Black History Month Presentations
Celebrating Black Chemists

Hartwig Group
Group Meeting Presentations
February 2021

In honor of Black History Month, we are recognizing and celebrating black chemists. We are doing this to educate ourselves and each other about important chemists that, due to widespread racism and marginalization, may not be recognized to the extent that their contributions warrant. While we must actively recognize and support black chemists all year long, we will take the opportunity of Black History Month to explicitly celebrate specific chemists and their work.

Percy Lavon Julian – Early Life and Challenges

Percy Lavon Julian
(1899–1975)

Percy Julian was born in 1899 and grew up in the Deep South (Alabama). Despite the challenges he would face, Percy's grandfather, a former slave, encouraged Percy to pursue education.

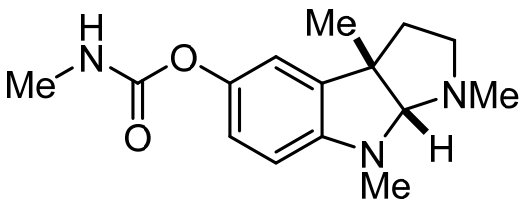
When Percy was growing up, public education ended at 8th grade for African-Americans in Alabama. After 8th grade, Percy was accepted to DePauw University and simultaneously took college and high-school classes while working. African-Americans were forbidden from living in the dorms, so Percy lived in the attic of a white fraternity house. Despite these challenges, Percy excelled in school and remained passionate about chemistry.

Percy was later accepted to the Harvard graduate program. Despite excelling with a 4.0 GPA, he was barred from earning a Ph.D. He later earned his Ph.D. from the University of Vienna in Austria. He later held positions in industry and academia and made several groundbreaking achievements.

Percy Lavon Julian – Accomplishments

Synthesized Physostigmine for the first time.

Physostigmine is a treatment for glaucoma scarcely available from Nature. Julian prepared it for the first time, and artificial Physostigmine was used to treat glaucoma.

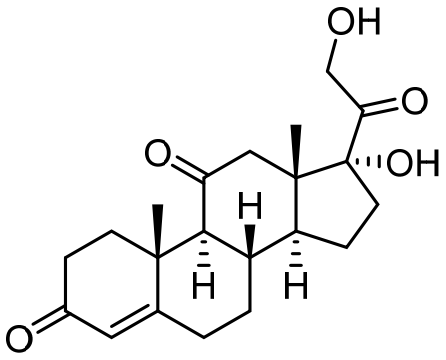


physostigmine

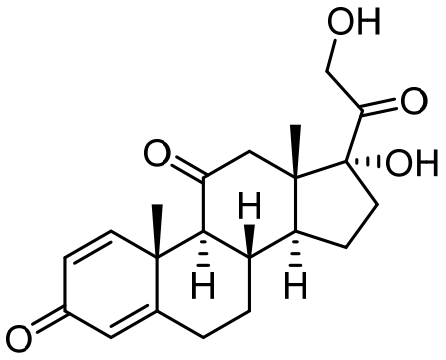
Discovered a method to extract stigmasterol from soybeans and converted stigmasterol to progesterone. He sent the original samples of synthetic progesterone to the UpJohn company for medical use in the US.

Developed a route to cortisone, a treatment for rheumatoid arthritis.

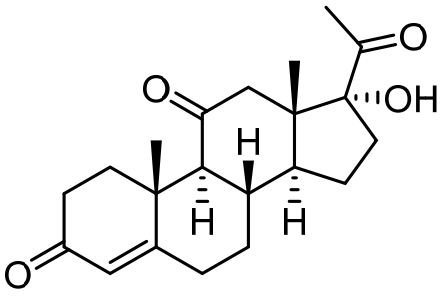
Started his own company and developed syntheses of the steroid drugs including prednisone, testosterone, and progesterone. He sold several medicines at a fraction of the price of major industries to ensure accessibility to low-income groups.



cortisone



prednisone



progesterone

Alice Ball

Early Life and Education

- Born 7/24/1892 in Seattle, WA
- Inspired by her mother and grandfather's careers in photography
- Despite being black, her parents were both listed as white on Alice's birth certificate
- Moved to Honolulu in 1903 to help grandfather's arthritis, but then moved back to WA. Received top grades in sciences.
- Bachelor at U. of WA 1912, second bachelors in pharmaceutical chemistry 1914. – "Benzoylations in Ether Solution" in *JACS*
- Master's Degree – Searching for Active Components of Kava Root
- First Woman to earn a Chemistry Degree at U. of Hawaii
- And also first woman "research chemist and instructor" at the University

Treatment for Leprosy

- While at Hawaii, she developed a treatment for Leprosy based on the chemicals in Kava plant
- At the time, leprosy was highly stigmatized, as there was no cure
- People were exiled to the Hawaiian island of Molokai
- Ball developed a technique to inject chaulmoogra oil to treat the disease (in its natural form, the oil was too viscous for systemic absorption and would form blister on the skin).
- She died before she could publish her findings, and her work was stolen
- But this was by far the best way to treat leprosy in the early 20th century
- She isolated esters from the oil and modified them so that they could be injected

Lloyd Noel Ferguson

Born in Oakland, California, had a backyard laboratory as a boy.

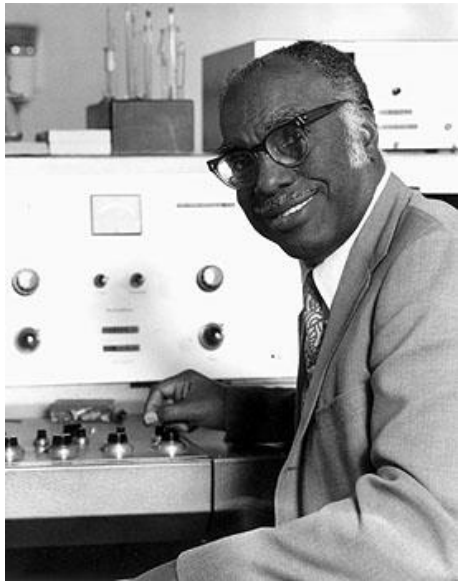
Was the first Black person to earn a Ph.D. in chemistry from the University of California
Berkeley*(B.S., '40; Ph.D. '43, Chem)* worked with Nobel Laureate Melvin Calvin on a project aimed at finding a material that would release oxygen for use in submarines. The solution was a hemoglobin-like material that, when heated, releases stored oxygen

get teaching position came into the department at a Black school in North Carolina, Agriculture & Technology College (NCATC) from 1943-1945

moved to Howard University the following year where he taught chemistry for 20 years. He was the chair of the chemistry department from 1958 to 1968. Also, he established the first Ph.D. program in chemistry at any historically Black college or university in 1958.

joined the chemistry department at California State University Los Angeles in 1965 and retired in 1985.

