

Lesson Plan

“The Physicist’s War:” Dr. Herman Branson and Scientific Training of African Americans during World War II



*Herman Branson in a laboratory with equipment circa 1939.
Image courtesy the AIP Emilio Segre Visual Archives, gift of Dr. Herman Branson*

Grade Level(s): 9-12

Subject(s): History, Physics, Chemistry

In-Class Time: 120-180 min (2 parts)

Prep Time: 30-40 min

Materials

For Part I:

- Photocopies of primary source documents (see Supplemental Materials)
- Internet access and A/V equipment to play video (link in Required Resources)

For Part II:

Each group should receive

- 1 fresh D battery
- vinyl electrical tape

- 3-inch iron nail
- 3-inch galvanized (zinc-coated) nail
- 3-inch stainless steel nail
- roughly 10 paper clips
- at least 3 different gauges (thickness) of insulated (coated) copper wire, cut to 2 foot lengths with the last 1cm of each end stripped off. 10, 14, and 18 gauge wire should be good.

Teachers will need:

- Wire strippers

Objective

In this lesson plan, students will learn about the mobilization of African American “war workers” at historically black colleges and universities during World War II. They will learn more specifically about well-known African American physicist Herman Branson and read about his assessment of the role of African Americans and HBCUs in preparing technical personnel for World War II. Additionally, students will learn about and interact with the forces of electromagnetism.

Introduction

Jim Crow segregation structured the whole of the United States in the early twentieth century. The “long civil rights” movement challenging segregation took root in the 1930s and escalated as World War II began and the United States became involved. The hypocrisy of defending the United States against Nazi fascism while serving in segregated military units and being denied full citizenship at home was too much for [many](#) African Americans. As defense industries and training programs expanded, they demanded the same opportunities for employment and education offered to white Americans. A. Philip Randolph—a union organizer for the Brotherhood of Sleeping Car Porters—and Bayard Rustin were two of the leaders of the March on Washington Movement, designed to pressure the U.S. government to desegregate the armed forces and provide equal employment opportunities in war industries. The pressure of the threat of the march led President Roosevelt to sign Executive Order 8802 on June 25, 1941, which prohibited racial discrimination in defense industries and established the Fair Employment Practices Commission. This was a major victory for African Americans and led to thousands of employment and educational opportunities.

World War II was often called “a physicist’s war” because of the importance of devices such as radar, proximity bombs, and others that were increasingly central to modern warfare. Therefore, training in physics and science was of primary concern in addressing the manpower shortage problem that faced the United States. The Engineering, Science, and Management War Training program (ESMWT) was created to address this problem. It was one of the largest educational programs implemented by the United States in American history and was operated by the U.S. Office of Education from October 1940 through June 1945. Almost 2 million students took courses at 227 colleges and universities across the country. Of those schools, 65 HBCUs participated and 12 held direct contracts with the U.S. Office of Education.

Howard University, one of the most prestigious HBCUs in the country and one of three at the time that offered graduate degrees in physics, became part of the ESMWT during World War II due to the efforts of Assistant Professor of Physics and Chemistry Dr. Herman Branson. Dr. Branson was born on August 14, 1914 in Pocahontas, Virginia and received his Ph.D. from the University of Cincinnati in 1939. He

arrived at Howard University in 1941, on the eve of the United States full-scale entry into World War II. Dr. Branson was a tireless advocate for increasing physics training at HBCUs and saw the war as a crucial opportunity. While HBCUs had developed sophisticated programs in medicine, dentistry, and law, the physical sciences sorely lacked infrastructure and teachers. According to Branson, HBCUs provided a crucial source of scientists that the United States should not ignore. The ESMWT program (then called the Engineering, Science, and Management Defense Training program) provided large amounts of federal funds to develop the laboratory infrastructure and increase physics instruction at institutions of higher education. However, he argued that the requirements effectively barred most HBCUs since eligibility relied on the number, training and experience of staff members, laboratory facilities, number of degrees conferred, and requirements for a major in a field of specialization. The consistent underfunding of HBCUs meant that they lagged behind predominantly white institutions in terms of these criteria. Under Dr. Branson’s direction, Howard University did become part of the ESMWT program from 1942 until 1944.

In this two-part lesson plan, students will read about the state of physics at HBCUs during World War II and about the Engineering, Science, and Management War Training program at Howard University. In the second part, students will conduct experiments after making electromagnets, which many of the ESMWT students would have worked on and developed.

Instructions/Activities

Part I: Historically Black Colleges and Universities and the War

Engage: 10-15 Minutes

The teacher will introduce World War II, including how the United States’ involvement led to a national manpower shortage. In addition, they will describe the fight for equal employment opportunities coinciding with the War’s developments. Finally, they will emphasize the importance of colleges and universities as training facilities for students to enter the military and war industries. This section will end with the presentation of a short video clip about HBCUs and the War.

What is the teacher doing?

1. Begin by discussing how the United States became involved in World War II.
2. Discuss the “manpower shortage” that emerged during the War and the need to produce both soldiers and workers for the various defense industries. African Americans were eager to enter these industries. Tell the students about how colleges and universities across the country (including historically black colleges and universities) dedicated themselves to training hundreds of thousands of students to become involved in war industries and the military.
3. Show the students the clip about how HBCUs prepared for World War II (2.5 minutes). Click [Here](#) to access video, and

What are the students doing?

1. Actively listen to the discussion of World War II, manpower shortages, the struggle for equal opportunities, and the collegiate contributions to the war effort.
2. Take notes on the HBCU video clips. Be sure to note: What fields were the students studying? What jobs were they preparing for?

<p>see Required Resources for full link and video information. Ask students to take notes about what they notice including what fields students are studying and what jobs they are preparing for. Ask them to write down any other observations they make about the videos.</p>	
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Explore: 25-35 minutes

<p>The class will divide into 3 small groups, which will each read and analyze an article (or set of short articles). Each article has corresponding Discussion Questions, which will be distributed by the teacher.</p>	
<p>What is the teacher doing?</p> <ol style="list-style-type: none"> 1. Divide the class into small groups and assign the articles and the corresponding Discussion Questions (both sets can found in the Supplemental Materials). <ol style="list-style-type: none"> <u>a.</u> J. A. Crowther, "Physicists and the War," <i>Journal of Applied Physics</i> vol. 12 (1941), 767-768. AND: Harold W. Woodson, "The Present Status of Physics in Negro Colleges," <i>American Journal of Physics</i> vol. 9 (1941), 180-183. <u>b.</u> Herman Branson, "The Role of the Negro College in the Preparation of Technical Personnel for the War Effort," <i>The Journal of Negro Education</i> vol. 11 (1942), 297-303. <u>c.</u> Herman Branson, "The Training of Negroes for War Industries in World War II," <i>Journal of Negro Education</i> vol. 12 (1943), 376-385. 2. Ask each group to summarize the articles, highlighting the most important points of the article so that they can share them with the class. 	<p>What are the students doing?</p> <ol style="list-style-type: none"> 1. Divide into 5 small groups. Each will receive a separate article and corresponding set of Discussion Questions. 2. Read and discuss the assigned article. create an effective summary with key points to be shared with the class, if possible incorporating answers to the Discussion Questions. These questions should be completed individually as well, especially if they will be evaluated by the teacher.

Explain: 15-20 Minutes

<p>Each group will present a summary of their assigned article, addressing their Discussion Questions. Presentations should be roughly 3 minutes each.</p>	
<p>What is the teacher doing? Have the Crowther/Woodson group go first and share why physics and physicists were so important to World War II and physics at HBCUs.</p>	<p>What are the students doing? In specified order, each group is to present their summaries of the article they read, teaching it to the class. Each presentation should include a brief</p>

<p>Then, have the Branson groups share what they learned about how African American physicists were responding the demands created by World War II, in the following order:</p> <ol style="list-style-type: none"> 1. "The Role of the Negro College in the Preparation of Technical Personnel for the War Effort" 2. "The Training of Negroes for War Industries in World War II" <p>If needed, the teacher may evaluate these presentations</p>	<p>summary of the article as well as possible answers to some of the discussion questions. The order of the presentations should be as follows:</p> <ol style="list-style-type: none"> 1. Crowther, "Physicists and the War" and Woodson, "The Present Status of Physics in Negro Colleges" 2. Branson, "The Role of the Negro College in the Preparation of Personnel for the War Effort" 3. Branson, "The Training of Negroes for War industries in World War II"
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Elaborate: 10-20 Minutes

<p>The class will hold a discussion, in which the students synthesize what they have learned, including how World War II affected the African American physics community, as well as how the ESMWT supported an increase in African American physicists trained at Howard University. The teacher will also encourage the students to consider the implications of what they have read and learned.</p>	
<p>What is the teacher doing?</p> <p>Lead a discussion in which the students discuss their readings generally, and synthesize what they have learned. Ensure that they understand how the African American physics community was affected by World War II, and how Howard University trained more physicists through the ESMWT.</p> <p>Also, encourage students to consider some of the implications of what they have read. Some of the following questions may be helpful in initiating conversation:</p> <ul style="list-style-type: none"> • Were African Americans justified in their optimism about the prospects of retaining their research and industrial positions after the War's end? What do you think happened after the conflict's close? • What do you think about African Americans being recruited to develop and build complex, crucial devices for the American war effort, while their public segregation in America was still deemed constitutional (before 1954 and <i>Brown v Board</i>)? 	<p>What are the students doing?</p> <p>As a class, discuss the readings and presentations. Be sure to understand the impact of the war on the African American physics community, and how the ESMWT helped train more black physicists at Howard University.</p> <p>Also, consider and discuss the implications of the increasing role African Americans played in the industrial and physical science spheres during the second World War. Discuss any questions posed by the teacher.</p>

Evaluate:

<p>Evaluation may emerge from the explanation section of this lesson plan. Teachers may collect and evaluate student responses to the article discussion questions. In addition, teachers may evaluate the</p>
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student group presentations.

Part II: Electromagnets

Note: This activity was adapted from “Electromagnetism—An Everyday Occurrence!”; an activity designed by TpT Store XIV and housed on *Teachers Pay Teachers*.

Engage: 2-5 Minutes

Teachers will refresh students’ understanding of magnetism, the movement of electrons within atoms and matter, polarity, and magnetic fields. Students will brainstorm methods to construct an electromagnet to attract paperclips in small groups.

What is the teacher doing?

Split students into small groups. Pass out the electromagnet worksheet. Refresh students’ understanding of magnetism. Introduce the concept of an electromagnet, and the process of producing a field by sending a charge through a wire. Engage in a class-wide brainstorming session of how students would construct an electromagnet

What are the students doing?

In groups, receive the electromagnetic worksheet, become familiar with electromagnets via teacher introduction, and begin brainstorming methods of constructing an electromagnet with given materials.

Explore: 25-30 Minutes

Student groups will then transition to physically constructing their electromagnets, using the worksheet as a guide. They will construct the electromagnets according to the given instructions. Subsequently, the groups will identify three (independent) variables that they will modify in different trials. Groups will document their work and findings on the worksheet. Teachers will distribute materials for magnet construction (having stripped 1 cm of the insulation off each end of the 2 foot wire pieces, using a wire stripper). Teachers will circulate and advise groups, monitoring for safety (NOTE: the electromagnets will produce heat, so be sure groups are disconnecting the wires from the battery as soon as each trial is concluded.)

What is the teacher doing?

Pass out required materials to construct electromagnet to each group. Ensure that each group starts by constructing their electromagnet according to the instructions (using 14 gauge insulated wire and iron nail). Help groups identify variables if needed, and monitor to ensure construction is conducted safely. Reiterate to groups that they must disconnect wires from battery after each trial/test. If needed, supply groups with replacement batteries.

What are the students doing?

In groups, construct electromagnets according to instructions on worksheet (using 14 gauge wire segment and iron nail). Conduct test to determine number of paper clips attracted. Identify and adjust variables (notably wire gauge/thickness and nail material) and repeat test. Document findings from each test on worksheet.

Explain: 10-15 Minutes

The teacher will lead students as they share and compare findings among and between groups. They will answer and pose questions related to the performance of the electromagnets and the groups’ identified variables and experiences.

<p>What is the teacher doing? Posing and answering questions to groups regarding their findings and the implications for how electromagnets function. Have groups share and compare their data and conclusions.</p>	<p>What are the students doing? Share and compare trial data and conclusions between groups, asking questions as needed to each other and teacher.</p>
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Elaborate: 10-15 Minutes

The groups will answer the reflection questions found on the last page of the worksheet. If desired, the teacher could have the groups graph their electromagnet trial data.

<p>What is the teacher doing? Ensure groups answer the reflections questions at the end of the worksheet. If desired, have groups graph data individually or collectively.</p>	<p>What are the students doing? Answer reflection questions. If needed, graph data.</p>
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Evaluate:

The main opportunity for evaluation will emerge as the students complete the electromagnet worksheets. The teacher may evaluate the groups' identification of variables and trial data, as well as the reflection questions found on the last page of the worksheet that function as the Elaboration element of this lesson plan.

Required/Recommended Reading and Resources

Required Resources:

Videos:

- "Negro students gain knowledge of medicine, economics, chemistry at Prairie View College and Howard University in the U.S.," 1943, http://www.criticalpast.com/video/65675059204_Negro-students_Howard-University_Prairie-View-College_navigation. (2 min 13 sec)

Articles (found in Supplemental Materials):

- J. A. Crowther, "Physicists and the War," *Journal of Applied Physics* vol. 12 (1941), 767-768.
- Harold W. Woodson, "The Present Status of Physics in Negro Colleges," *American Journal of Physics* vol. 9 (1941), 180-183.
- Herman Branson, "Physics Training for the Negro Student," *American Journal of Physics* vol. 10 (1942), 201.
- Herman Branson, "The Role of the Negro College in the Preparation of Technical Personnel for the War Effort," *The Journal of Negro Education* vol. 11 (1942), 297-303.
- Herman Branson, "The Training of Negroes for War Industries in World War II," *Journal of Negro Education* vol. 12 (1943), 376-385.

Recommended Resources:

- This clip provides a broader view of war preparation on college campuses and includes a brief clip of African American students. It could be used for comparison. "Colleges prepare students for military and civil occupations useful in war effort, United States," 1942, http://www.criticalpast.com/video/65675052263_Edward-C-Elliott_colleges-at-war_training_cadets-trained-for-war. (10 min 49 sec – HBCU material starts at 7:00 minutes)

Discussion Questions

Discussion Questions for Part I can be found as a Handout with a corresponding Answer Key in the Supplemental Materials to this lesson plan.

J. A. Crowther, “Physicists and the War”

1. Where is J. A. Crowther from?
2. Why does Crowther believe that physics and physicists are crucial for winning World War II?
3. How does Crowther compare physics students during wartime and the future to the physics student of the past?

Harold W. Woodson, “The Present Status of Physics in Negro Colleges”

1. How many colleges did Woodson include in his study? Why did he choose the colleges that he did?
2. According to Woodson, what problems do schools face in including physics in their general curriculums?
3. What are the main challenges facing physics departments at HBCUs?
4. How many schools offer graduate degrees in physics? What schools are they?

Herman Branson, “The Role of the Negro College in the Preparation of Technical Personnel for the War Effort”

1. How has World War II changed the economic opportunities for African Americans?
2. According to Branson, what fields do HBCUs traditionally specialize in?
3. What is the status of physical sciences at HBCUs?
4. What are examples of some courses and special training programs that have been introduced at Howard University to address training for World War II?
5. What is the Engineering, Science, and Management Defense Training program and the National Defense Research Committee?

Herman Branson, “The Training of Negroes for War Industries in World War II”

1. What are the two major programs initiated by the U.S. Office of Education to address the need to train personnel for World War II?
2. What are the numbers of African Americans and HBCUs participating in these programs?
3. In the various fields of training offered by the VTWPW program (see p. 377), where are African Americans most represented? Where are they least represented?
4. What is the geographic distribution of African American trainees?
5. How does the ESMWT program work?
6. How are African American women faring in these training programs?
7. What is Branson’s overall assessment of the training of African Americans for war industries?

Further Reading and Additional Resources

- *African Americans in World War II: Struggle against Segregation and Discrimination*, a one-hour documentary available on YouTube that documents the struggle waged by African Americans

against segregation and discrimination during World War II,

<http://www.youtube.com/watch?v=U3rnCPeKBwg>.

- Daniel Kryder, *Divided Arsenal: Race and the American State during World War II* (Cambridge: Cambridge University Press, 2000). This book provides an in-depth examination of the racial politics of federal manpower initiatives and the National Defense Program.

Extensions

Related AIP Teacher’s Guides on Women and Minorities in the Physical Sciences:

- Physical Sciences at Historically Black Colleges and Universities
- African American Physicists in the 1960s

Common Core Standards

For more information on Common Core Standards, visit <http://www.corestandards.org/>.

Speaking & Listening	
<u>CCSS.ELA-LITERACY.SL.9-10.1</u>	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
<u>CCSS.ELA-LITERACY.SL.9-10.4</u>	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.
<u>CCSS.ELA-LITERACY.SL.11-12.1</u>	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
<u>CCSS.ELA-LITERACY.SL.11-12.4</u>	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.
History/Social Studies	
<u>CCSS.ELA-LITERACY.RH.9-10.1</u>	Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.
<u>CCSS.ELA-LITERACY.RH.9-10.2</u>	Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.
<u>CCSS.ELA-LITERACY.RH.9-10.3</u>	Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.
<u>CCSS.ELA-LITERACY.RH.9-10.4</u>	Determine the meaning of words and phrases as they are used in a

	text, including vocabulary describing political, social, or economic aspects of history/social science.
<u>CCSS.ELA-LITERACY.RH.9-10.6</u>	Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts.
<u>CCSS.ELA-LITERACY.RH.9-10.9</u>	Compare and contrast treatments of the same topic in several primary and secondary sources.
<u>CCSS.ELA-LITERACY.RH.11-12.1</u>	Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole.
<u>CCSS.ELA-LITERACY.RH.11-12.2</u>	Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.
<u>CCSS.ELA-LITERACY.RH.11-12.3</u>	Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain.
<u>CCSS.ELA-LITERACY.RH.11-12.6</u>	Evaluate authors' differing points of view on the same historical event or issue by assessing the authors' claims, reasoning, and evidence.
<u>CCSS.ELA-LITERACY.RH.11-12.9</u>	Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.

Next Generation Science Standards

For more information on the Next Generation Science Standards, visit <http://www.nextgenscience.org/>.

Physical Sciences	
<u>HS-PS2-5 Forces and Interactions</u>	Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. Grade: High School (9-12)

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