

Accessibility

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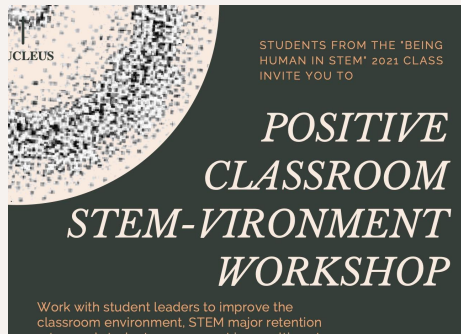
Imposter Syndrome was developed by psychologist Pauline Rose Clance and Suzanne Imes in 1978 with a particular focus on women, who generally are more prone to be "susceptible" to Imposter Syndrome. Through its recognition and further development into the 21st century, its focus has expanded to more than just women. It's generalized for all marginalised groups within workplaces and academia. Millions have ascribed their feelings of self doubt to Imposter Syndrome and it's not new to our conversations in Inclusivity/Diversity Trainings. There are plenty of women's leadership conferences that include workshops on "Overcoming Imposter Syndrome" because we are all under an umbrella of pluralistic ignorance when it comes to discussing these experiences/feelings.

There is a widely held belief that STEM is not for the weak-minded but rather intellectual, advanced persons with an insight that differs from others. The analytical. Currently the face of STEM at large is the white male, our professors are predominantly male across all colleges under the umbrella of STEM. This belief perpetuates the idea, and I mean statistically within the respective fields and by average grade, that the intellectual is male and the Other identities do not have the same intellectual build to succeed in STEM.

Very loose paraphrase from Kendi "These tests were made by rich white males to get into university without daddy's connection and we expect these same tests to work for the more and more diverse people entering higher education. These tests were kept to prove their beliefs about every marginalized groups— black people are lazy and stupid, women are too weak to be good at math, etc."

Intellect has been made into a male trait when in fact— we have proven it to be untrue.

THIS font is too small



At the core of the Underrepresented Student experience is Invisible Labor, which are unseen efforts, hidden work, generally distinct experiences common amongst URS that you can't necessarily put on your resume but affect your STEM career (whether you continue or not). These are the additional things that students have to deal with on top of studying STEM in order to achieve the same playing field as students that are historically over-represented in the expectations of STEM classes. They are perpetuated when STEM isolates social contexts, making it harder for URS to feel supported and welcomed. In navigating these experiences without guidance or validation, students often will find themselves lacking inspiration to continue their career in STEM feeding into the common metaphor "the leaky pipeline" from educational careers.

It might be tricky to differentiate everyday life experiences and URS experience that can adversely affect their classroom experience. I've listed a number of examples that can illustrate the concept of invisible labor: Creating access in areas of no accessibility; this can range from spending extra time on material because of cognitive or mental disabilities or transcribing material in text that is understandable to the student.

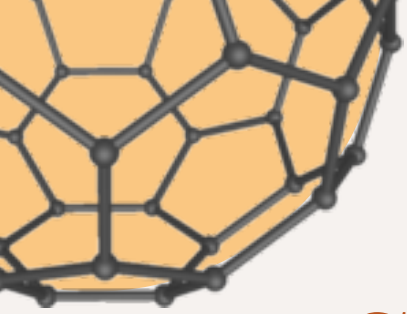
Navigating social contexts: protests, policies that affect certain identities; everyday non-academic contexts can adversely affect students and generate mental exhaustion. On the other side of this, senior students or professors that have related experiences due to their identities spend extra time supporting students when the classroom does not. In other words, they have used tokenism very loosely because it is not only individually but also at a university level that senior students or professors have to do in addition.

Finally proving self worth is an external and internal experience that students find themselves navigating

In the past year, we have seen significant strides in what education can look like.

PARTICULARLY, HOW WE CAN MAKE EDUCATION ACCESSIBLE TO ALL STUDENTS. WHILE MANY STUDENTS HAVE HAD THEIR COMPLAINTS ADDRESS, DRAIN OF THE IVC FORMAT, MANY STUDENTS HAVE BENEFITTED FROM THE FORMAT AND FURTHERMORE WE HAVE SEEN ATTRIBUTES OF IVC SUCH AS RECORDED LECTURES, LIVE CAPTIONING, EASY PRONOUN/NAME IDENTIFICATION...

WE BELIEVE THAT INCLUSIVITY AND ACCESSIBILITY ARE SYNONYMOUS WITH EACH OTHER. IN CONVERSATION OF SOCIAL JUSTICE, IT IS NECESSARY WE TALK ABOUT ACCESS AND DISABILITY. DISABILITY JUSTICE IS TRANS-INTER DISCIPLINARY. WE SEE IT IN EVERY SOCIAL GROUP AFFECTS ALL PERSONS AND ALL IDENTITIES. HOWEVER, ACCESS IS NOT CONFINED TO ASSISTING ONLY PERSONS WITH DISABILITIES BUT EVERYONE AT LARGE. AGAIN, WE STRONGLY BELIEVE THAT ACCESS AND INCLUSION ARE SYNONYMOUS WITH EACH OTHER. A LOT OF WHAT WE SPOKE ABOUT STEMS FROM HAVING NO ACCESS WHETHER THAT'S MENTORSHIP OR REPRESENTATION OR OTHERS.



Supportive Classroom STEM-vironment Workshop

*Presented by the
CSME/Being Human In STEM Interns:*

Ella Spurlock, Marina Gerton, Michelle Cao



Getting Started

Please rename yourself based on what your role at the university is.

Add before your name:

- US - for undergraduate student
- F - for faculty or instructor
- S - for staff
- GS - for graduate student
- P - for postdoc
- O - other

Ex: “F - Claudia De Grandi” or “US - Ella Spurlock” etc.

WHO WE ARE



Michelle Cao
(she/they)

Major: Physics & Astronomy
michellekimcao@gmail.com



Ella Spurlock
(she/her)

Major: Chemistry
ella.spurlock@utah.edu



Marina Gerton
(she/her)

Major: Chemistry and Biology
marina.gerton@utah.edu

Disclaimer

This workshop has been created by students, and even more significantly by humans. We are not infallible in our knowledge and we are open to different interpretations. Our content is entirely built on a student viewpoint that is not generalized across the student body. We understand there are plenty of grey areas and surrounding language that have different associated personal preferences or connotations. We are mindful about these viewpoints and intentional in our language use.

Logistical Notes

This workshop is 90-minutes long with a short break half-way through

The slides and recording will be made available after the workshop

Live captioning is available by clicking on the bottom right of the screen under the Live Transcript button 'CC'

What Informed Us

Our Goals, Inspiration, & Research:

Goals: Present our investigation about the correlation between STEM classroom environments and retention rates/diversity

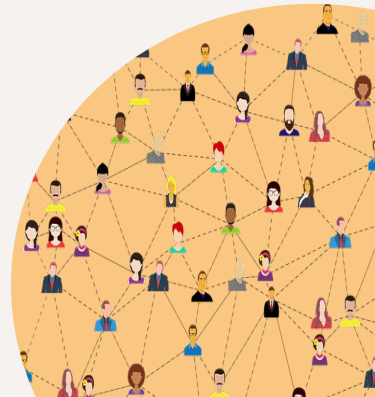
- We believe instructional teams are foundational in providing healthy, positive, and *supportive* classroom environments
- Socio-Political structures informs us on every aspect of culture including how we learn, the content we learn, and how we are taught.
- *Identity not only belongs in STEM but is inherent in how we approach learning*

Quantitative Data: Student demographic by major publicly provided by the Office of Budget & Institutional Analysis (OBIA)

<https://www.obia.utah.edu/>

Qualitative Data: *Personal stories as told by students via an informal Survey, Feedback from Professors Instructing Summer Semester 2021

*Sent out & collected in April 2021



Teaching Strategies

Investigation into pedagogical strategies: researched Universal Design for Learning (UDL), Formative Assessments, Constructivism, Scaffolding, Group Learning, etc.

“What I Wish My STEM Professor Knew”

Collected student stories via an open survey distributed to select STEM courses at the U of U. To inform us on the student perspective.*

**Sent out and collected through the month of April 2021.*

SUMMER INTERNSHIP WORK

Recommendations for Inclusive Learning

Curated a non-exhaustive collection of recommendations for teaching inclusively.

Observed classes across The College of Science.

Held informal conversations with professors to learn the realistic challenges, barriers, and implementations of these strategies.

(NOTE: The College of Engineering and The College of Mines & Earth Sciences did not offer intro-level courses over the summer. 3 math & 2 physics courses were observed.)

Our Motivation: Accessibility & Inclusivity

- Inclusivity and Accessibility are synonymous with each other
- In conversations of social justice, it is necessary we talk about access & disability
- Disability justice is trans/inter-disciplinary
- The majority will live with at least one disability at some point in their/our lives
- Accessibility is not confined to assisting only people with disabilities.
 - Access includes English learners having available assistance in understanding instructors
- When access is not available, students are facing *invisible labor*

“Because of my disability **if things aren't presented in a clear organized way I struggle to get through them.** I can spend much more time trying to understand unclear guides than I do actually learning the material. **Once I know what's expected,** it takes no time at all. Working hard isn't a challenge, working on the right thing can be. I'm near constantly trying to find ways to do as best I can so that my disability doesn't show. If it has to be brought up it has caused my previous teachers to use that as a reason not to try and help me. (Before coming to the U. I don't reveal it anymore) Most of the time my disability hasn't prevented me doing well, it's just made it harder...”

Major: Mechanical Engineering



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 - b. Scientist #1: Chien-Shiung Wu
 - c. Scientist #2: Martin Gouterman
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Our Learning Outcomes

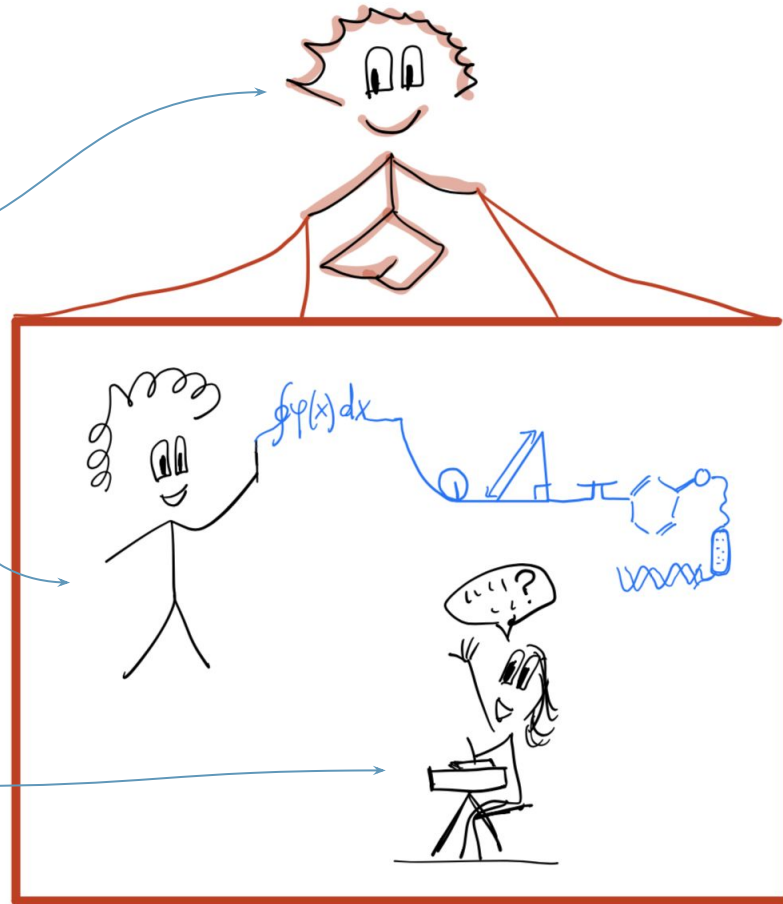
- Attendees will use the content of the workshop as a stepping off point for reflecting on their teaching practices
- Attendees will identify some of the practices demonstrated in the workshop or laid out in the list of inclusive practices that they will implement in their classrooms
- Attendees will identify and learn about a non-traditional scientist in their own field of study who interests them
- *Keep in mind your own personal learning outcomes/goals (i.e. why did you choose to attend the workshop?)*

Our Format

Guide to Inclusive Learning/Instructing
Explains the underlying lecture structures

Lecturer
Delivering content

Student
Voice the thoughts of a student in class



Lecture Outlines

Yesterday:
Compounds/molecules,
types of bonds, and
naming compounds

Today: Chemical Bonding

1. Lewis Structures
 - a. Octet rule
2. VSPER

Example of chemistry lecture outline

Kinematics
(linear motion)

Dynamics (force/
laws of motion)

Momentum
+ Energy

*Example of physics
semester outline*

Applications

Rigid Bodies

Oscillations

Waves

Today's Topic: Competition

*Example of biology
lecture outline*

- a. Interspecific vs. Intraspecific competition
- b. Lotka-Volterra model
- c. Exploitative vs. Interference competition
- d. Scramble vs. Contest competition
- e. Fundamental vs. Realized niches

Outlines, Organization, Outcomes

- Assists neurodivergent students (those with autism, ADHD, ADD, etc.), but also the entire student body, to learn with ease
- Broad course outlines and everyday class outlines allow students to understand the flow of content
 - Students will make connections between topics
 - Students will know expectations and understand learning outcomes
- Provide students with general learning outcomes or goals for the course
 - Interventional Learning (What is important to the student? How does this course relate to or enrich the student's life? Why did they choose to take the course?)
 - Should be straightforward and 'measurable'
 - Reaffirm the importance of having personal learning goals as well
- Lecture and subtopic titles allow students to organize and study with ease



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Dimensions of Representation

- What is Representation?
 - Representation tells people they belong and are capable of making significant contributions
- Our current understanding of STEM is because of the contributions of many people across different disciplines over time
 - Ex. Calculus tells us about kinematics, quantum/particle physics tells us about atomic structure, atomic bonding and molecular interactions tells us about DNA, so forth...
- Interdisciplinary Representation
 - Knowledge comes from all forms and types of questioning how things works
- Removing Singular Representation
 - Ex. Liu Hui was solving linear eq. using matrices in 220 BC which we know as Gaussian Elimination, Islamic Golden Age (850C) had many different texts on the laws of motion which we know as Newton's Law of Motion, Pythagorean theorem was found all over the world

The Importance of Representation: Dimensions

Eurocentric STEM culture

“In schools, the standards and policies of math/science learning reflect a normative canon of knowledge, values, and practices shaped by colonial and settler colonial histories. From this perspective, learning becomes a process of enculturation where, in Western Modern Science (WMS) for example, empiricism, objectivity, and rationale seem the only legitimate ways of knowing and being”

“While colorblindness implies a blindness toward racial identities of people, cultureblind STEM signals a blindness to the anti-Black, colonial, and settler colonial histories that have shaped WMS (and mathematics) to be anything but ‘culture-free’”

The Importance of Representation

- Aspirations in STEM fields oftentimes come from established participants that look like them
 - Students need to be able to picture themselves as: Scientists, Technologist, Engineers, & Mathematicians.
 - Participation in STEM from all backgrounds benefits everyone (more ideas, more hands)
- Hidden figures in science are predominantly the historically marginalized social classes
 - Feeds into underrepresentation/low participation amongst marginalized social classes
- Non-traditional STEMicist
 - Contributors of STEM that do not ascribe to over-represented social class (white, cis, heterosexual, abled males)



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Can you name a Chinese (or east-asian) Scientist
other than Chien-Shiung Wu?
(Reflective, type in chat)

Chien-Shiung Wu

吴健雄

(Wú Jiànxióng)

“jee-ahn shee-ung woo”

Particle, Nuclear, Experimental
Physicist
1912-1997



Obtained from <https://hackaday.com/2017/09/28/there-is-no-parity-chien-shiung-wu/>

What is the first image in your mind when you
picture a scientist?
(Reflective, type your answer in chat)

How do these pictures challenge your idea of a scientist?



"A petite Chinese girl worked side by side with some top US scientists in the laboratory studying nuclear collisions. This girl is the new member of the Berkeley physics research team. Ms. Wu, or more appropriately Dr. Wu, looks as though she might be an actress or an artist or a daughter of wealth in search of Occidental culture. She could be quiet and shy in front of strangers, but very confident and alert in front of physicists and graduate students. China is always on her mind. She was so passionate and excited whenever 'China' and 'democracy' were referred to. She is preparing to return and contribute to the rebuilding of China."

A Short Timeline: “Ask Dr. Wu”

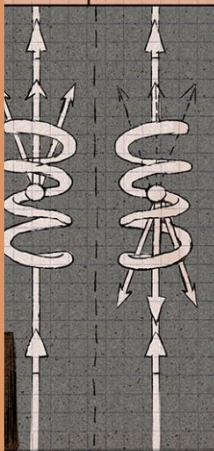
CHIEN-SHIUNG WU 吴健雄



Wu immigrates to the US in 1936 faced with sexism/racism. Her thesis is completed at UC Berkeley in 1940.



At UC Berkeley, Wu conducts research in Uranium Fission Products (did not obtain faculty here)



Wu is appointed faculty at Columbia University in 1945 (until her retirement 1981).



Other experiments: Manhattan Project, EPR, Beta Decay, CVC Hypothesis Sickle Cell Anemia



Wu Experiment is Carried at Columbia University in 1956-1957



World leading experimental physicist with the honors: the first women with an honorary doctorate at Princeton, first female president of The APS, and the first living scientist to have an asteroid named after her.

“Mrs. Wu is wasting her time. I would bet you a large sum that parity is conserved.”

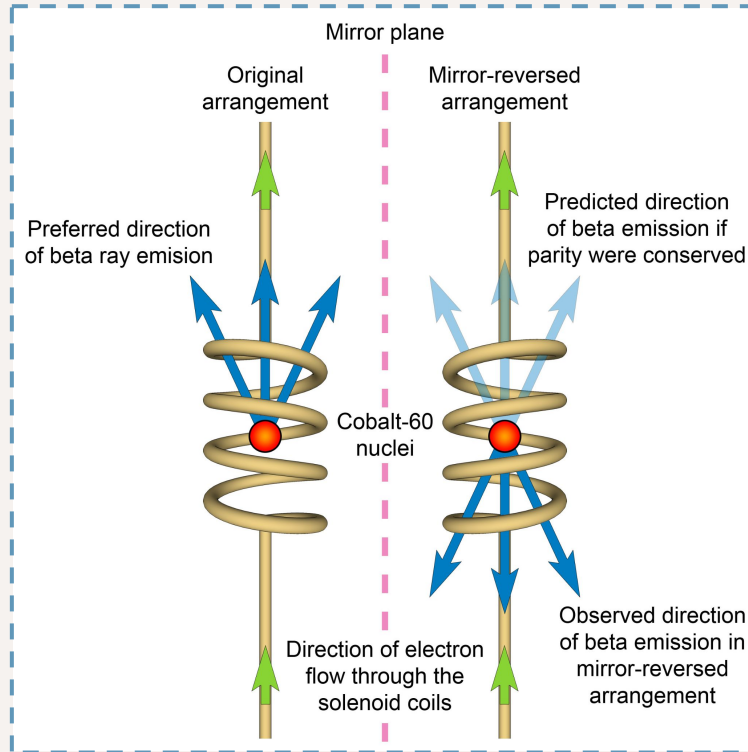
Wolfgang Pauli to Victor Weisskopf

Scientific Findings: Violation of Parity

The Wu Experiment (1956-1957)

Chen-Ning Yang and
Tsung-Dao Lee won the
Nobel Prize in Physics for
CP Violation in 1957.

Wu would not get
recognized for her
experiment until the Wolf
Prize was awarded to her
in 1978.



