THE NEW JERSEY
ITALIAN HERITAGE COMMISSION

Rita Levi-Montalcini

Scientist — Nobel Prize Recipient
Born 1909 – 2012

Grade Level: **6–12**

Subjects: Science

Categories: Arts and Sciences / Italian and Italian American Women

Standards:

Please see page 6 of the lesson plan for complete New Jersey Student Learning Standards alignment.

Objectives:

The students will be able to:

1. identify Rita Levi-Montalcini as a famous Italian female influence in science.
2. describe the cultural lifestyle of Italians during the World War II era.
3. grow bacteria cultures to observe cell growth as a simulation of Rita Levi-Montalcini's work.

Abstract:

During a time of unrest throughout the world Rita Levi-Montalcini challenged the face of adversity and achieved great status as a world renowned scientist. Rita, a half Italian and half Jewish woman defied her father's wishes to become a traditional wife and mother. She graduated from medical school and began her research and experimentation with the Brussels Neurological Institute during World War II. Rita's perseverance would eventually lead her to her discovery with colleague Stanley Cohen of the Nerve Growth Factor for which she was recognized with several remarkable awards including the Nobel Prize. Rita has been honored many times as a famous Italian woman who has influenced many women in the area of science.

In this lesson, students will have an opportunity to experiment in simulated nerve growth activities.

Materials:

- Access to internet
- Background material
- Petri dishes
- Cotton swabs
- Sample sticks
- Microscope slides
- Microscopes
- Nutrient Agar

Background:

Rita Levi-Montalcini was born on April 22, 1909. Her father Adamo Levi, an engineer, was Jewish. Her mother, Adele Montalcini, was a painter in Turin, Italy. Rita was one of four children and had a twin sister. Rita's family was very loving and close with one another. Her father held very traditional values and believed that professional careers would not allow enough time for women to fulfill their work as wives and mothers. He decided that his three daughters should not pursue academic studies that would lead to careers.

Against their father's beliefs, Paola, Rita's twin sister, pursued her interest in art and went on to become a well known Italian artist. At the age of 20, Rita completed her high school studies and enrolled in medical school in Turin, Italy. She was graduated in 1936 with honors. Her degree was in Medicine and Surgery. She then pursued a specialization in Neurology and Psychiatry.

Later in 1936, Benito Mussolini enacted the "Manifesto per la difesa della razza", which 10 Italian scientists agreed to support. This prevented non-Aryan Italians from continuing their academic or professional careers in science. As a result, Rita left Italy to join the Brussels Neurological Institute.

In 1940, she returned to her family in Turin, just as the German army was about to invade Belgium. She continued her research and experiments in a small laboratory she built in her bedroom. In 1941, the heavy bombing of Turin forced the Levi-Montalcini family to flee to a country cottage for safety. Rita once again built a small laboratory to continue her work. In 1943, the German army invaded Italy. Rita and her family were forced to leave their cottage in Piedmonte and take refuge in Florence, Italy, where they lived underground until the end of the war.

In 1944, the Anglo-American army forced the Germans to leave Florence and Rita was hired as a medical doctor to help with the war refugees brought down from the north where the war was still ongoing. At the end of the war in 1945, Rita resumed her studies at the University of Turin.

In 1947, Rita's life would take an exciting turn. She was invited by Viktor Hamburger, an assistant professor in the Department of Zoology, to work under him at Washington University in St. Louis, Missouri. There she would help Viktor continue his research on the nerve tissue of chicken embryos. Due to the location of her work, Rita held dual

citizenship in Italy and the United States. In 1948, they discovered that a specific form of mouse tumor sparked nerve growth when introduced to chicken embryos. They named the substance that caused this reaction Nerve Growth Factor (NGF). Rita continued to experiment with NGF on nerve cultures in the laboratory. With the help of Stanley Cohen, her colleague at the university, she was able to extract the NGF substance from the mouse tumor. This substance stimulates the growth of nerve cells and fibers in the peripheral nervous system. Rita remained at Washington University until 1961 and returned to Italy to resume her work at The Institute of Cell Biology in Rome. While in Rome, she was the director of the Research Center of Neurobiology from 1961 to 1969 and the director of the Laboratory of Cellular Biology from 1969 to 1978. She retired in 1979 and became a guest professor at the Research Center.

Rita Levi-Montalcini was the recipient of many awards. In 1968, she was the 10th woman elected to the United States National Academy of Science. In 1986, Rita Levi-Montalcini and Stanley Cohen were awarded the Nobel Prize for Physiology and Medicine for their discovery of the Nerve Growth Factor. In 1986, she also received the Albert Lasker Award for Basic Medical Research. In 1987, she was awarded the National Medal of Science, the highest award in the scientific world of America. In 2001, she was appointed Senator-for-Life by Italian President, Carlo Azeglio Ciampi. As of April 2006, Rita Levi-Montalcini was the oldest laureate member in the Upper House of the Senate of Italy until her death in 2012.