authored more than 50 journal articles and seven textbooks, created opportunities for Black people interested in chemistry and biochemistry. He was a cofounder of the *National Organization for the Professional Advancement of Black Chemists & Chemical Engineers(link is external)*

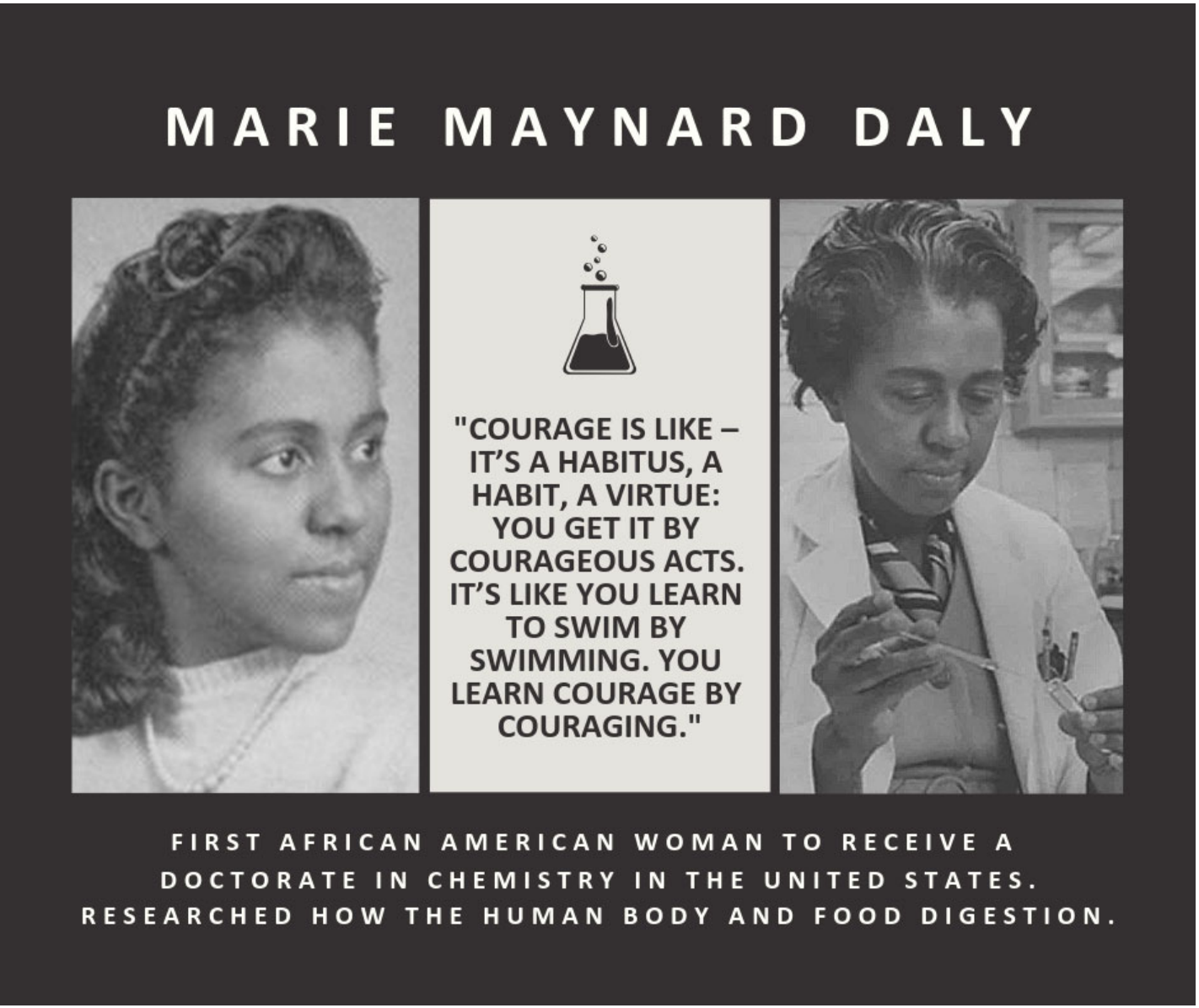


Lloyd Noel Ferguson

February, 1918 – November, 2011

a brilliant chemist, a dedicated teacher and mentor, and an ardent supporter of young Black people entering the fields of chemistry and chemical engineering.

Marie Maynard Daly



Marie Maynard Daly is the first African American woman to receive a doctoral degree — earning it from Columbia University in 1947

After receiving her Ph.D., she held an instructor position at Howard University for two years and began research on the composition and metabolism of components in the cell nucleus

In 1988, she established a scholarship fund at Queens College for African Americans in commemoration of her father

Research

- Nuclear protein (Histone)
- Cholesterol and hypertension
- protein metabolism

Jeanette Brown

- Born 1934 in the Bronx
- First African American woman to earn master's degree from U Minnesota in organic chemistry
- Worked at Novartis (then CIBA) since 1958, and Merck (then Schering Plough) since 1969. At Merck for 25 years.
- Helped develop cilastatin, a renal dehydropeptidase inhibitor used to make antibiotics more effective since it blocks renal metabolism of drugs. Marketed as part of primaxin ®
- Visiting professor at New Jersey Institute of Technology (1993-2002), where she taught middle and high school chemistry teachers as part of a Camille and Henry Dreyfus Foundation grant
- Served on NSF Committee on Equal Opportunities for Women Minorities and Persons with Disabilities, active in ACS WCC, NOBCCHE, and Association of Women in Science (AWIS)
- Since 2002 transitioned into a historian of science, wrote 7 biographies of black chemists and 2 books (*African American Women Chemists* and *African American Women Chemists in the Modern Era)*
- From *African American Women Chemists*: before the Civil Rights Act of 1964, industry was open to minority BS and MS chemists, but not to PhD chemists

Walter Lincoln Hawkins

Born: 21 March 1911 in Washington D.C.
Died: 20 August 1992 (81 yrs old)

1934: M.S. Howard University
1938: Ph.D. McGill University

National Medal of Tech and Innovation – 1992
National Inventors Hall of Fame Inductee – 2010

Early Life

- Dad was a lawyer and mom was a teacher.
- Grew up a tinkerer – built toys, radios, and other things.
- Ph.D. focused on the science of cellulose.
- Moved to Columbia Univ. to continue research.

References:
https://peoplepill.com/people/walter-lincoln-hawkins

Professional Life

- 1942: Began working at Bell Labs on developing rubber alternatives
- Post-WW2, investigated telephone cable insulating materials.
- Created new long lasting cable coating able to withstand extreme conditions.
- Active in outreach to minorities – developed summer research program.
- 1st chairman of ACS SEED program – promotes science careers for minorities.

James Andrew Harris

- Born 1932 Waco Texas, parents divorced when young, moved to Oakland, CA

- Earned BS in chemistry at Tillotson College (1953, Austin, TX)
- Briefly served in the Army (Sgt)

- Struggled to find work as a Black chemist, especially w/o PhD

- "I was even given a job test simple enough for elementary school kids - basic addition and subtraction... I told the secretary I didn't need a job that badly.“

- Began work in radiochemistry at Tracerlab in Richmond in 1955, worked for 5 years

Gonzales, Lisa *"Jim Harris left his mark on science and community". Berkeley Lab Currents.* **2000**, Berkeley Lab.

James Andrew Harris

- Moved to LBNL isotopes division, prepared radiotargets for the discovery of new elements, promoted to Head of Engineering and Technical Services Division 1977
- Most notable scientific achievement: integral part of the team that led to the synthesis & isolation of Rf and Db (104 and 105)
- Broadly praised for ability to do difficult purifications, removing e.g., Pb from targets; colleague Al Ghiorso called Harris's target for elem. 104 "the best ever made for heavy element research"
- Received Masters in 1975 in Public Administration in 1975, honorary PhD from Huston-Tillotson for his work on Rf and Db
- Retired in 1988
- Very involved in extracurriculars and trying to increase the number of Black scientists and Engineers
- Routinely participated in recruitment and outreach in schools

Gonzales, Lisa *"Jim Harris left his mark on science and community". Berkeley Lab Currents.* **2000**, Berkeley Lab.

Henry Aaron Hill (1915 – 1979)

- Born on May 30, 1915, in St. Joseph, Missouri
- Undergraduate: Johnson C. Smith University in Charlotte, North Carolina (BA, 1936)
- Ph.D.: University of Chicago (1 year); then MIT (1942)
- Racial prejudice made it difficult for Hill to land a job. 54 applications sent, finally joined North Atlantic Research Associates in Newtonville, MA, as a research chemist. Hill investigated and developed water-based paints, firefighting foam, and several types of synthetic rubber. He became research director there and became vice president in 1944.
- Civilian employee: the Office of Scientific Research and Development (1944).
- Research group leader: Dewey & Almy Chemical Co. in Cambridge, MA (1946),
- Assistant manager and co-founder: National Polychemicals, Inc., of Wilmington, MA (1952). Supplier of intermediates for the polymer industry.
- Founded Riverside Laboratory in 1961 for research, development, and consulting.

- Public service:
- Appointed by President Lyndon Johnson to the National Commission on Product Safety (a predecessor to the Consumer Product Safety Commission). Implemented new safety standards for household products in the US.
- President of ACS (1977), the first African American president.
- Established standards for employer-employee relationships in the chemical profession.
- Henry A. Hill Award for Outstanding Service (1980, posthumously).

Charles Richard Drew

The father of the blood bank

- 1904; born in Washington, DC.

- 1926; graduated from Amherst College in Massachusetts (an athletics scholarship).

- 1933; received the Doctor of Medicine and Master of Surgery degree from McGill University in Quebec.

- 1940; earned a Doctor of Science in Medicine degree. This was the first case for African Americans.
  Thesis "Banked Blood”

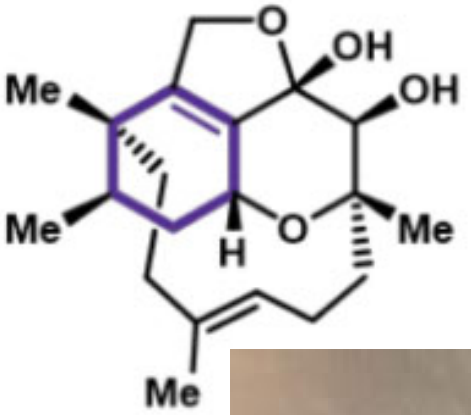
- 1940; worked for a blood bank in UK.

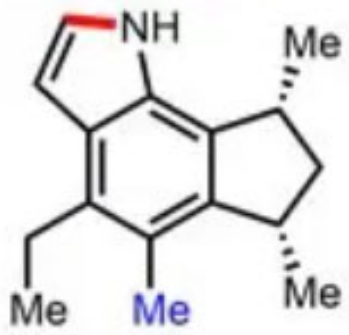
- 1941-42; worked as a director for the first American Red Cross Blood Bank. To protest the fact that African-American’s blood was stored separately from white people’s blood, he resigned.

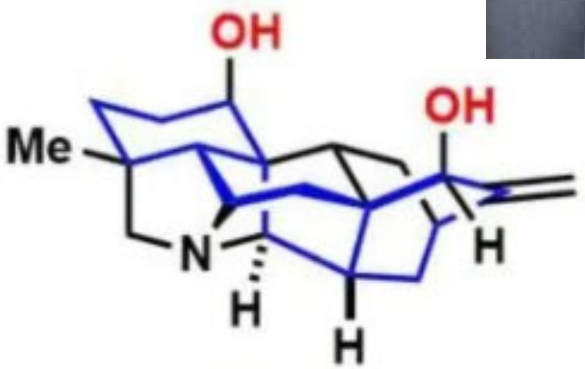
- 1950; died due to a car accident. Few months later, the Red Cross ended the blood separation.

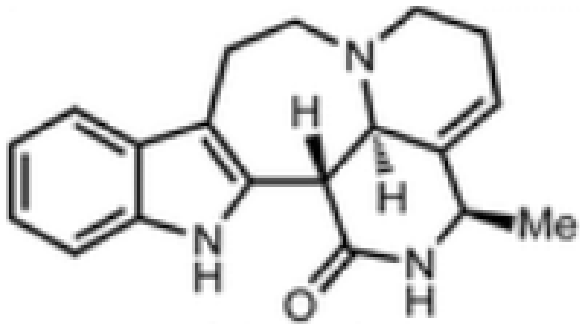
Richmond Sarpong

Black History
Month Presentation





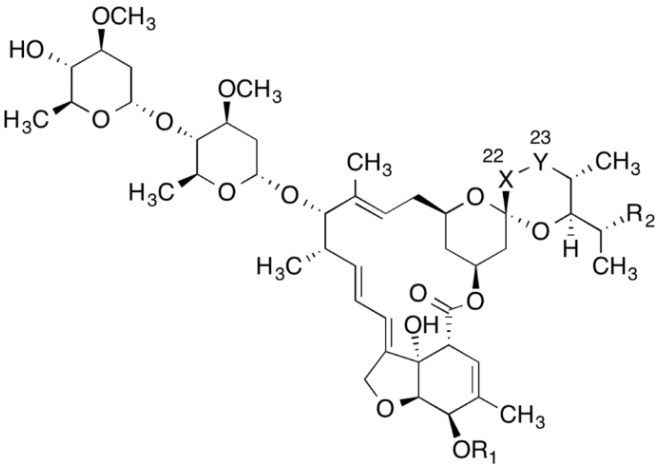




The Face of Disease in Africa

- Richmond Sarpong was born in Ghana, Africa to a teacher (mother) and medical doctor (father)
- His family fled Ghana when he was very young after his father was targeted during a *coup d'état*
- He eventually moved to Zambia then Botswana during the beginning of the HIV/AIDS epidemic (up to 33% infected)

Richmond ca. 1979, Ghana



Ivermectin and the parasite *O. volvulus*

- Richmond, throughout his earliest years, encountered disease all around him, and even contracted parasitic infections that were common throughout Africa
- He was inspired to study chemistry in the 80's when Merck supplied Ivermectin to Africa for free to treat the parasite that causes river blindness
- As early as 8 years old, he poured over his Father's Merck Index, fascinated by the structures of drugs

New Beginnings in America

- Fascinated by chemistry, Richmond moved to America in 1991, where he obtained his undergrad degree in chemistry at Macalester college

- He conducted PhD studies under Martin Semmelhack at Princeton, then his post-doc at Caltech with Brian Stoltz

- He started as an assistant prof here at UC Berkeley in 2004 and has been rocking total synthesis and C–C/C–H activation since then!

Awards

2009 UC Berkeley College of Chemistry Teaching Award
2015 Royal Society of Chemistry Synthetic Organic Chemistry Award
2016 Noyce Prize for Excellence in Undergraduate Teaching
2017 Guggenheim Fellowship
2019 International Society of Heterocyclic Chemistry A.R. Katritzky Award
2019 Society of Synthetic Organic Chemistry Japan Mukaiyama Award
2020 Elected Fellow of the American Association for the Advancement of Science

Bettye Washington Greene

- Bettye Washington Green
- Born March 20, 1935, Fort Worth, Texas.
- Attended segregated public schools and graduated from I.M. Terrell High School.
- B.S. in chemistry, Tuskegee Institute in Alabama. (1955)
- Ph.D. in physical chemistry, Wayne State University. (1962)
- Doctoral dissertation: Determination of particle size distributions in emulsions by light scattering

Bettye Washington Greene

- Dow Chemical Company's E. C. Britton Research Laboratory. (1965)
- First African-American woman to hold professional position at Dow.
- Senior research chemist (1973), senior research specialist (1975), retired in 1990.
- Research interests:
  colloid and latex chemistry.
  Interactions between latex and paper.
  Properties that lend to the redispersement of latex.
  Determination of the surface tension of liquids or solutions.
- Patents:
  Stable latexes containing phosphorus surface groups.
  Latex based adhesive prepared by emulsion polymerization.
  Composite sheet prepared with stable latexes containing phosphorus surface groups.

Samuel Proctor Massie Jr. (1919 – 2005)

- Born in Little Rock, Arkansas
- B.S. in Chemistry: Arkansas AMN College (1938).
- Masters: Fisk University (1940).
- Ph.D.: Iowa State University (with Henry Gilman, 1946).
- He could not live on campus or work in the same laboratories as white students. He said: "The laboratory for the white boys was on the second floor next to the library. My laboratory was in the basement next to the rats. Separate but equal."
- His draft deferment was rejected in 1943, with a racial slur about being over-educated. He reached out to Gilman, who then recruited him to work on the Manhattan Project at Ames Laboratory. He studied the incorporation of uranium isotopes into liquid compounds.

Career:

- Langston University, Oklahoma (1947-1953). First African-American President of the Oklahoma Academy of Science.
- Fisk University (1953-1960). Classic studies of phenothiazine.
- Howard University, Washington, D.C. (1960-1963); NSF Associate Program Director for Special Projects in Science Education.
- President of North Carolina College at Durham (1963-1966).
- First African-American Professor at the United States Naval Academy (1966-1993), appointed by President Lyndon Johnson.

Other achievements and Legacy

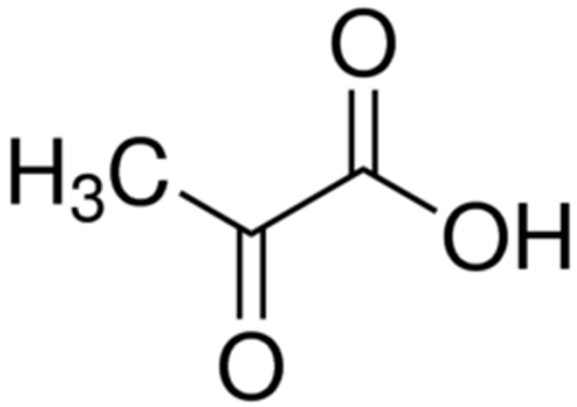
- Patent for treatment of gonorrhea, malaria, and bacterial infections. (1984)
- Dr. Samuel P. Massie Chair of Excellence, a $14.7 million DOE grant to nine historically black colleges and one for Hispanic students to further environmental research.

St. Elmo Brady

- Born on December 22, 1884 in Louisville, KY.
- Attended Fisk University in Nashville, TN.
- Graduated with a bachelor's degree in chemistry in 1908.
- Taught at Tuskegee University in Alabama after graduating for four years.
- Offered a scholarship to study at UIUC in 1913.
- M.S. in chemistry in 1914.
- Ph.D. in chemistry in 1916.
- **First African-American chemist to earn a Ph.D. in the United States.**
- After a couple of teaching stints, Brady returned to Fisk University in 1927 where he taught for 25 years.
- After retiring from Fisk University, he went to teach at Tougaloo College in Jackson, MS.
- Brady had two sons.
- Brady passed away on December 25, 1966.

Chemistry

- Focused on early work in physical organic chemistry.
- A big focus of his Ph.D. was analyzing the effects of functional groups on the acidities of carboxylic acids.
- His studies engendered new methods in the synthesis and purification of various carboxylic acids.
- He published many papers in his career, including publications in JACS and Science.



Legacy

- Brady did monumental work in creating an infrastructure for undergraduate and graduate chemistry education.

- At Fisk he was an outstanding professor and created the chemistry building which attracted many famous chemists as well as African-American students into STEM to this day.

- He gathered funding to create the Infrared Spectroscopy Institute that was open for all colleges and universities in collaboration with UIUC.

- **Brady told his students that in graduate school “they started with 20 whites and one other and ended in 1916 with 6 whites and one other.”**

Alma Levant Hayden (1927–1967)

"Always try to do the very best and to be the very best in whatever group you are working with"

- Born in Grenville, South Carolina on March 30, 1927.

- Bachelor's degree @South Carolina State College in 1947
  Master's degree @Howard University in 19??

