversations (approximately 3 to 5 minutes) that help to describe your microbiologist. Please practice what you intend to say before coming to class. While you are mingling, I will play the role of a science reporter who will photograph and document the event. I will ask a few questions too, so that I can report concisely and accurately which scientists attended the event and why they are noteworthy. You must interact with me to receive credit; if I do not meet your character, I will have no idea how you presented your character. You may have note cards to help you, but do not read to classmates. Remember, you wrote the handout, so you should be able to talk to the class about it. All students submitting a handout must participate in the social to receive credit.

LISTENING TO OTHER STUDENT PRESENTATIONS. Just as your classmates will listen respectfully to you, you are asked to listen to them with attentiveness and courtesy. You may not show up late or leave the social early!!! After hearing about each scientist, you will have ample time to ask additional questions.

HOW YOUR HANDOUT AND INTERACTIONS WILL TEACH OTHERS. Please bring a sufficient number of handout copies for your classmates. Copying services are NOT available from me. The handouts from your classmates will help you to learn further about each microbiologist outside after class and minimize the need for taking notes as you mingle. The exam will contain questions about the microbiologists that were discussed. Questions will be developed from the presentations, handouts, and discussions.

NAME: _____

LAB: _____

GRADE: _____

The rubric provided below:

- reduces the amount of subjectivity associated with grading this writing or presentation activity,
- informs you about the evaluation criteria,
- provides you with specific feedback about relative strengths and weaknesses of your work, and
- allows you to critique yourself and classmates with consistency.

When you prepare your handout and practice your presentation, I encourage you to use this rubric to identify the strengths and deficiencies for your own work. If you do not understand an item, please ask! Note the respective weights for each component. The point scale below defines the rubric:

5 = excellent, outstanding, exemplary

4 = very good, very minor mistakes

3 = adequate, a few obvious deficiencies

2 = below expectations, incomplete, major deficiencies

1 = unacceptable, obvious last minute effort

0 = not provided

HANDOUT (70%)	5	4	3	2	1	0
Does not exceed one-page document (8.5" by 11")						
Well organized and visually appealing						
Includes visual aids (photographs, figures, drawings, art, etc.)						
No spelling or grammatical errors						
Provides at least three references with full citation						
Who am I?						
Where am I from?						
When was I born? When did I die?						
What was my background and education?						
What were my contributions to microbiology?						

Why are my contributions significant?						
How did I design my experiments or make my discoveries?						
What was happening in the world around me when I was performing my work?						
What stories or vignettes are associated with me?						
TOTAL						
Comments:						
<p>TOTAL POINTS: _____ SCORE (X / 70): _____ SECTION GRADE (out of 70%): _____</p>						

SOCIAL (30%)	5	4	3	2	1	0
Portrays microbiologist convincingly						
Includes effective costume or visual clues						
Offers clear and informative dialogue						
Underscores significance of the microbiologist						
Addresses questions from audience						
Runs 3 to 5 minutes						
TOTAL						
Comments:						
<p>TOTAL POINTS: _____ SCORE (X / 30): _____ SECTION GRADE (out of 30%): _____</p>						

SURVEY OF MICROBIOLOGISTS

NAME: _____

Please respond honestly for each person on the list.

- 1 = NO ... I DO NOT RECOGNIZE this person's name, and I DO NOT KNOW the person's contribution to microbiology.
- 2 = MAYBE... I VAGUELY RECOGNIZE the person's name, but I DO NOT KNOW the person's contribution to microbiology.
- 3 = YES... I RECOGNIZE this person's name, but I DO NOT KNOW the person's major contribution to microbiology.
- 4 = YES ... I RECOGNIZE this individual's name, and I THINK I KNOW the person's contribution to microbiology.