Procedures:

I. Ask the students the following questions:
   a. How would you define determination?
   b. Was there ever an instance when you may have displayed determination?
   c. How would determination be a valuable quality to have as a student?
   d. How would determination be a valuable quality in pursuing a professional career?

II. Explain to the students that the focus of this lesson is about a famous Italian-Jewish woman, Rita Levi-Montalcini, who overcame adversity to fulfill her dream.

III. Give the students a brief explanation of the circumstances and prejudices surrounding World War II.

IV. Discuss with the students the background information on Rita Levi-Montalcini.

V. Ask the students to discuss why Rita's work, along with her colleagues', on cell growth is important to the fields of science and medicine. How could cell growth research benefit people around the world?

VI. Explain to the students that they will have an opportunity to experiment with cell growth in the classroom.

VII. The students should be divided into groups of three or four.

VIII. The students will collect two samples of bacteria from classroom items such as a desk, doorknob, chair, etc.
   a. The students should take their two samples from the same location.

IX. The students will need the following items for the experiment:
   a. Three Petri dishes, two for cell growth of bacteria and the third as a control
   b. Nutrient agar should be used to prep the Petri dishes
   c. Two laboratory swabs
   d. Microscope, microscope slides, and sample sticks

X. The students should prepare their three Petri dishes with a small amount of nutrient agar, just enough to coat the bottom of the dish.

XI. The students should then choose a location in the classroom to swab and collect two samples using two different swabs.

XII. The students should then proceed to wipe the assumed bacteria into the Petri dishes. One swab goes into Petri dish number one and the other swab into Petri dish number two. Petri dish number three should remain as a control.

XIII. The Petri dishes should be numbered and labeled with the location from which the sample came and the date and the students' names or group number.

XIV. One Petri dish should be kept at room temperature and not in direct sunlight. The other should be kept in a dark area.

XV. One week following the initial experiment set up, the students should swab a sample from each Petri dish and examine it on clean glass slides under a microscope.

XVI. Have the students record their findings in a narrative as well as a drawing of what they see. The students may use the experiment worksheet to record their findings. Drawings of the students' observations through the microscopes may be done on the back of the experiment worksheets.

XVII. The students should complete the project by writing a short conclusion comparing the three Petri dishes.

Homework:

Have the students write a short essay on Rita Levi-Montalcini's displayed determination throughout her life and how she may have influenced other women to have the determination to pursue professional careers.

Assessment:

Evaluate the students' experiment recordings and their essay on Rita Levi-Montalcini.

Extensions:

- Have students research and write a short essay on the current status of the Nerve Growth Factor. What new developments, if any, have come about since Rita's research? What effect does the Nerve Growth Factor have on medical challenges such as Alzheimer's disease? Is the Nerve Growth Factor known to help in the study and/or potential cure of any other medical diseases?

- Information for research on Nerve Impulse Conduction may be found at: http://thebrain.mcgill.ca/flash/d/d_01/d_01_m/d_01_m_fon/d_01_m_fon.html

- Have the students research how many Italian or Italian Americans were recipients of the Nobel Prize for various aspects of the award (in any field of endeavor).

Background Resources:

- ✓ https://www.thoughtco.com/rita-levi-montalcini-biography-4172574
- ✓ www.almaz.com/nobel/medicine/1986b.html
- ✓ https://www.famousscientists.org/rita-levi-montalcini/
- ✓ www.britannica.com/eb/article-9047979/Rita-Levi-Montalcini

New Jersey Student Learning Standards

Science

LS1.D: Information Processing ♣ Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories. (MS-LS1-8)

English Language Arts

W.6.1b
Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of the topic or text.

W.6.1e
Provide a concluding statement or section that follows from the argument presented.

W.6.2a
Introduce a topic; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

W.6.2b
Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.

W.7.1b
Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.

W.7.2a
Introduce a topic; organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia) when useful to aiding comprehension

W.8.1b
Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.

W.8.2a
Introduce a topic and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia).

W.9-10.1
Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

W.9-10.1e
Provide a concluding statement or section that follows from and supports the argument presented.

W.11-12.1a

Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.

W.11-12.1e
Provide a concluding paragraph or section that supports the argument presented.

W.11-12.2b
Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

SL.6.2
Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.

SL.7.2
Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

SL.8.1d
Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

SL.8.2
Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

SL.9-10.1c
Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.

SL.9-10.1d
Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

SL.9-10.4
Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

SL.11-12.1c
Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

SL.11-12.1d
Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the

task.

SL.11-12.4
Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

RST.6-8.3
Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

RST.9-10.3
Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

RST.11-12.3
Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Rita Levi-Montalcini
Experiment Recording Worksheet

Initial Experiment Setup

Date:
Names/Group Number:
Materials Used:
Swab Location:
Objective:
Process:
Observation:

Sample One Observation

Date:
Names/Group Number:
Materials Used:
Swab Location:
Objective:
Process:
Observation:

Sample Two Observation

Date:
Names/Group Number:
Materials Used:
Swab Location:
Objective:
Process:
Observation: