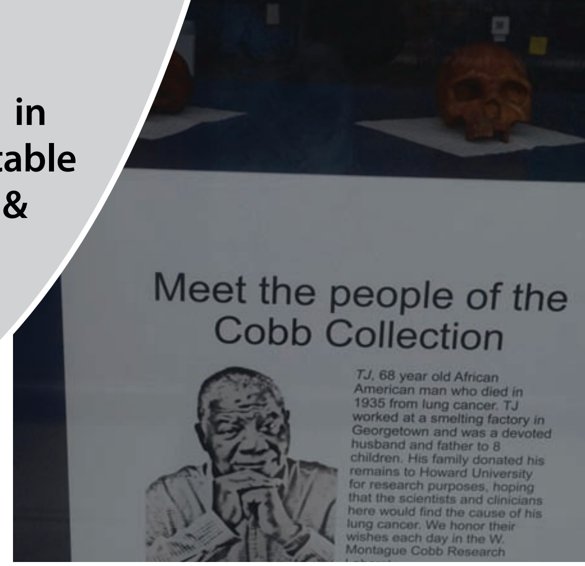
FEATURE ARTICLE

# Expanding the Science Capital in K–12 Science Textbooks: A Notable Doctor's Insights into Biology & Other Accomplishments of African American Scientists

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**Abstract**

*This article explores the need to include the science capital and cultural capital of African Americans in science teaching and offers practical exemplars for inclusion in the K–12 science curriculum. The author discusses ideas in the evolution of culture that contribute to the science content and perspectives of current textbooks and their supporting educative curriculum materials. The exemplars provided shed light on the scientific concepts and ideas indicated by the scientific accomplishments and narratives of African American scientists and a notable doctor, Charles R. Drew. The practical considerations described have implications for the disciplinary core ideas in the* Next Generation Science Standards, *and for understanding the cultural, social, and political values inherent in the nature of science.*

**Key Words:** *African American; scientists; K–12 curriculum; textbook; nature of science; NGSS; cultural capital.*

## ○ Introduction

People of color are known for various kinds of cultural capital that have helped them persist in the face of adversity. Yosso (2005) describes these as aspirational capital, linguistic capital, familial capital, social capital, navigational capital, and resistant capital. All have helped communities of color to become successful. However, aspirations to be a scientist are still especially challenging for some people of color. Even though studies show that research experience has a positive impact on self-efficacy (Salto et al., 2014; Robnett et al., 2015), African Americans and Native Americans with increased self-efficacy still have difficulty identifying as scientists (Robnett et al., 2015). Robnett et al. (2015) attributed this to other constructs that need to be explored.

> *"One should not minimize the importance and authority of textbooks, which legitimize and provide permanency, turning tentative ideas into facts."*

One unexplored construct in science is the impact of a lack of perceived science capital or cultural capital in science. Even though African Americans have been practicing science for generations, they continue to be absent from textbooks and accompanying curriculum supports. Their accomplishments and paths to success are often suppressed (Carlone & Johnson, 2007; Brown et al., 2016). Bourdieu (1977) indicates that the transmission of power and privileges within the education system is often concealed by what appears to be a "neutral attitude." This is especially true for the transmission of cultural capital within science, often masked by "objectivity" and "neutrality" within textbooks. The present article does not address the impact of a lack of science cultural capital on students of color. Instead, it makes a case for how and why to include the narratives and accomplishments of African Americans in science. More specifically, this article explores why it is important to build science capital and suggests practical exemplars for how this can be done.

## ○ The Need for Cultural Capital in Science

Mokyr (2017) describes the biases that accompany cultural evolution and result in learned or symbolic transmission. These biases in cultural evolution are content-based bias, direct bias, consistency and confirmation bias, model-based bias, rhetorical bias, frequency dependence bias, rationalization bias, coercion bias, and salient event bias (Mokyr, 2017). Mokyr (2017) discusses these biases in relation to the impacts of history on cultural evolution, noting: "Unlike what happens in biological evolution, cultural selection is not natural but is mostly conscious. The questions are what happens during the acquisition process and how are such choices made" (Mokyr, 2017, p. 44).



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The biases that Mokyr (2017) describes will be used to explain why the narratives, experiences, and accomplishments of African Americans in science should be included in textbooks and supporting curriculum materials. In several cases, more than one descriptor might be relevant to the information presented. Descriptors that are salient to the author are placed in parentheses.

## ○ The Role of Textbooks

Science textbooks, along with their accompanying curriculum materials, are one of the primary modes of transmission of privilege and power in the science classroom (content bias). Educational reforms resulting in new standards and benchmarks, such as the *Next Generation Science Standards* (NGSS) and the Project 2061 benchmarks, are usually accompanied by textbook evaluations to assess alignment. Subsequently, mobilizations and investments in textbooks and curriculum supporting materials by companies, national organizations, academies, scientists, and science educators ensue. More recently, the *Journal of Science Teacher Education* dedicated its first issue in 2017 to the educative curriculum. Articles such as "The Benefits and Limitations of Educative Curriculum Materials" (Krajcik & Delen, 2017) and "Designing for the Next Generation Science Standards: Educative Curriculum Materials and Measures of Teacher Knowledge" (Roseman et al., 2017) look at the need to design curriculum materials that supports teachers' implementation of the NGSS.

One of the changes made to some textbooks has been the inclusion of scientists and scientists' perspectives to address the benchmarks related to the scientific community and the nature of science. However, if we look at any typical textbook, such as *Plant Physiology, 4th ed*. (Salisbury & Ross, 1991), the authors are, phenotypically speaking, European Americans or of European origins (frequency bias). The twenty-two instances of in-depth profiles of scientists would be indicative of the experiences and interests of the authors (content-based bias), and none of the scientists are phenotypically African Americans (model-based bias). In this text, one international scientist wrote about "Pursuing the Questions of Soil-Plant Atmosphere Water Relations" and described the excitement of his journey through this process. We come to know his interests, where he studied, what positions he held as he journeyed through his master's and doctoral studies, and some of his insights into the nature of science:

> Of course, in most cases, more careful observation, more thorough reading of the literature, or a critical discussion with colleagues leads to an awareness either that your ideas or observations won't hold up, or that someone else has anticipated you . . . . Somewhat surprisingly, these views, published in both experimental and review papers, were rapidly accepted by the scientific community and have since been reconfirmed in general aspects by numerous investigators. (Salisbury & Ross, 1991, p. 48)

Other biographical excerpts penned by scientists include "Must We Write," by a phenotypically Asian scientist; and "Ventilation in Waterlilies: A Biological Steam Engine," "The Function of Sodium as a Plant Micronutrient," and "A Special Importance of the Primary Cell Wall in Plant Development," all by phenotypically European scientists (consistency bias; salient event bias; model-based bias). These inclusions support the historical impact on cultural evolution within the scientific texts and most of all they support what constitutes content-based bias. If we exclude these scientists, we do not lose the science but we do lose the history, the cultural capital, and cultural and social relevance. Likewise, the inclusion of the narratives and accomplishments of African Americans will add to these dimensions and provide a more complete picture of the social, cultural, and political nature of science.

## ○ Understanding the Content-Based Bias of Textbooks

I will now apply Mokyr's (2017) description of content-based bias to science, to the history of science, and to what is considered the norm in science. Mokyr (2017) asks: "By what means is knowledge validated, legitimized, and ultimately accepted?" Kuhn's famous book *The Structure of Scientific Revolutions* provides some perspective on this question. Kuhn (1996) notes that prior to the textbook era, scientists presented their findings to the public individually, in an "open-ended" way, and drew specific followers to their work. Later, as scientific research addressed more advanced information than the general public was capable of understanding, the publishing of scientific works shifted to a more confined and elitist audience. Hence, a more highly directed research resulted, with paradigms guiding communities of scientists (Kuhn, 1996). This historical perspective supports Mokyr's (2017) contention that what drives content-based bias is the number of people who are persuaded. More importantly, this is especially true when knowledge is "tight" or guided by paradigms. Mokyr (2017) notes that "when knowledge is untight or more complex to evaluate, beliefs may not become fixed in the population" (p. 49). In this case, Mokyr (2017) refers to Darwin's *Origin of Species* and the challenges related to accepting Darwin's ideas. Textbooks have made knowledge tight. According to Kuhn (1996), the way in which the study of science is often summed up in textbooks reflects, like a travel brochure, the cultural context.

There are many ideas, paradigms, and images propagated by textbooks that are now accepted as facts. The fact that scientists are typically white males has been widely assimilated into the consciousness of K–12 students of color (Walls, 2012; Wong, 2015), accompanied by a fear that one is venturing into unchartered territory (Wong, 2015). Textbooks, as an authoritative source, make scientific discovery seem linear and cumulative, "truncating the scientist's sense of his discipline's history" (Kuhn, 1996, p. 137). It includes paradigms that have stabilized and are currently applicable, "transforming previously accessible information into facts" (Kuhn, 1996, p. 141). However, excluding African Americans from textbooks and from the curriculum influences public perspectives. First, textbooks reflect society's rhetoric by contributing to the negative psychological antecedents that have been used to describe African Americans as unmotivated and inferior (Mutegi, 2013). Mokyr (2017) indicates that "if the subject is a statement of a fact, it seems reasonable that they consider the evidence, but as noted, how they interpret the evidence and when they consider it sufficient are functions of the rhetorical conventions of the society" (Mokyr, 2017, p. 48). Textbooks as sources of authority contribute to the rhetoric that African Americans have contributed nothing to science within our society. Mokyr (2017) states that "what it is precisely that convinces people that a belief is correct depends in part on the kind of information supporting it" (p. 49). In the case of textbooks, the featured scientists are the source of authority and information on particular subject areas, and therefore the absence of diverse authoritative sources reinforces society's rhetoric.

## ○ The Antidote for Direct Bias & Content Bias: The Narratives & Accomplishments of African American Scientists

African American scholars and professors at historically black colleges and universities such as Howard University have long recognized the need to create counter-narratives to influence their students' feelings of self-efficacy and belief that they could do science. One such professor at Howard, scientist Marjay Anderson, created a booklet titled *A Compendium of African-American Scientists and Their Contributions to the Natural Sciences*, which she distributed to her students. It contains highlights of the accomplishments of 30 African American scientists and six African American inventors, both male and female. She distributed this booklet to students in her life sciences course. Dr. Anderson (then retired and now deceased since this interview) said that she was motivated to pay attention to the accomplishments of African Americans in science because when she first began teaching at Howard University in 1968, students would tell her that she was the first African American female scientist they had met. She added that many notable male scientists and inventors ended up at Howard because they could not get jobs at white institutions, even if they had attended one. Dr. Anderson also included excerpts about other issues relevant to African Americans, such as the story of Henrietta Lacks, and she recalled the article on Ms. Lacks that was published by *Jet* magazine (M. Anderson, personal communication, June 24, 2019). Henrietta Lacks was an African American woman whose unique cancer cells continued to be studied by white scientists at Johns Hopkins over many years – a great source of controversy. More recently, her life story was publicized by a phenotypically white author and science writer, Rebecca Skloot, in her book *The Immortal Life of Henrietta Lacks*. Currently, professors and teachers at colleges and K–12 institutions incorporate the lives and accomplishments of African Americans piecemeal. However, one should not minimize the importance and authority of textbooks, which legitimize and provide permanency, turning tentative ideas into facts.

From Anderson's compendium of African American scientists, we learn about biologist Ernest Everett Just's focus on reproductive zoology. Anderson tells us: "His specific endeavors involved the most meticulous experiments and analysis of slides and the dissection of specimens aimed at understanding the fertilization of eggs, parthenogenesis and ectoplasm and cortex of invertebrate marine organisms" (Anderson, ca. 1980). We also learn about the challenges Just faced to find research laboratories in the United States, which led him to work in laboratories in Germany and Italy, where he was more welcome.

## ○ Expanding the Range of Research Interests & Questions

One of the ways that African American scientists can add to the cultural capital in science classrooms is seen in the nature of their scientific interests—fields of study that often give African Americans a chance to learn about themselves. Scientist Michael Campbell, graduated with his doctorate from Columbia University and now a professor at Howard University, is among an international team of scientists interested in understanding the genetics of skin color (Figure 1). Dr. Campbell's interest is informed by prior extensive research studies on skin color that have focused on European subjects, and by the lack of data on skin pigmentation that include people of color, particularly those of black African origins. Campbell's research is rooted in the plight of people of black African heritage and has ranged from looking at the origins of lactase persistence in Africa, to the bitter taste gene in Africa, to African genetic diversity and disease mapping. Campbell obtains sequences from biological samples from the field and uses computational and evolutionary methods to analyze DNA sequence data.

Scientists' research interests often begin at an early age. Edwin Cooper, who enjoyed collecting bugs as a child, was interested in studying invertebrates at a time when many scientists thought that little would be gained from understanding lower organisms such as earthworms. As noted in a video interview with *The HistoryMakers*, "Cooper founded the International Society of Developmental Immunology in 1975 and was a founding editor of the International Journal of Developmental and Comparative Immunology" (Cooper, 2012). Now a leader in the field of "invertebrate immune system and comparative immunology," Cooper recalls that he was interested in environmental pollution and considered the earthworm the best organism to learn from because, he believed, they had a good immune system, given that they were able to thrive in polluted environments. This seemed "a precarious idea" at the time (Cooper, 2012).

It is important to expand the cultural capital in science to include African Americans, as a part of giving all students a more comprehensive human picture of science. In the study of cells, for instance, textbooks infuse the narrative with observations and drawings by Robert Hooke and Antonie van Leeuwenhoek, even if only to mention that the work of one confirmed the work of the other, or that Matthias Schleiden and Theodor Schwann concluded that plants and animals, respectively, are made of cells. However, a similar biology textbook, such as *Inquiry into Life* (Mader, 2008), might discuss blood, along with relevant and current issues such as immunization, but make no mention of blood banks. And texts such as *Applied Anatomy and Physiology: A Case Study Approach* (Shmaefsky, 2013) might use the words "blood donation" but make no mention of the African American doctor, Charles R. Drew, who is known as the "father of blood banking" (Tan & Merritt, 2017). Thus, the absence of African Americans from STEM textbooks often seems to understate the significance

**Figure 1.** Scientist Michael Campbell at work in his office and lab. Photos by author.

and relevance of their accomplishments, so much so that any familiarity with the works of African American scientists is historical and not scientific, as if to say they could not serve as exemplars for understanding specific science concepts. The more I read a science text, the more I am reminded of the perceived insignificance of the fact that this absence and invisibility seem to send a clear message – that African Americans have contributed nothing to our society – which is far from the truth.

## ○ Expanding the Cultural Capital in K–12 Science Curricula: Where We Are Today

Currently, the creation of STEM curricula begins and ends with scientific concepts and engineering problems and solutions that reflect only the accomplishments and involvement of the dominant culture. Even when African Americans first began to make headway in the sciences, only the works of a few, such as Dr. Drew, became published and publicly available. The NGSS begins to address this disparity by acknowledging that "Science is a Human Endeavor," and that "People have practiced science for a long time. . . . Individuals and teams from many nations and cultures have contributed to science and to advances in engineering" (NGSS Lead States, 2013). However, a recent study showed that educators had difficulty articulating what culturally relevant pedagogy would look like in the classroom (Underwood & Mensah, 2018). K–12 implementations need to go beyond using biographies of African American scientists as an add-on with little relevance of the curriculum to their scientific contributions.

## ○ Charles R. Drew: The Life & Work of an Inspiring African American Doctor's Insights into Biology

### Connections to the Human Nature of Science

Despite the disadvantages and difficulties faced by an African American scientist in his era, Charles Drew's dissertation on blood preservation and his subsequent work led him to contribute to the development of our current system of blood banking in the years leading up to World War II. However, a study of Drew's involvement and role in developing blood banks will also draw attention to other, more embarrassing cultural phenomena, including the plight of African American doctors during the war. Drew's wartime service ended abruptly when he refused to go along with a baseless but officially mandated policy of segregating donations and transfusions of blood. He pled with his "superiors" to pay attention to the biological and scientific facts when determining if whites should accept blood from African Americans. This is a story in which pseudoscience prevailed over the principled stand of a distinguished scientist. As a result of this context, Drew's highly publicized work might not easily attract mainstream culture as an exemplar of science. But in fact, the history of blood transfusions during World War II is socially, culturally, and racially embedded, with relevance and implications for the nature of science and the history of science, especially for African Americans.

### Introduction to Drew's Dissertation

Charles Drew creatively and explicitly embarks, in his dissertation, to fill a gap in the research, and his work reflects an interdisciplinary and multidisciplinary approach. In the introduction, he acknowledges the source of the phrase "blood bank": "The common depot in a hospital to which donors are sent to give or deposit blood in anticipation of later need, and from which withdrawals can be made at a later date, was called by Fantus (1937) a 'blood bank' " (Drew, 1940, p. 1). He then proceeds to describe the advantages and disadvantages of blood banks at that time. You get a sense of the progression of Drew's thinking and his subsequent studies in his review of previous work in the field. "This series of studies," he writes, "was begun in an attempt to answer the first question: Is blood which has been kept in a preservative of some kind for varying periods of time dangerous? If so, in what quantities and in what conditions? Finally, what is the toxic factor?" (Drew, 1940, p. 2). He drew from prior studies such as that of Jacques (1938), who had shown that small quantities of ammonia in an algal species, *Valonia macrophysa* Kütz., change its permeability to Na+ and K+ (Drew, 1940).

Drew's dissertation can be used as an engaging context for authentic explorations into specific topics. For instance, his review leads one to wonder why scientists used algae to learn about red blood cells. Authentic explorations can be integrated into a unit for student research and presentations. Table 1 summarizes related topics, connections, and questions that can be explored.

### Connections to NGSS Disciplinary Core Ideas

In his review of the literature, Drew found that prior experiments had shown that even though erythrocytes were usually impermeable to sodium and potassium, a change in pH changes the permeability of the cells to sodium and potassium and that placing the erythrocytes in a combination of salt and glucose displays some advantages. It appeared that an increase in ammonia concentration is a natural direction/step the cells go through. The increase in ammonia leads to an increase in pH, which then leads to increased permeation. His review seemed to suggest that this increased permeation is due to actual hemolysis occurring. Therefore, he drew blood (most likely venous blood) and compared the outcomes for blood drawn under carbon dioxide and that drawn under air. The results show the impact on ammonia concentration and the changes in other variables such as Na+, K+, and pH. The biggest indicator seems to be the change in ammonia content of the blood. So, the ammonia is the independent variable that impacts the Na, K, and pH. Drew's creative and fascinating studies shed light on the interdisciplinary nature of the physiology of blood. Table 2 summarizes some of the concepts that are addressed in Drew's (1940) dissertation.

## ○ Understanding the Nature of Science for African Americans: W. Montague Cobb Research Laboratory

The Cobb Research Laboratory was founded by scientist William Montague Cobb, who established his lab for skeletal research in

**Table 1. Inquiry connections between the work of Dr. Charles R. Drew and the *Next Generation Science Standards* (NGSS Lead States, 2013).[a] This table makes one set of connections between instruction using Drew's work and the NGSS. Other valid connections are likely. The materials, lessons, and activities outlined in the article are just one step toward reaching the performance expectations listed below. The examples provided have the potential to be very complex or simple explorations, depending on the instructor's approach. This does not mean that more complex or simpler standards do not apply.**