Fundamental Contribution to Particle
Physics which Lead to the Development
of the Standard Model

“It is perhaps difficult for a modern student of Physics to realize the basic taboo of the past period (before 1956) ... it was unthinkable that anyone would question the validity of symmetries under ‘space inversion,’ ‘charge conjugation’ and ‘time reversal.’ It would have been almost *sacrilegious* to do experiments to test such *unholy* thoughts.”
Chien-Shiung Wu (date unknown)

First Lady In Physics

In a speech at MIT symposium 1964 against gender discrimination:

“I wonder... Whether tiny atoms and nuclei, or the mathematical symbols, or the DNA molecules have any preference for either masculine or femine treatment”

Chiang, Tsai-Chien (2014). *Madame Chien-Shiung Wu: The First Lady of Physics Research*. World Scientific.

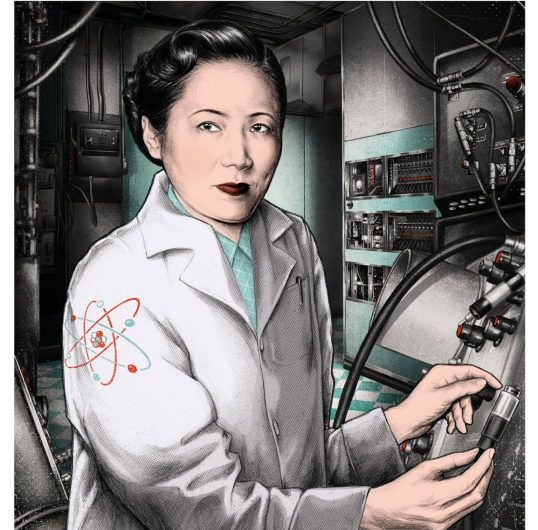
In 1963:

“In China there are many, many women in physics. There is a misconception in America that women scientists are all dowdy spinsters. This is the fault of men. In Chinese society, a woman is valued for what she is, and men encourage her to accomplishments, yet she remains eternally feminine.”

Quoted in 'Queen of Physics', *Newsweek* (20 May 1963)

TIME

THE WEEKLY NEWSMAGAZINE



CHIEN-SHIUNG WU (1945)
Unlocking the atomic age

Quiz!

1. Have you identified a teaching practice that you will consider this upcoming semester so far? (yes, no, somewhat)
2. Do you think the challenges/barriers that Chien-Shiung Wu faced are still applicable today? (yes, no, somewhat)

Questions Asked Before:

1. Can you name a Chinese (or other east-asian) scientist other than Chien-Shiung Wu?
2. What is the first image in your mind when you picture a scientist?
3. Does the picture of Chien-Shiung Wu Challenges your idea of a scientist?

Feedback: what are the ways you can gauge understanding?

This question gauges the entire presentation engagement and impact

Many of these questions are to posed in order to facilitate reflection

Quiz questions should reflect main-takeaways, multiple choice is a great way to quickly gauge how students are understanding the course/lecture "main ideas"

Quiz questions that reflect Exam questions takes the anxiety of the unknown from students, making studying more efficient

STEMicists of the Week: Physics & Mathematics Edition

Kinematics (linear/uniform circular motion)

Karen Uhlenbeck/ Maryam Mirzakhani (late 1900, mathematicians)- modern geometric analysis (more applicable to quantum mechanics/classical physics)

Nasir al-Din al-Tusi (1200, mathematician)- formulated spherical trigonometry as early as 400 BCE (basis for uniform circular motion)

Bhaskara Acharya (1100, mathematician)- conceived differential calculus

Domingo de Soto (1500, theologian)- refined definition of acceleration

Dynamics (force)

Thabit ibn Qurra (c. 850, polymath)- founder of the analysis of force/torque.

Ibn Sina (900, polymath)- conceptualized inertia (1st law of motion)

Hibat Allah Abu'l-Barakat al-Baghdaadi (1100, philosopher)- conceptualized constant force imparts a constant acceleration (2nd law of motion)

Ibn Bajjah (1100, polymath)- conceptualized opposite reactions (3rd law of motion)

Energy/work

Emilie du Châtelet (1700, physicist)- refined the conservation of energy and momentum concept

Emmy Noether (1900, mathematician)- every conserved force has a conservation law

Rotational/rigid bodies

Katherine Johnson (1900, mathematician)- orbital mechanics

Sophya Kovalevskaya (1800, mathematician)- "Kovalevskaya Top" list of known integrable rigid bodies

Oscillations/waves

Nergis Mavalvala (present, physicist)- proved gravitational waves exist

Donna Strickland (present, optical physics)- chirped pulse amplification application

Astronomy

Cecilia Payne-Gaposchkin (1900, physicist)- demonstrated hydrogen is the most abundant element in the universe

George Edward Alcorn Jr. (present, astrophysicist)- computer analysis of launch trajectory and orbital mechanics for Rockwell Missiles

George Carruthers (1950, astrophysicist)- Invented UV camera/spectrograph used by NASA in Apollo 16

Subrahmanyan Chandrasekhar (1900, physicist)- white dwarf mass limit
Henrietta Swan Leavitt (1800, astronomer)- discovered relationship between luminosity and Cepheid Variables (measure the dist. of stars relative to Earth)

Annie Jump Cannon (1800-1900, astronomer)- credited with creating the Harvard Classification Scheme of stars

Quantum Mechanics

Sau Lan Wu (present, quantum physicist)- discovered J/ψ particle (standard model)

Lisa Randall (present, theoretical physicist)- Randall-Sundrum Model

My back hurts; I need to stand up and stretch/walk around

I need to quickly go check on my child in the other room

I had a class right before this and didn't get to eat lunch; I need to grab a snack

Break Time

I'm having a hard time paying attention anymore; I just need to step away for a bit

I pulled an all-nighter last night to finish a paper, I need to step away from my computer and get coffee

I rushed to this meeting and really have to use the bathroom, but didn't want to miss any content

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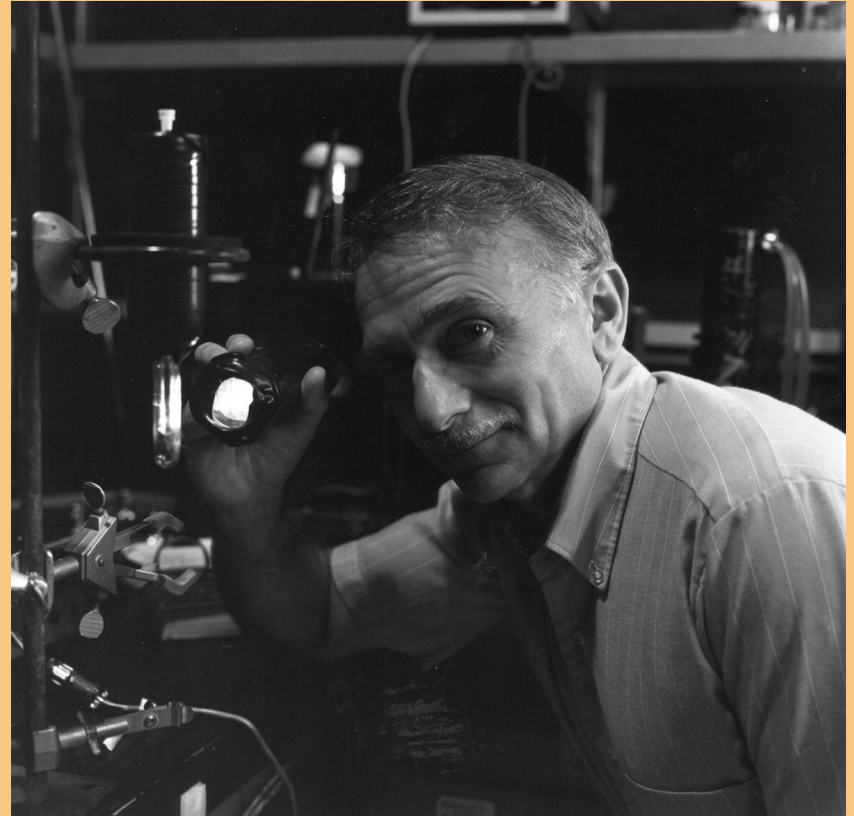
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Martin Gouterman

Quantum Chemist and Gay
Activist

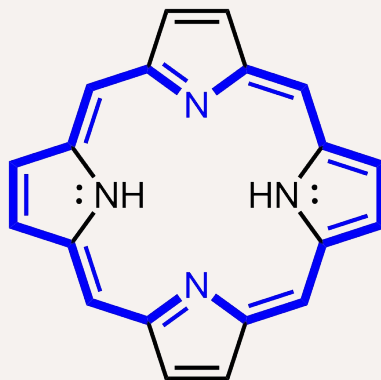
1931 - 2020



Brief Biography

Scientific Contributions:

*Developed the influential
'four-orbital model' of
porphyrins*



Social Contributions:

*One of the first out gay
chemists and fought for
better lives for LGBTQ+
community*

Scientific Career

Undergraduate and graduate
degrees in physics.

*University of Chicago
(1949-1958)*

University of
Chicago

Scientific Career

Postdoc to William Moffitt, and
then Assistant Professor of
Quantum Chemistry upon Moffitt's
sudden death.

Harvard University
(1958)

University of
Chicago

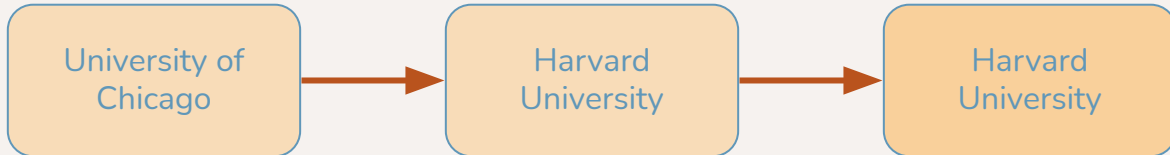


Harvard
University

Scientific Career

Independent career in quantum chemistry researching porphyrins began.

*Harvard University
(1958-1966)*



Scientific Career

Roald Hoffmann:

Gouterman's student who went on to earn a Nobel Prize

(not pictured)



Paul Seybold:

Gouterman's student who published a paper cited over 700 times.

**Martin
Gouterman**

University of
Chicago

Harvard
University

Harvard
University

Scientific Career

Focused on mentorship and shifted to more applied chemistry.

*University of Washington
(1966-end of career)*

University of
Chicago

Harvard
University

Harvard
University

University of
Washington



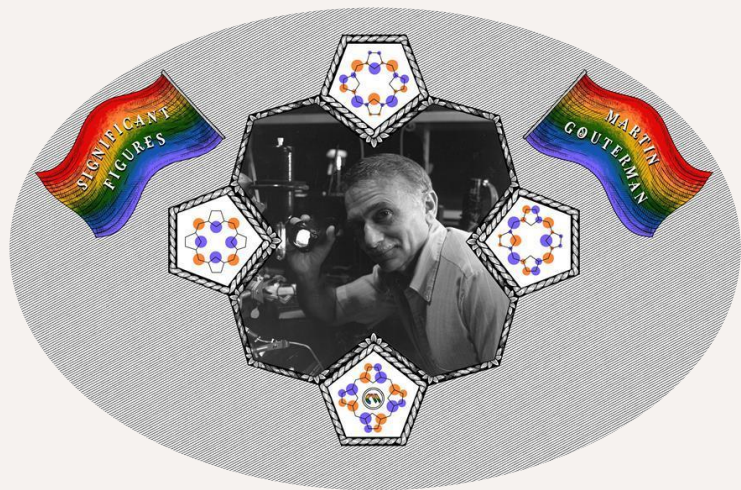
Personal Life

Martin married Delynn Eastwood, a female postdoc and colleague in his lab, briefly while at Harvard.

Why?

“Gouterman made it clear that the marriage was merely a cover that he, for one reason or another, felt obliged to resort to.”

Personal



Quiz:

What molecule did Martin Gouterman spend his career studying?

- A. Phosgenes
- B. Pyridines
- C. Porphyrins

Quiz: Growth Mindset

- Growth Mindset requires the creation of a humane environment/space that allows growth
- Humane environments tell students they are able to improve without worrying about detriments to their grades
- Provide low-stake assessments
 - Short assignments worth little points
 - Spread throughout the semester (quizzes, pre-class assignments, in-class assignments)
 - To build familiarity with topics/questions
- Remind students about beneficial study habits/growth mindset and provide opportunities for them
 - Ex. “Successful habits”, “Study halls over office hours”

STEMicists of the Week: Chemistry Edition

Ben Barres (Neurological Chemist) - He did revolutionary work on glial brain cells and was the first openly transgender member of the US National Academy of Sciences

Rachel Carson (Marine Biologist) - Brought attention to bad effects fertilizers and other industrial chemicals have on the environment, and closeted lesbian

George Washington Carver (Agricultural Chemist) - Besides advocating crop rotation, Carver also helped pioneer the field of chemurgy.

St. Elmo Brady (Physical Organic Chemist) - First African American to earn a Ph.D. in chemistry. Built chemistry programs at 4 major HBCUs.

Winifred Burks-Houck (Environmental Organic Chemist) - First woman president of NOBCCChE. Forged bonds with other national societies to advance black chemists.

Marie Maynard Daly (Biochemist) - Elucidated how histones function. The first African American woman in the United States to earn a Ph.D. in chemistry.

George Edward Alcorn Jr. (inventor, physicist)- invented the X-Ray Spectrometer (applied in physics lab)

James A. Harris (nuclear chemist)- co-discovered Rutherfordium (104) and Dubnium (105)

Lise Meitner (physicist)- discovered protactinium and nuclear fission (she also observed energy is not conserved in beta decay)

Tapputi Belatekallim - world's 1st recorded chemist

Elizabeth Fulhame - discovered catalysis

Irma Goldberg (Organic Chemist)-Goldberg Reaction (Copper reaction to produce nitrogen-carbon bond)

Ursula Franklin (metallurgist) - concluded the radioactive isotope strontium-90 was appearing in children's teeth which led to the "Partial Nuclear Test Ban Treaty of 1963"

Maria Goeppert-Mayer (nuclear physicist) - atomic nuclear shell structure

Alice Ball (chemist) - developed the Ball Method (effective leprosy treatment)



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Tikvah Alper

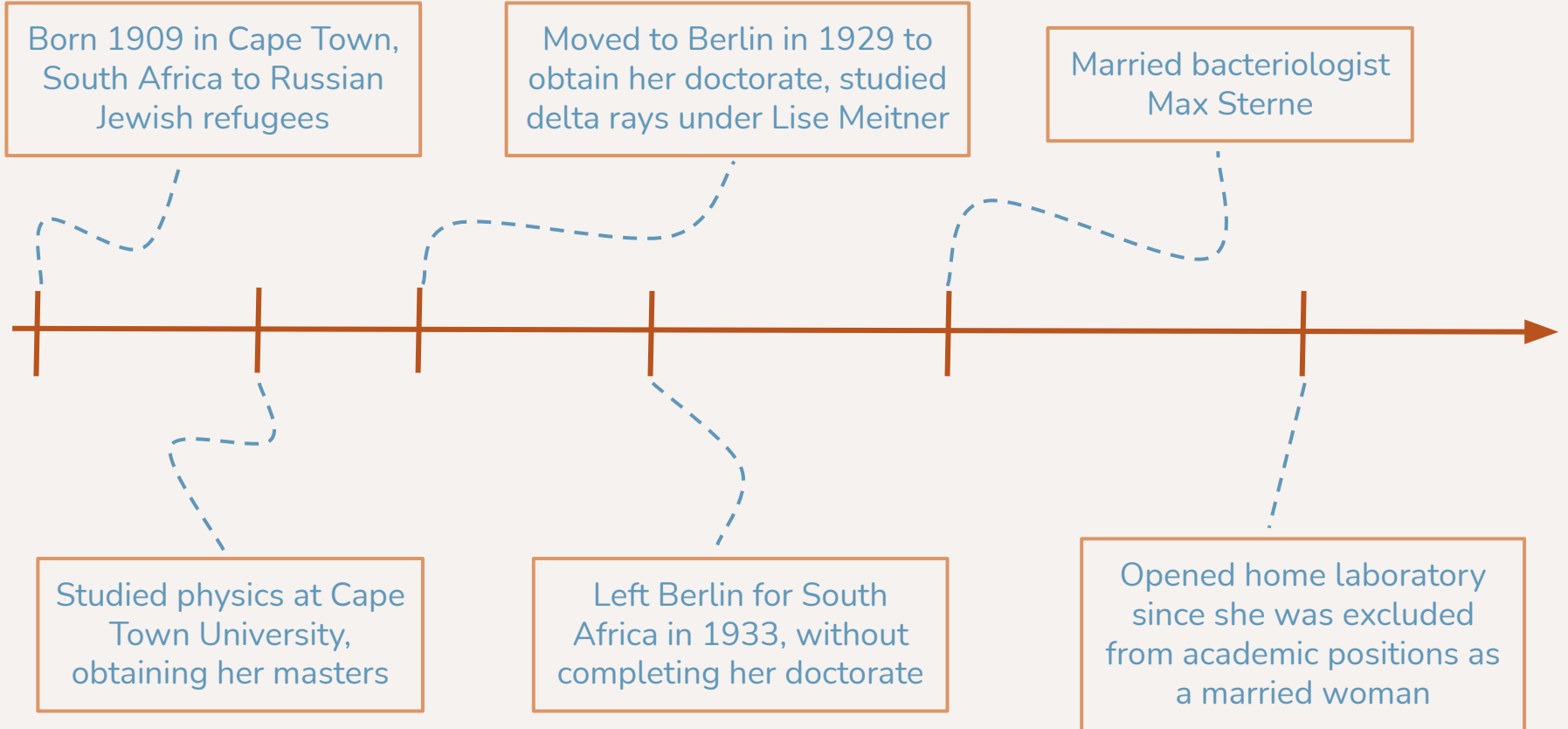
“The Sage of Radiobiology”

Physicist and Radiobiologist
1909-1995



Obtained from: https://en.wikipedia.org/wiki/Tikvah_Alper

Brief Biography



Brief Biography: Continued

Sons Jonathan and Michael born in 1935 and 1936

Became head of Biophysics section of South African National Physics Laboratory in 1948

Took an unpaid position at MRC Radiobiology Laboratories at Hammersmith Hospital in London

Died in England in 1995

Left South Africa as a result of her opposition to apartheid in 1951

Became Director of the Radiobiology Unit in 1962, and studied prion diseases and the infectious agent of Scrapie

Trained in speech therapy and became teacher to the deaf to assist disabled son Jonathan

Researched the effects of radiation on cells and cell biology



Science and Community Engagement

Scientific Achievements

- Developed method for measuring optical density of bacterial cultures
- Discovered that infectious agents of Scrapie and BSE do not contain nucleic acid
- Worked towards identifying the existence of prions
- Developed an instrument to help visualize pitch variations for speech therapy

Action in the Community

- Retrained as a speech therapist after learning her older son was deaf
- Temporarily (14 years) left scientific career to teach her son and other deaf children
- Was a noted feminist who never took her husband's name or wore a wedding ring
- Lost her South African passport and laboratory position due to her opposition to apartheid

Who did we talk about?

- Chien-Shiung Wu

- Experimental, particle, and nuclear physicist
- “First lady of physics”, “Madame Wu”, “Dragon Lady”
- Notable works: Manhattan Project (U-286), Wu-Experiment (CP Violation), Beta Decay
- 1st female president of American Physics Society, Honorable Doctorates at Princeton

- Martin Gouterman

- Quantum Chemist
- Notable Works: 4 orbital model of porphyrins
- Leading figure in Seattle’s gay rights movement of the 1960s
- Mentor to many recognized scientists

- Tikvah Alper

- Radiobiologist and physicist
- “The sage of radiobiology”
- Notable work on: prions, Scrapie, irradiation of cells, opacity of bacterial cultures
- Also worked as a teacher to deaf children

Reflection: Group

Reflection

Questions

- Did you already know about these three scientists? Why or why not?
- Do you think that the legacy of scientists are affected by their activism (positively or negatively)?
- How do you plan to introduce non-traditional STEMicists to your classes?

STEMicists of the Week: Biology Edition

Rebecca Lee Crumpler (physician and nurse) - first African-American woman to obtain M.D., published medical text directed towards mothers

Rotonya Carr (physician-scientist) - hepatologist studying and treating alcoholic and non-alcoholic fatty liver disease

Rosalyn Yalow (medical physicist) - 1977 Nobel laureate, developed the radioimmunoassay technique

Flossie Wong-Staal (virologist) - first to clone HIV and determine function of its genes

Rita Levi-Montalcini (neurobiologist) - discovered nerve growth factor, 1986 Nobel laureate

Yizhi Jane Tao (biochemist) - mapped the atomic structure of influenza A nucleoprotein

Françoise Barré-Sinoussi (virologist) - worked to link HIV as cause of AIDS, 2008 Nobel laureate

Dorothy Crowfoot Hodgkin (chemist) - X-Ray Crystallography to determine biochemical structures (an essential tool in structural biology)

Roseli Ocampo-Friedmann (microbiologist) - studied extremophiles, work has contributed to exploring terraformation of Mars

Maria Sibylla Merian (naturalist) - skilled illustrator, studied botany and tropical insects

Branson Herman (physicist) - researched alpha helix protein structure (led to our understanding of how sickle cell anemia works)

Emmett Chappelle (biochemist) - discovered single cell organisms photosynthesize, worked on bioluminescence

Ernest Everett Just (biologist) - research observed cell surface in the development of organisms, could have sped up our understanding of the cell

Nettie Stevens (geneticist) - discovered sex chromosomes

Maude Menten (biochemist) - worked in enzyme kinetics, Michaelis-Menten kinetic equation

Gerty Cori (biochemist) - discovered course of catalytic conversion of glycogen, 1947 Nobel laureate

Alma Howard (radiobiologist) - proposed the first concept of cell cycle (4 distinct periods)

Margaret Bastock (geneticist) - provided the 1st evidence that a single gene can change behavior

Barbara McClintok (cytogeneticist) - discovered genetic transposition, 1983 Nobel laureate

Reflection

Questions

- Did you already know about these three scientists? Why or why not?
- Do you think that the legacy of scientists are affected by their activism (positively or negatively)?
- How do you plan to introduce non-traditional STEMicists to your classes?

Instructions

- First spend some time reflecting on the questions on your own
- If you would like to discuss with a group, please move into a breakout room
- If you end up in a room alone, please move to another
 - If you see any rooms with 4 people in them already, choose a different room
- If you don't want to have any group time, please stay in the main room

Share your thoughts and/or what you discussed
with your group about introducing non-traditional
STEMicists to your courses

Type in chat or raise your hand to comment verbally

Group Time and Resubmissions

After individual section, group time allows students to check in with each other and increase their understanding

Allowing group resubmissions ensures that students can apply increased understanding and recover from mistakes

Taken together, group time and resubmissions build connections amongst students and provide a safety net for grades

We recommend limiting group sizes to 3-4 people to help maintain positive group dynamics



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Debrief: Takeaways

Recommendations for Inclusive Learning/Teaching

- Lecture outlines and clear organization of courses
 - Titling lectures, providing guidelines of topics, setting clear expectations (learning outcomes)
- “Non-traditional STEMicist” and why representation in STEM matters
 - Eurocentric standard, de-colonizing STEM
- Feedback
 - Structured and unstructured quizzes
- Quizzes
 - Group submissions
 - Providing expectations/guidelines
 - Maintain regular quiz schedule
 - Growth Mindset
- Affirmations
 - Ex. “This is a positive & supportive classroom environment”
- Mental/physical breaks

[Link](#) to full list of recommendations for inclusive learning

What this looks like post-COVID

- Record lectures
 - Allows students to focus more on understanding than note taking, and recover from missed lectures
- Post slides (pre- and post-lecture)
 - This allows students to study directly from provided material and look back over what they may have missed
- Optional IVC
 - This ensures students can still attend class if they are unable or uncomfortable coming in person
- Online assignment submission
- Supplemental technology programs
 - Provides a different instructional method to keep students engaged
- Designated breaks
 - Gives students the chance to recharge and deal with non-class related issues
- Be flexible!

Designing your course

Think about overall structure/delivery of your course (beyond content)



Think about content you're teaching

Think about student reactions (engagement, feedback, etc.)

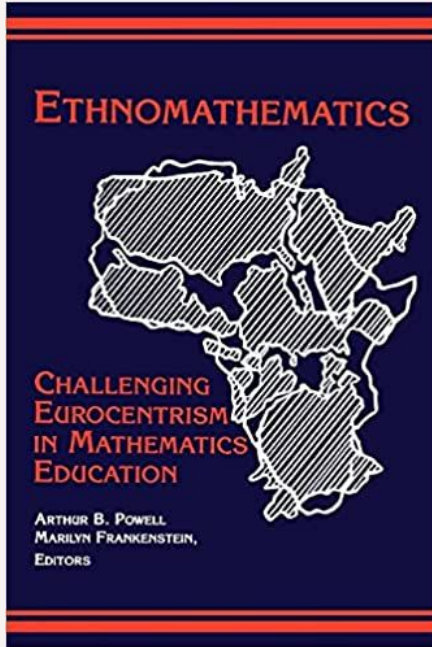
How do you introduce your course?

Our Learning Outcomes

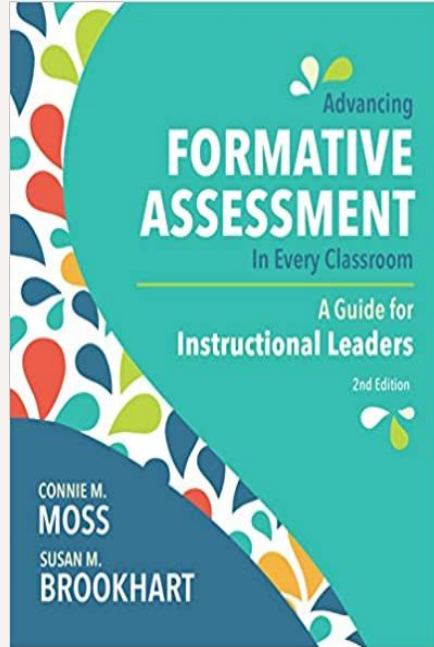
- Attendees will use the content of the workshop as a stepping off point for reflecting on their teaching practices
- Attendees will identify some of the practices demonstrated in the workshop or laid out in the list of inclusive practices that they will implement in their classrooms
- Attendees will identify and learn about a non-traditional scientist in their own field of study who interests them
- *Keep in mind your own personal learning outcomes/goals (i.e. why did you choose to attend the workshop?)*