• *One of **the first African-American women** working in Washington*

~1950: National Institute of Arthritis and Metabolic Diseases at NIH

mid-1950: Food and Drug Administration

• ***Specialty**: Analyzing chemicals using spectrometry*

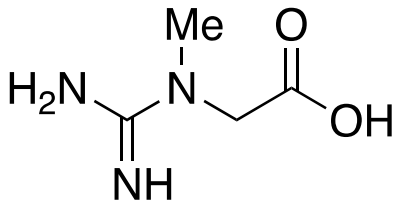
Taken in 1952 @NIH

*at that time, there was a **cancer cure**, "Krebiozen"* (Stevan&Andrew)

Horse → inject *Actinomyces bovis* → distill horse's blood serum → *Krebiozen* as a white powder

II

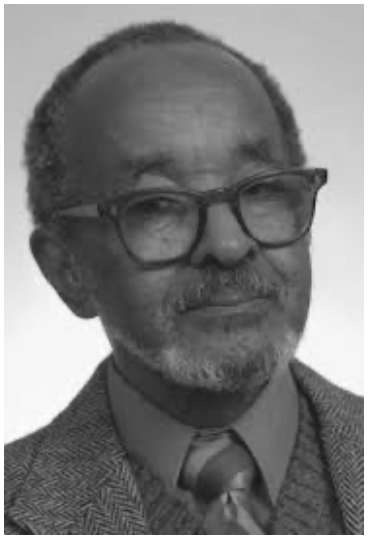
Spectrometry (Hayden @FDA) + Crystallography (MIT) → *Creatine*



Emmett Chappelle

Early Life, Education, and Careers

- **Born Oct. 25, 1925 in Phoenix, AZ and attended a segregated high school.**
- **1942: drafted into U.S. Army. Took engineering courses but reassigned to the all-Black 92nd Infantry Division and served in Italy.**
- **Associates degree in electrical engineering from Phoenix College**
- **B.S. in biology from UC Berkeley.**
- **1950-1953: teacher at Meharry Medical College in Nashville, TN (independent research)**
- **1954: Master's degree from University of Washington and continued graduate studies at Stanford**
- **1958: joined Research Institute for Advanced Studies in Baltimore, MD**
- **1966: started at NASA's Goddard Space Flight Center**
- **Biochemist, exobiologist, astrochemist, inventor**

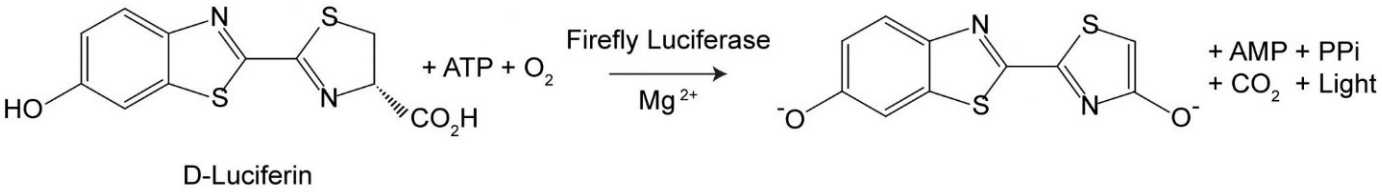


Emmett Chappelle

Two (of many) Major Contributions

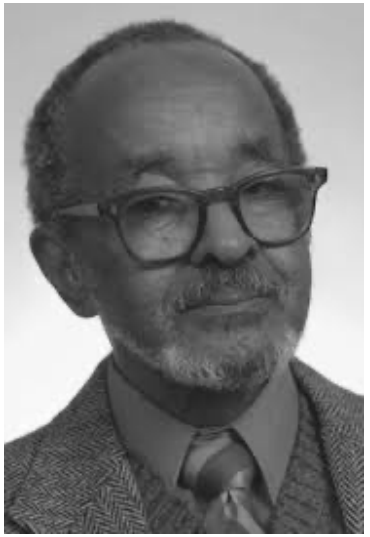
- **Discovery that single-celled organisms are photosynthetic**
  - **Led to renewable source of clean oxygen for astronauts in space**

- **Identification of chemical composition of bioluminescence led to technique of detecting ATP**



D-Luciferin

- **Now used for:**
  - **Measuring crop growth by satellite for optimizing food production by measuring luminescence**
  - **Monitoring for bacteria in water or urine samples**
  - **Searching for extraterrestrial life!**



Emmett Chappelle

Achievements and Accolades

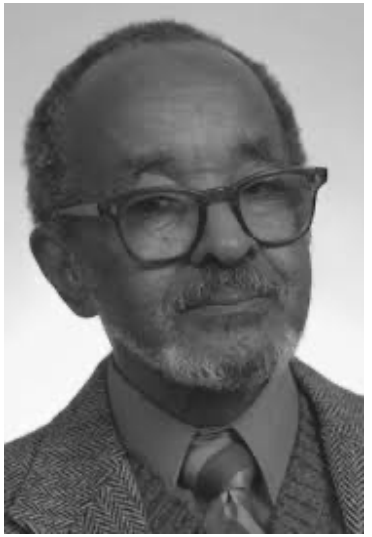
- **14 U.S. Patents**
- **35 peer-reviewed publications**
- **NASA's Exceptional Scientific Achievement Medal**
- **Inducted into National Inventors Hall of Fame**

- **Links for further reading and list of patents:**

https://patents.justia.com/inventor/emmett-w-chappelle

https://www.promegaconnections.com/the-work-of-emmett-chappelle-lighting-up-the-search-for-extraterrestrial-life/

https://www.thoughtco.com/inventor-emmett-chappelle-4070925



Paula T. Hammond

Koch Professor of Engineering at MIT;
Department Head of Chemical Engineering

National Academy of Science (2019)
National Academy of Engineering (2017)
National Academy of Medicine (2016)
(Only 25 people have earned all three distinctions)

Born 1963 in Detroit, MI to highly educated parents.

“Grew up surrounded by accomplished Black professionals.” (C&EN)

Began undergraduate degree at MIT (Chem. Eng.) at 16 years old.
Often the only Black student in her classes, one of the only women.

Initially joined Motorola corporation as a process engineer, but quickly became fed up with the racism and sexism she experienced in that position.

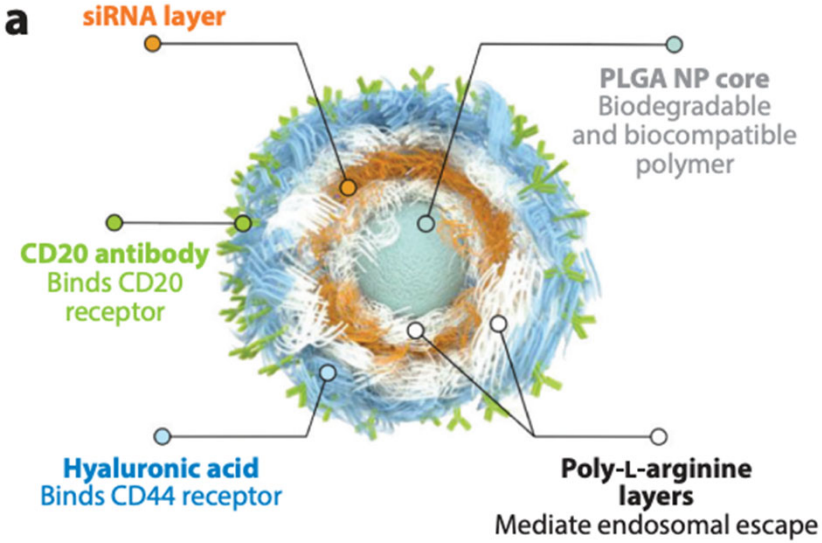
MS: Georgia Tech
PhD: Michael F. Rubner (MIT)
Postdoc: George M. Whitesides (Harvard)

https://cen.acs.org/people/profiles/Career-Ladder-Paula-Hammond/99/i6 Accessed 02/24/2021

Paula T. Hammond – Independent Research

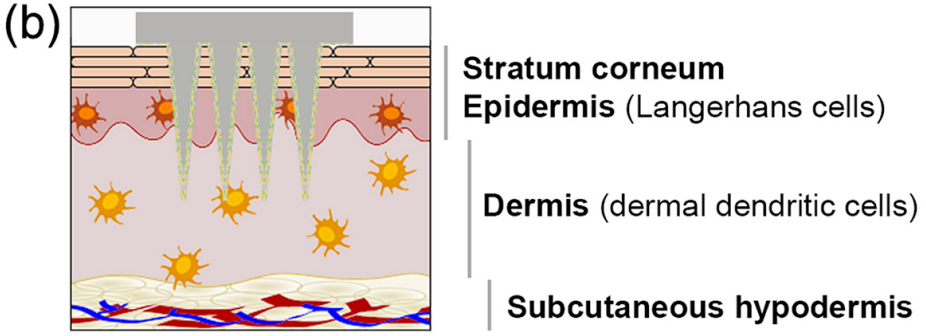
"the understanding and use of secondary interactions to guide materials assembly at surfaces and in solution"

Targeted delivery of siRNA, drugs

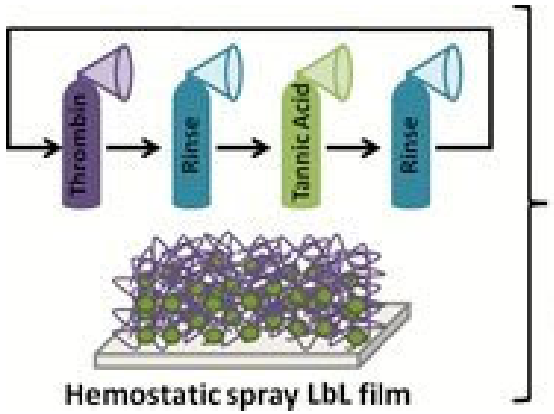


Annu. Rev. Biomed. Eng. **2020**, *22*, 1-24

Drug delivery by microneedles

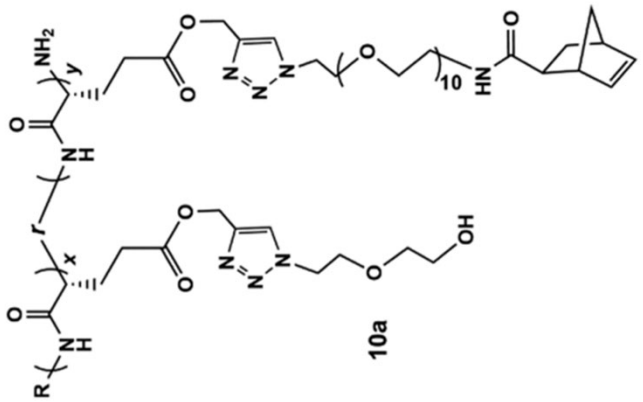


Adv. Drug Deliv. Rev. **2012**, *64*, 1547



Adv. Mater. **2011** *24*, 492

Synthesis of hydrogels for cell culture



Biomacromolecules, **2020**, *21*, 566

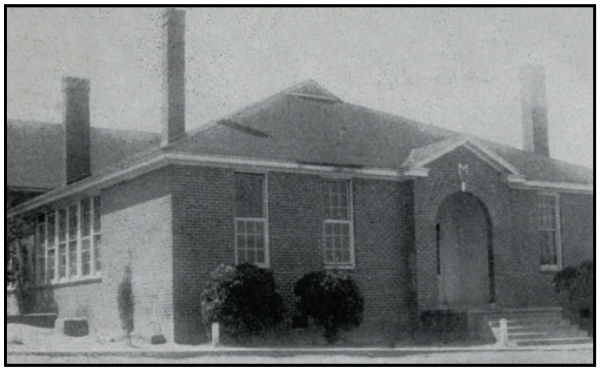
Dr. Reatha King

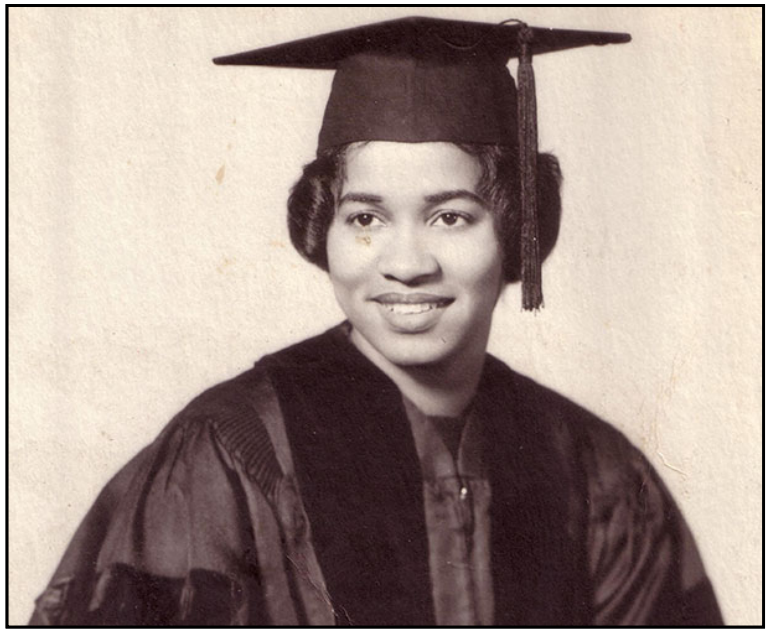
“I realized early in life that education is our best enabling resource, that technical skills are important, and that my stamina for championing educational opportunity for all people is inexhaustible.”