NAME	Have you heard of this person before?				I think that this person's MAJOR contribution to microbiology is...
	1	2	3	4	
1. Bruce Ames					
2. Oswald Avery					
3. David Baltimore					
4. Martinus Beijerinck					
5. Paul Berg					
6. Thomas Brock					
7. Martha Chase					
8. Ferdinand Cohn					
9. John Collier					
10. Gerhard Dogmagk					
11. Paul Erlich					
12. Alice Evans					
13. Hans Christian Gram					
14. Frederick Griffith					
15. Stanley Falkow					
16. Alexander Fleming					
17. Robert Gallo					
18. Alfred Hershey					
19. William Hinton					
20. Dmitri Ivanowski					
21. Francois Jacob					
22. Robert Koch					
23. George Kohler					
24. Arthur Kornberg					
25. Rebecca Lancefield					
26. Joshua Lederberg					
27. Joseph Lister					
28. Lynn Margulis					
29. Barry Marshall					
30. Matthew Messelson					
31. Elias Metchnikoff					
32. Cesar Milstein					
33. Peter Mitchell					
34. Jacque Monod					
35. Luc Montaigner					
36. Kary Mullis					
37. Eugene Nester					
38. Louis Pasteur					
39. Margaret Pittman					
40. Stanley Pruisner					
41. Walter Reed					
42. Francis Peyton Rous					
43. Hamilton Smith					
44. Theobold Smith					
45. Franklin Stahl					
46. John Tyndall					
47. Craig Venter					
48. Emil von Behring					
49. Selman Waksman					
50. Sergei Winogradsky					
51. Carl Woese					
52. Rolf Zinkernagel					

BRUCE AMES

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

DAVID BALTIMORE

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

PAUL BERG

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

THOMAS BROCK

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

JOHN COLLIER

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

ALICE EVANS

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

HANS CHRISTIAN GRAM

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

FREDERICK GRIFFITH

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

STANLEY FALKOW

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

KARY MULLIS

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

WILLIAM HINTON

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

ARTHUR KORNBERG

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

REBECCA LANCEFIELD

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

LYNN MARGULIS

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

BARRY MARSHALL

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

MATTHEW MESSELSON

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

CESAR MILSTEIN

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

PETER MITCHELL

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

EUGENE NESTER

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

MARTHA PITTMAN

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

STANLEY PRUISNER

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

HAMILTON SMITH

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

CRAIG VENTER

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

CARL WOESE

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

EMIL VON BEHRING

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

FRANCIS PEYTON ROUS

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

is cordially invited to join the
Microbiologists Social

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Date: _____

Place: _____

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RSVP from _____

is cordially invited to join the
Microbiologists Social

Time: _____

Date: _____

Place: _____

Appropriate handouts and presentation are
requested

RSVP from _____

Curriculum Resources

Example Student Handouts

Created by students for the assignment: [David Baltimore](#) and [Alice Evans](#).

David Baltimore



Hello, my name is David Baltimore and I am honored to have been invited to this special social event, and being able to share with you events in my life that enabled me to do my work and play an important role in the world of science.

BACKGROUND and EDUCATION:

I was born on March 7, 1938 in N.Y.

My family consists of my wife Alice Huang and my daughter Lauren.

1956-1960 (SWARTHMORE COLLEGE)- This is where I attended college. My studies were biology, chemistry and molecular biology. I received a B.S. and honors in chemistry.

1960-1961 (GRADUATE SCHOOL/MIT)- My studies were biology and biophysics.

1961-1964 (ROCKEFELLER INSTITUTE)- My studies were in animal virology. I also received my Ph.D.

POST DOCTORAL POSITIONS:

1963-1964 (MIT)

1964-1965 (ALBERT EINSTEIN COLLEGE OF MEDICINE)- Studied virus specific enzymes.

1965-1968 (SALT LAKE INSTITUTE FOR BIOLOGICAL STUDIES)- I studied along with Dulbecco researching the replication of the Poliovirus. I also had the opportunity to work with him on differentiating normal cells from cells with tumors due to viruses.