| Performance Expectations | Connections to Classroom Activities |
|---|---|
| Students will plan and conduct an investigation into the characteristics of *Valonia macrophysa* Kütz. that made it ideal for learning about blood. | Students will gather information from various data sources on *V. macrophysa*. Depending on the age group, this information may be provided to students or students may seek out information from credible sources. These sources may include but are not limited to the following websites, which also lead to other links.<br>• *Smithsonian Collections*: https://collections.nmnh.si.edu/search/botany; search site: https://collections.nmnh.si.edu/search/botany/?ark=ark:/65665/3cfc3ff3dea764ba781440eec8f43044f<br>• *National Institutes of Health, The Charles Drew Papers:* https://profiles.nlm.nih.gov/ps/retrieve/Narrative/BG/p-nid/336 (also includes links to grades 7–16 lesson plans in history and social studies)<br>• *American Chemical Society:* https://www.acs.org/content/acs/en/education/whatischemistry/african-americans-in-sciences/charles-richard-drew.html<br>• *Other Smithsonian Learning Lab Collections:* http://www.visibilityinstem.com |
| Science & Engineering Practice | |
| Students will<br>• ask questions;<br>• plan and carry out investigations;<br>• analyze and interpret data;<br>• construct explanations;<br>• obtain, evaluate, and communicate information. | After students are provided background information on the overall work of Charles R. Drew, the teacher can explain that Dr. Drew used *V. macrophysa* to help understand how red blood cells work. The nature of the details provided will vary depending on the age group, as will the nature of the questions students ask. However, students of different grades can all participate in asking questions. Some questions that appear simple might be of importance to both older and younger students. However, they might explore these questions to varying degrees. Questions may include but are not limited to the following:<br>• What can we learn about *V. macrophysa*? What kind of organism is it? Where is it found? Why did Drew (and possibly other scientists) look at *V. macrophysa* to understand more about how erythrocytes work?<br>• What are erythrocytes? What characteristics of *V. macrophysa* inform us about erythroctyes? How did researchers use organisms such as *V. macrophysa* to learn about blood or to help humans? |
| Disciplinary Core Idea | |
| Life Science | K–2 students can explore how the structure of *V. macrophysa* supports various functions, such as photosynthesis and taking in of substances. |
| LS1.A: Structure and Function | K–2 students can explore how the organism responds to various stimuli and how this information helps *V. macrophysa* grow and survive. |
| LS1.D: Information Processing | K–2 students can explore the different observable properties of matter that *V. macrophysa* encounters or that the organism needs to survive. They can understand how this organism is made up of smaller parts that carry out living functions. |
| PS1.A: Structure of Matter | Grades 3–5 students can explore behaviors that highlight the existence of particles too small to be seen but in which measurements of different properties can be used to identify particular materials. |
| Crosscutting Concept | |
| Patterns | Students can observe patterns that prompt questions about relationships and factors that influence them. This is especially important if older students are comparing the structure and function of *V. macrophysa* and erythrocytes. |

(continued)

**Table 1. Continued**

| Performance Expectations | Connections to Classroom Activities |
|---|---|
| Structure and Function | Students will understand how shape and substructure affect the properties and functions of the various parts of *V. macrophysa* and the erythrocytes. The depth at which students explore properties and function depends on their grade. |
| Nature of Science Category | |
| Science Is a Human Endeavor | Students can come to understand that/how men and women of diverse backgrounds are scientists and engineers (K–2), creativity and imagination are important to science (3–5), and technological advances influenced the progress of science as science has influenced technology (high school). |
| Scientific Investigations Use a Variety of Methods | In each grade (K–12) and to varying degrees, students will come to understand that scientists use a variety of methods, tools, and techniques. |

[a]Based on https://www.nextgenscience.org/pe/1-ls1-1-molecules-organisms-structures-and-processes; https://www.nextgenscience.org/pe/4-ls1-2-molecules-organisms-structures-and-processes; and https://www.nextgenscience.org/pe/2-ps1-1-matter-and-its-interactions.

**Table 2. Concepts addressed in Dr. Charles R. Drew's dissertation and other work.**

| Chemistry Connections | General Biology Concepts[a] | Scientific & Engineering Practices | Sociocultural Issues & Concepts[b] |
|---|---|---|---|
| pH: effect of pH on permeability; rates of increase, sodium, potassium; changes in cations/anions; ammonia and alkalinity/acidity | Permeability: diffusion/osmosis (osmotic balance), homeostasis, ammonia and cell permeability | Others' work: Sea algae, *Valonia macrophysa*; comparisons: solutions, organisms, conditions; methodology: centrifugation, examining data | Article: C.R. Drew (1943), "The Negro physician in the present war effort," Howard University Archives, Washington, DC; and radio broadcast, April 27, 1943, 12:15 pm, Station KSD, Missouri |
| Calcium and phosphorus salts, reprecipitation, buffering, reverse reactions, insolubility, coefficient constants | Plasma, preserved blood, erythrocytes, white blood cells, prothrombin anticoagulant, pH of blood, platelets, placental vs. cardiac blood, cadaver blood, shock, toxicity in man | Methods: titration, methods created by others, measurements used (systems of measurements); "ideal container for blood" | The present status of blood substitutes for the navy. Blood substitutes in the armed forces. Drs. Newhouser and Kendrick. American Human Serum Association. Symposium June 2–3, 1941, Washington, DC |
| Changes of other ions in preserved blood: magnesium, electrolytes | Citrated hemoglobin; effects of trauma | Methodology/data: before shaking/after shaking, number of days/length of studies | Overview of the many accomplishments of African American scientists |
| Effect of heat | | Different ways of drawing blood | Pseudoscientific thinking and myths |

[a]Including physiology, bacteriology, and immunology.
[b]Including connections to history and social studies.

1932 in the College of Medicine at Howard University (Anderson, ca. 1980). This lab was set up to study the biological anthropology of African Americans and is currently home to 700 adult skeletons from three skeletal collections – the New York African Burial Ground, the Cobb Collection, and the Rupert's Valley African Burial Ground. The Cobb Research Laboratory is currently directed and overseen by Dr. Fatimah L. C. Jackson, a biological anthropologist interested in the interactions between the environment and the gene, especially when it comes to the experience of African Americans.

Dr. Jackson founded a newsletter, *Cobb Research Lab News*, and a journal, *The Backbone*. These rich sources of science capital for African Americans provide both narratives and images with African American historical, social, and cultural contexts. The research derived from studying the bones in the Cobbs Research Lab tells a story about the plight of African Americans. More importantly, the research shows that the forms these narratives take are dependent on who is telling the story and whose historical, social, and cultural context frames the science and narratives. Table 3 provides

**Table 3. Resources on the lives and contributions of African American scientists.**

| |
|---|
| *The HistoryMakers*, https://www.thehistorymakers.org<br>The HistoryMakers was founded by an African American woman, Julieanna Richardson, who was deeply concerned about making sure that the narratives of accomplished African Americans were recorded and brought to life. While this large interview collection with well over 1000 accomplished African Americans was not designed to focus on scientific accomplishments, it does include, as of this writing, 213 African American scientists who talk about their lives and accomplishments. The collection continues to grow and provides narratives from scientists' perspectives grounded in history and society. |
| *Howard University Biologists*, https://biology.howard.edu/people/faculty<br>Howard University has been the home of many accomplished scientists who spent a great deal of time teaching or working at Howard. This faculty page provides a glimpse into current and past research along with faculty highlights and video clips of their work and accomplishments. Click on the "faculty" and "faculty highlights" icons for more information. |
| *Cobb Research Laboratory*, https://www.cobbresearchlab.com |
| *The Science behind Skin Color with Prof. Michael Campbell* (video), https://www.youtube.com/watch?v=Pz8jliHipqU&feature=emb_logo |
| *How Plants Domesticated Humans – AMNH SciCafe*, https://www.youtube.com/watch?time_continue=1145&v=fwtBBTVDFsk<br>Scientist Fatimah Jackson provides a biological anthropology perspective on plants at the American Museum of National History's SciCafe. Students can gain insights into her thinking and ways of looking at the world through her scientific lens. |
| *Visibility In STEM*, http://www.visibilityinstem.com<br>Author's work on culturally representative STEM curriculum funded by NSF. |

a summary of classroom resources for implementation at the high school level and beyond. These resources reflect the interests of African American scientists whose work is grounded in the plight of African Americans.

## ○ Conclusion

The need for science capital and cultural capital in science, for all people, can be summed up in the African proverb that states that until the story of the hunt is told by the lion, it will always glorify the hunter. Thus, until students understand the science cultural capital from the work of African Americans, the importance of African Americans in STEM will always be undermined. Expand the science cultural capital and students will better understand the social, cultural, and political nature of science. Moreover, diversity in STEM will be accompanied by decreased adversity in STEM for African Americans and other people of color.

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