Dr. Reatha King

Early Life

- Born on April 11, 1938 to poorly-educated sharecroppers in Pavo, Georgia
- Attended a one-room schoolhouse at the local Baptist church until attending a segregated high school, graduating valedictorian of her class in 1954
  - ➢ *Brown v. Board of Education of Topeka* (1954)





Clark College, Atlanta

- B.S. Chemistry and Mathematics, 1958
- Originally intended to major in home economics and teach high school in her hometown

The University of Chicago

- Received the Woodrow Wilson National Fellowship to support her M.S. (1960)
- Received her PhD in thermochemistry under Dr. Ole J. Kleppa in 1963
- The first Black woman to receive a PhD from the University of Chicago

Dr. Reatha King

NBS (now NIST) (1963-1968)

- The bureau's first Black female chemist
- Worked with NASA to develop the chemistry of OF_2, now a common additive in rocket fuels
- Developed certain coiled cooling components that were essential for the Apollo program
- Won the Meritorious Publication Award for her work with fluorine flame calorimetry

York College, New York, NY (1968-1977)

- 1970- Associate Dean of the Division of Natural Science and Mathematics
- 1974- Associate Dean for Academic Affairs
- While in New York, she earned her MBA from Colombia

Metropolitan State University, Minneapolis, MN (1977-1988)

- Second university president

General Mills (1988-2002)

- Executive director of the General Mills Foundation and vice president of the General Mills Corporation.

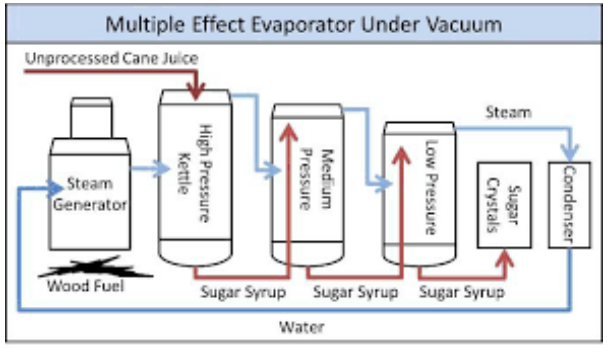
Norbert Rillieux

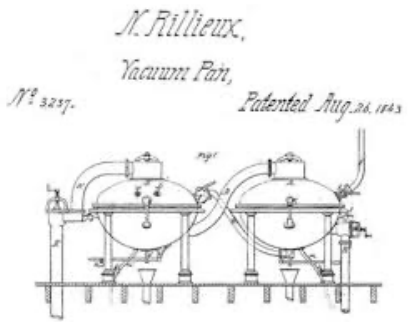
- Born in Louisiana, 17 March 1806
- Son of inventor Vincent Rillieux (steam-operated press for cotton baling) and Constance Vivant
- Educated in France after showing a great interest in invention/engineering
- Age 24: instructor in applied mathematics at École Centrale, Paris
- 1830: publishes a series of papers on steam engines and steam power
- 1830's: return to New Orleans and early work on sequential evaporators
- 1843: the first Rillieux evaporator is installed, bringing fame and a large fortune to Rillieux
- Following his professional successes, he was 'the most sought-after engineer in Louisiana'
- When visiting plantations for installation work, he could not stay in either the plantation house, nor in the slaves' quarters; he was often provided a special lodging with slave servants and considered a 'consultant'
- As the Civil War loomed, Rillieux moved back to France to escape increasingly draconian laws on the liberties and movements of black people
- After mastering his sugar refinement system, he applied for a patent which was denied by the US government, who mistakenly thought he was a slave; slaves were not considered citizens of the US
- Maintained an interest in Egyptology; could be found deciphering hieroglyphs at the Bibliothèque Nationale
- Died in 1894, buried in Cimetière Père Lachaise, the most prestigious necropolis in Paris

https://www.acs.org/content/acs/en/education/whatischemistry/landmarks/norbertrillieux.html

Key Discoveries and Inventions

Multiple Effect Evaporator
- formed the basis for all modern industrial evaporation
- maximized steam economy by recycling latent heat in steam and vapors from evaporation processes
- developed for industrial processing of sugar cane syrup to crystalline sugar
- produced high-quality, uniform batches of crystalline sugar; superior to evaporating over open flames, as was the standard practice in the Caribbean and southern US
- 1846 Patent for a series of vacuum/partial vacuum pans that are combined in a unified system such that latent steam heat and pressure could be carried through the system before reaching a condenser; utilized the variation of syrup boiling points with respect to pressure and temperature
- Massively increased sugar production quality and efficiency; some sugar plantation owners refused to adopt Rillieux's system despite the improvements it offered as they thought slaves to be incapable of operating 'sophisticated equipment' and didn't wasn't slaves learning new skills
- Rillieux evaporator was widely adopted in the US, Cuba, Mexico, France, Egypt, and the Caribbean
- Rillieux evaporator is still recognized as being one of the best industrial methods of evaporation





Living Legacy / Life in Louisiana

- Rillieux evaporators are still common and widely used in industrial processes requiring evaporation
- Encapsulated life in the *gen de couleur libre* (free people of color), a racial caste unique to New Orleans in the antebellum era and holder of French colonialism
- Free blacks enjoyed higher social standing and rights, which deteriorated as American influence grew in New Orleans; some free blacks owned slaves and plantations
- Norbert Rillieux was forced to live in a caste that was neither enslaved nor free

Lawrence H. Knox

Hartwig Research Group

History

Life:

- Born in 1906, the grandson of a slave
- Father graduated high school and worked as a post office accounts clerk
- He and his brother went on to study chemistry in college
- Post-undergrad he taught chemistry at Morehouse College (HBCU in Atlanta)
    - Frustrated with racism, he and his brother, faculty at Howard, decided to pursue further studies
- Ph. D. from Harvard under Bartlett (Physical organic)
    - “Neatest and prettiest job of any research student I have yet had” – Bartlett re: Knox’s dissertation
- Still not very many opportunities, mainly restricted to HBCUs
- War time prompted demand for scientifically trained individuals
    - Worked as a postdoc at Columbia with Doering researching quinine

Fun Fact:

- He and his brother were two of only 30 black Ph. D. chemists between 1914 and 1940

Source: doi:10.1126/science.caredit.a1100004

Contributions and take-aways

Graduate/professional work:

- Studied the mechanism of substitution reactions and synthesized substrates incapable of inversion of stereochemistry to confirm hypotheses about mechanistic details
  - *J. Am. Chem. Soc.* 1939, 61, 11, 3184–3192
  - Still cited (JOC. **2020** *85* (18), 11741-11749)
- Studied aromatic systems to confirm Hückel's theories of classes of compounds that would display aromaticity

Key take-away message:

- Worked hard and overcame all odds and obstacles
- Contributions and success would not have been possible without allies who amplified the voices of underrepresented groups and took a risk – important work to continue

doi:10.1126/science.caredit.a1100004

William M. Jackson

- Born 1936 in Birmingham, Alabama
- Son of a teacher and a government worker
- Started 1st grade at 4 y/o
- Broke nose at 9 y/o and contracted polio becoming paralyzed in the leg (at this African-Americans were not supposed to be able to contract polio)
- Spent 9 months in hospital, had to move houses to a ranch and the house next door was bombed by the KKK
- Went to segregated high school
- Attended Morehouse College and graduated in 1956 (chem and math)
- Got into Purdue and Northwestern graduate schools but could not attend without $
- Moved to DC to get a job, walked to Catholic University of America with his handwritten grades in hand, got a meeting with the chair, who invited him to a research position in his lab (F. O. Rice on molten salts)
- After taking a year off to make money for his incoming child he got his PhD from CUA