Exit Survey

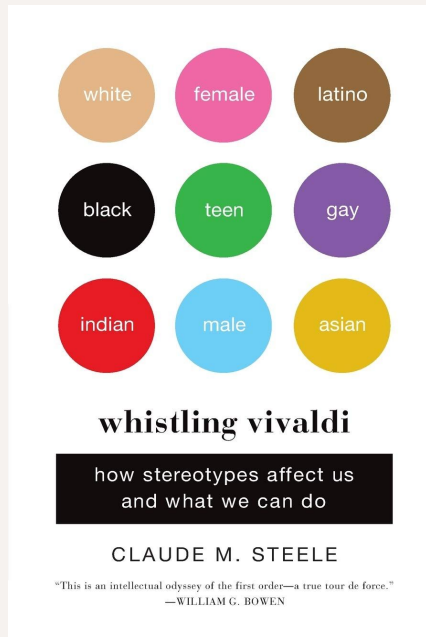
Resources: Literature (on teaching)



Arthur B. Powell and Marilyn Frankenstein on understanding the eurocentric history of, and links between, culture and mathematics
Ethnomathematics



Connie M. Moss and Susan M. Brookhart on formative assessment as an instructional practice
Advancing Formative Assessment In Every Classroom

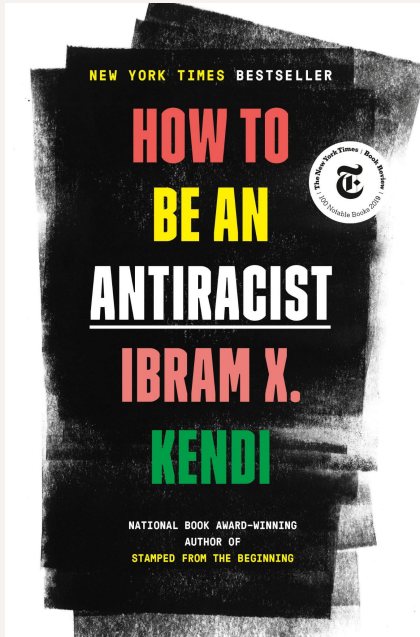


Claude Steele on the effects of stereotypes
Whistling Vivaldi: How Stereotypes Affect Us and What We Can Do

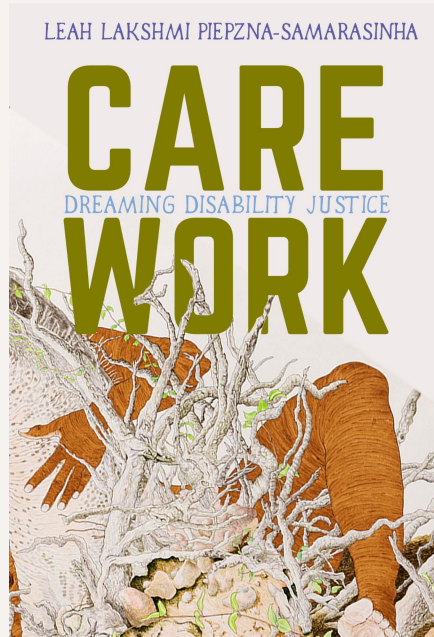


bell hooks on teaching pedagogies and educational practices (from top left, top right, to bottom)
Teaching To Transgress: Education as a Practice of Freedom
Teaching Critical Thinking: Practical Wisdom
Teaching Community: A Pedagogy of Hope

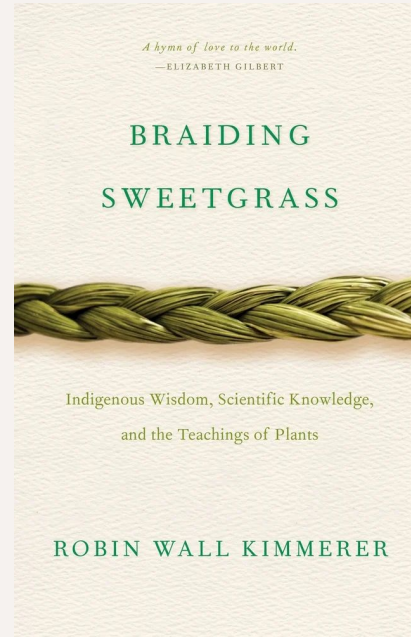
Resources: Literature (social justice, broadly)



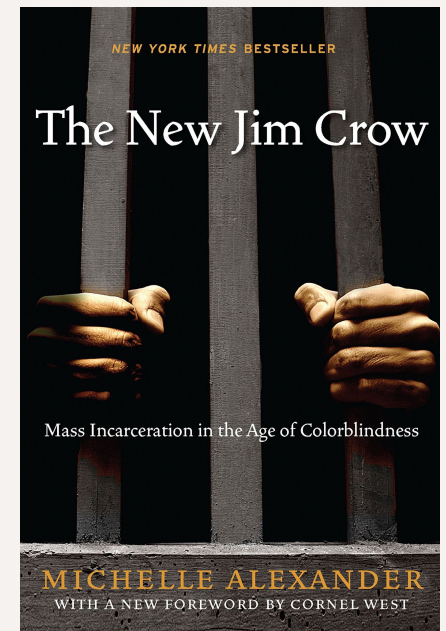
Ibram X. Kendi on Black Experience, Racism at large
How to be An Antiracist



Leah Lakshmi Piepzna-Samarasinha on disability as trans/inter-disciplinary social justice work
Care Work: Dreaming Disability Justice



Robin Wall Kimmerer on indigenous knowledge and the alternative scientific method outside of the traditional form.
Braiding Sweetgrass



Michelle Alexander on mass incarceration and modern prison systems
The New Jim Crow

Resources: Other

Literature

Rising Out of Hatred

Detours: A Decolonial Guide to Hawai'i

Sapiens

The Double Helix

Stamped From the Beginning

White Fragility

Between the World and Me

Walking Out On the Boys

The Sixth Extinction: An Unnatural History

Creating Inclusive Learning Opportunities in
Higher Education

Hidden Figures

Becoming

The Remedy: Robert Koch, Arthur Conan Doyle,
and the Quest to Cure Tuberculosis

Freedom is a Constant Struggle

Fiction

The Nickel Boys

Americanah

Bluest Eyes

Sulah

Their Eyes Were Watching God

Film

Picture a Scientist

13th

Just Mercy

The Pieces I Am

Crip Camp

Podcasts

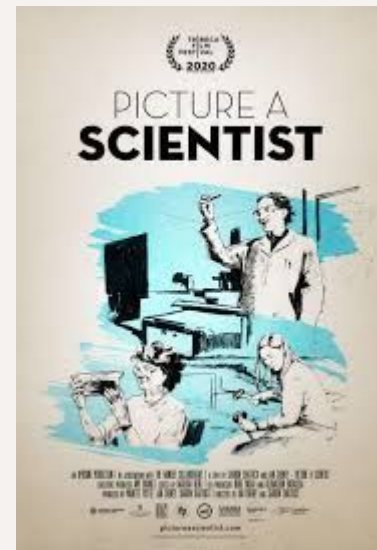
Scene on Radio

White Lies

Sounds Like Hate

This American Life

Nice White Parents



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