1968- (MIT)- I was appointed Associate Professor of Microbiology and worked with Alice Huang, who I later married. Together we were able to show that Vesticular Stomatitis Virus and RNA were reproduced by an unusual enzyme. This enzyme was an RNA dependant polymerase that copies RNA in a process without DNA. Also during this time I researched and experimented with RNA tumor viruses to find if similar enzymes were found in their reproduction. This led to the discovery of reverse transcriptase. (an enzyme encoded retrovirus able to copy sequence of mRNA in sequence of DNA.

This discovery was a valuable tool in recombinant DNA technology. Isolating genes from one organism manipulating the DNA in a lab, and to transfer the genes to other organism. This is called Gene Cloning.

1972- (MIT)- I became a full professor in microbiology.

1983- (WHITEHEAD INSTITUTE for BIOMEDICAL RESEARCH) - I became the director of this institute.

1990-1994- (ROCKEFELLER UNIVERSITY) I became professor, and then the president. During this time I was forced to resign as president because of a fraud charge for a published paper that a tufts professor and I had written. I was never charged with this crime.

1994 (MIT) I returned here to work.

1996- Ten years after the scandal paper was published the tufts professor cleared of all charges.

1997- (CALIFORNIA INSTITUTE of TECHNOLOGY) I was appointed president.

ACCOMPLISHMENTS AND HONORS:

1970 - I played a role in creating a consensus on national science policy regarding DNA research. I was also an advocate of federal aids research.

Honors at this time included the Gustaves Stern Award in Virology.

1971- Honors included the Eli Lilly and Company. Award in Microbiology and Immunology.

1974- Honors included the National Academy of Science, American Academy of Arts and Science, American Association for the Advancement of Science, American Academy of Microbiology and also published 500 peer-reviewed articles.

1975- Nobel Prize in Physiology or Medicine.

1978- Elected member of Pontifical Academy of Science and a foreign member of the Royal Society in England.

1996- Appointed to head the National Institute of Health Aids Vaccine Research.



1999-Awarded the National Medal of Science.

WORLD EVENTS AT THIS TIME:

1960's-Cuban missile crisis, John F Kennedy assassinated, Protest against Vietnam war, Astronauts Neil Armstrong and Edwin Aldrin landed on moon.

1970's-Micro computer developed in U.S., Equal Opportunity Act passed, Nixon resigned.

1980's-Civil war in El Salvador, U.S. Soldiers invade Panama International Financial Crisis, Peace agreement in U.S. signed by Palestinian leader Arafat and Israeli prime minister Rabin.

1990's- OJ Simpson tried for murder and acquitted.

WORK CITED:

1. Access Excellence About Biotech. Diagram of a Retrovirus. Online . Internet.

Available:<http://www.accessexcellence.com/AB/GG/diagram.html>

2. Alberts, et al. Graphics Gallery. The Life Cycle of A Retrovirus.1998.Online.Internet.15 July.2000.

Available:http://www.accessexcellence.org/AB/GG/retro_Life.html

3. Autobiography of David Baltimore. David Baltimore.1975.Online.Internet.11

July.2000. Available:<http://www.nobel.se/medicine/laureates/1975/baltimore-autobio.html>

4. Caltech Home Page. Dr. David Baltimore. Online.Internet.11 July.2000.

Available:<http://www.caltech.edu/president/index-frame.html>

5. Caltech Media Relations. Caltech president David Baltimore named winner of 1999 National Medal of Science. January 31,2000.Online.Internet.11 July.2000. Available:

<http://broccoli.caltech.edu/media/Press-Release/PR12029.html>

6. CDC. Basic Statistics of Hiv/Aids Prevention. Basic Statistics-International Statistics.Online.Internet.13

July.2000. Available:<http://www.cdc.gov/hiv/stats/internat.htm>

7. History of the World-Americas.Online.Internet. Available:file:///C:/My Documents/History of the World-Americas.htm

8. MSN. Encarta Learning Zone. Encarta Encyclopidia. Baltimore, David. Online.Internet.13 July.

2000. Available:<http://encarta.msn.com/find/Consize.asp?ti=OB44FOOO>

9. Nester, Eugene W., et al. Microbiology A Human Perspective. 2nd ed. McGraw Hill Company, 1998. pg183and194.

10. NOVA Online. The Search for Longitude. Today's Great Challenge. Online.Internet.13

July.2000. Available:<http://www.pbs.org/wgbh/nova/longitude/baltimore.html>

11. PICO. Poliovirus Life Cycle. Online.Internet.15 July.2000.

Available:<http://12859.173.136/PICO/Chapters/Cellular.html>

SIGNIFICANT CONTRIBUTIONS TO MICROBIOLOGY:

Reverse transcriptase founded by Temin and myself relayed information on altering host DNA, and how a normal cell is changed into a cancer cell. Normal cells can monitor their growth and stop replication when in contact with other cells. Retroviruses such as AIDS destroy's this type of mechanism and rapid growth is the result. Options in the treatment of Cancer and Aids were possible because of these particular findings.

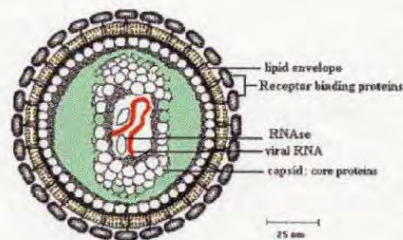




Diagram of a Retrovirus

Retroviruses are infectious particles consisting of an RNA genome packaged in a protein capsid, surrounded by a lipid envelope. This lipid envelope contains polypeptide chains including receptor binding proteins which link to the membrane receptors of the host cell, initiating the process of infection.

Retroviruses contain RNA as the hereditary material in place of the more common DNA. In addition to RNA, retrovirus particles also contain the enzyme reverse transcriptase (or RNAse), which causes synthesis of a complementary DNA molecule (cDNA) using virus RNA as a template.

When a retrovirus infects a cell, it injects its RNA into the cytoplasm of that cell along with the reverse transcriptase enzyme. The cDNA produced from the RNA template contains the virally derived genetic instructions and allows infection of the host cell to proceed. The virus that causes AIDS (acquired immune deficiency syndrome) is a retrovirus. It is called HIV for human immunodeficiency virus.



One of Microbiology's Heroines

Alice Evans
1881-1975





Background and Education:

I was born on January 29, 1881, in Neath, Pennsylvania. I enrolled in a "two year" course at Cornell University in Ithaca, New York. It was there, I became interested in science. I completed a B.S. at Cornell and an M.S. at the University of Wisconsin, both in bacteriology. I started working on the bacteriology of milk and cheese for the dairy division of the U.S. Department of Agriculture.

Significant Events:

I initiated my studies of bacterial contamination of milk in 1910. However, I did not reveal my findings until 1917. My work identified the organism that causes brucellosis. Researchers, veterinarians, and physicians were skeptical of my findings. The dairy profession also scoffed at my warning that raw milk should be pasteurized to safeguard human health. Despite the opposition of my colleagues, milk pasteurization were enacted.



Positions:

In 1928, I became the first woman to serve as president of the American Society of Microbiology at the Dairy Division of the Department of Agriculture. An award established by the ASM Committee was named after me. The Alice C. Evans Award recognizes an individual for contributions of women in microbiology.

What is Brucellosis?

Brucellosis is a non-contagious infection caused by the bacteria *Brucella abortus*. It is transmitted to humans from infected cows, pigs, sheep, and goats.

Is it a common threat to humans?

In the past, humans have contracted Brucellosis by ingesting non-pasteurized however, the Centers for Disease Control no longer consider Brucellosis a reportable human disease. Today, the chances of humans contracting this disease are extremely unlikely.

References:

I. -1998. Brucellosis- The Real Story. Found at
<http://www.interinbaibison.org/brucellosis.hum>

II. -2000. Encyclopedia Britannica. Online. For Alice Evans.

II. III. -1999. Evans, Alice. Found at
<http://www.eb.com/women/articles/Evans/Alice.hum>