William M. Jackson

- Joined Lockheed-Martin and worked on formaldehyde resins to protect missiles as the reenter the atmosphere
- Left and Joined National Institutes of Standards and Technology studying how radiation impacts the coatings on space vehicles
- Moved to Goddard Space Flight Lab where he proposed using an ultraviolet satellite to observe comets
- He then became interested in detecting free-radicals using laser technology
- Was able to use experimental and theoretical methods to establish how free-radicals form in comets
- Moved to UC Davis in 1985 to continue his development of lasers that can detect and characterize free-radicals
- Still there as an emeritus professor of chemistry
- One of the founders of the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE)
- Successfully advocated before congress for increased research funding to HBCUs
- When he got to Davis in 1985, only 2 students from underrepresented minority communities had ever received chem phds there, he increased that to 15%/cohort with funding from Sloan Foundation
- “I take the stones the builders rejected and turn them into cornerstones for future scientific research”

Angie Turner King

1905-2004

Chemist, Mathematician, Educator, Mentor

Background & Education

- Born in Elkhorn, West Virginia in 1905 – both parents died before the age of 8 she was mostly raised by her grandparents
- Graduated high school at age 14

- Attended present-day Bluefield State College before transferring to West Virginia State College - paid her way through school washing dishes & waiting tables
- Graduated *cum laude* in 1927 with a B.S in Chemistry and Mathematics

- Attended graduate school at Cornell during the summer while teaching at a high school – received a mater's degree in physical chemistry in 1931

"The Interaction Between Solutions of Tannic Acid and Hydrous Ferric Oxide."

- Earned a Doctor of Philosophy in general education from University of Pittsburgh in 1955 while raising 5 daughters

"***An Analysis of Early Algebra Textbooks Used in American Secondary Schools before 1900"***

Her master & Ph.D. theses were her only published works

- In 1992- was presented with an honorary Doctors of Law degree from West Virginia State

https://www.acs.org/content/acs/en/education/whatischemistry/african-americans-in-sciences/angie-turner-king.html

Career & Impact

She Dedicated Her Life to Teaching & Mentorship

- worked as an instructor in chemistry and mathematics at West Virginia State High School for 8 years

- Became an associate professor at West Virginia State College (WVSC) – an HBCU & revamped their laboratory courses to better resemble a “real” laboratory

- During WWII, served as one of WVSCs instructors for the Army Specialized Training Program unit to teach soldiers chemistry

- Chaired WVSC’s Division of Natural Resources and Mathematics & chaired West Virginia Governor’ Commission on the Status of Women

Awards & Societies

- Was the first WVSC Alumna of the Year
- Member of the American Association of University women, serving as president for WV division
- Member of ACS, West Virginia Academy of Science, and the American Association of University of Professors

Taught and mentored students such as: Katherine Johnson (mathematician – Hidden Figures), Jasper Brown Jeffries (Manhattan Project), and Margaret Strickland Collins (Entomologist & activist) **described as** "a wonderful teacher—bright, caring, and very rigorous."

Mary Elliott Hill (01/05/1907 - 02/12/1969)

Early Life:

- *01/05/1907 in small segregated town in North Carolina
- Bachelor in Chemistry in 1929 at what is now called Virginia State University (VSU)

Career:

- Teaching at VSU's Laboratory High School & Hampton University in Virginia
- 1941 Master in Analytical Chemistry from University of Pennsylvania
- Continued teaching at Tennessee A&I State College (now: Tennessee State University) as Associate Professor of Chemistry

In 1950s: Intractable racial barriers kept PoC from finding technical employment in industry or academia outside of black colleges.

Conventional wisdom at that time: No work in science besides teaching at a black school for PoC.

- 1962 husband Carl McClellan Hill became president of Kentucky State College, MEH became professor of Chemistry, supported her husbands research as analytical chemist

Mary Elliott Hill (01/05/1907 - 02/12/1969)

Research:

- Syntheses of ketenes through Grignard reagents (funded by NSF and U.S. Air Force)
- Usage of spectroscopic methods, including UV-spectroscopy to determine solubility of components in non-aqueous media
- Enabled identification, isolation and quantification of products
- First steps towards polymerization of ketenes and therefore plastics

Achievements:

- Won several awards for her teaching
- Established student chapters of the American Chemical Society at colleges
- Inspired many of her students; >20 of her students became chemistry professors
- Co-author on >40 papers

Further reading:

Scott, B. (2000, February). Hill, Mary Elliott (1907-1969), organic and analytical chemist. *American National Biography.*

Carl M Hill et al. *JACS*, **1958**, 81, 3372-3374. Carl M Hill et al. *JACS*, **1951**, 73, 1663-1664.

Carl M Hill et al. *JACS*, **1954**, 76, 4538-4539. Carl M Hill et al. *JACS*, **1958**, 80, 3623-3625.

Dr. Gladys W. Royal

- Born Gladys G. Williams on August 29, 1926 in Dallas, Texas
- Graduated from Dillard University in 1944 (age 18) with a BS in chemistry
- Married George C. Royal in 1947 while he was obtaining his MS in bacteriology at the University of Wisconsin
- They moved to Tuskegee where George was a bacteriology instructor and Gladys worked in the lab and earned her MS in organic chemistry in 1954
- She did predoctoral research at the Univ. of Wisconsin and then applied to Ohio State University ultimately obtaining her PhD also in 1954
    - *The Influence of Rations Containing Sodium Acetate and Sodium Propionate on the Composition of Tissues from Feeder Lambs*
    - Initial experimental work on flavor chemistry
- Both Royals took positions at North Carolina A&T where Gladys was a professor of chemistry beginning in 1953 (prior to getting her advanced degrees)

Research and Activism

- The Royals began a research partnership in the late 1950s and early 1960s which was funded by the US Atomic Energy Commission
    - Supported at least 5 grants which were proposed by both
- Focused on bone marrow transplants to treat radiation overdoses
- By 1964 Gladys focused again on flavor chemistry while working at NC A&T, looking into additive salts
- In 1965 she joined the US Dept. of Agriculture
- Became the principal biochemist at the Cooperative State Research Service
    - Looking into human nutrition and consumer use
- She was also involved in activism, supporting integration for the YWCA and desegregation of the Greensboro schools
- She mentored female students and encouraged their study in science
- 1977 she sued the head of the Dept. of Agriculture for discrimination
- She died November 9, 2002

African American Women Chemists (Oxford University Press, 2011) https://doi.org/10.1093/acref/9780195301731.013.34087