

Voice in the Wilderness: A Pioneering Biologist Explains Why We Must and How We Can Diversify the Scientific Workforce

The Wildlife Society

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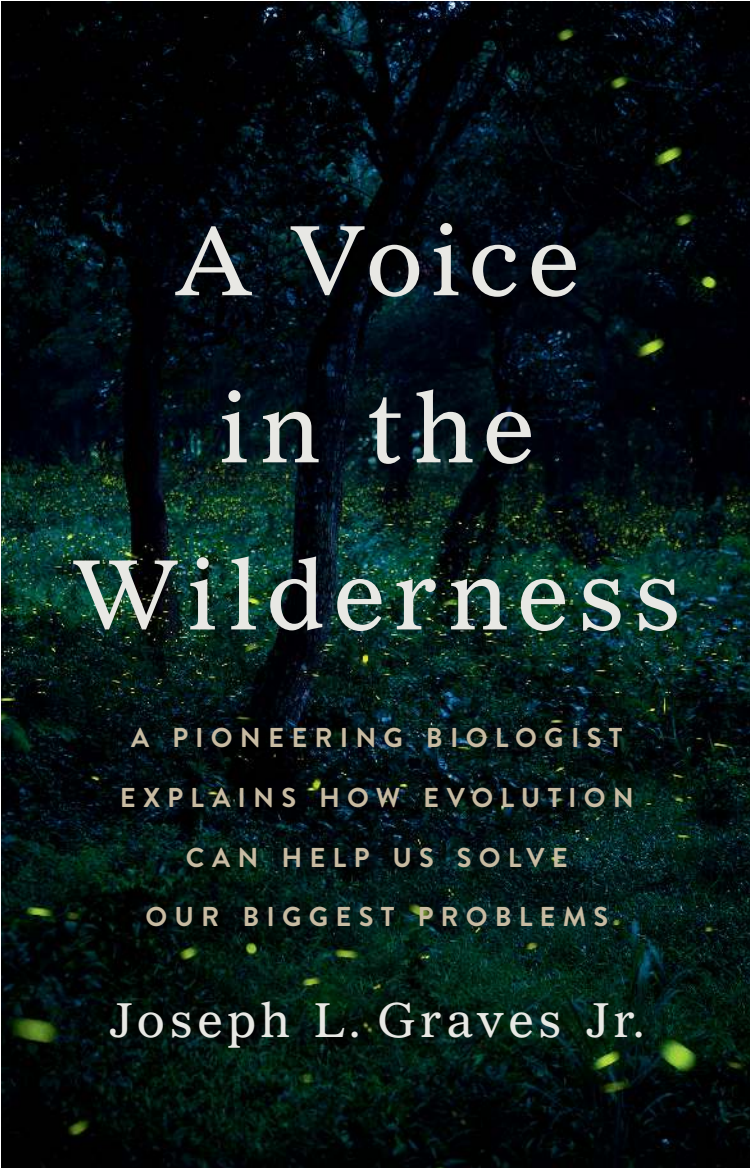
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A Voice in the Wilderness

A PIONEERING BIOLOGIST
EXPLAINS HOW EVOLUTION
CAN HELP US SOLVE
OUR BIGGEST PROBLEMS.

Joseph L. Graves Jr.

Publisher: Basic Books

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Purpose: To acquaint readers with my pioneering journey as the world's first African American evolutionary biologist.

Part I: The Unexpected Path – is autobiographic; focuses on early life, education, first significant scientific problems: lakes/rivers, parasitology, community ecology, chaos theory, evolution and physiology of aging.

Part II: How evolution can solve our biggest problems – focuses on my fight with scientific racism, science and religion, genomics of adaptation, science & social justice.

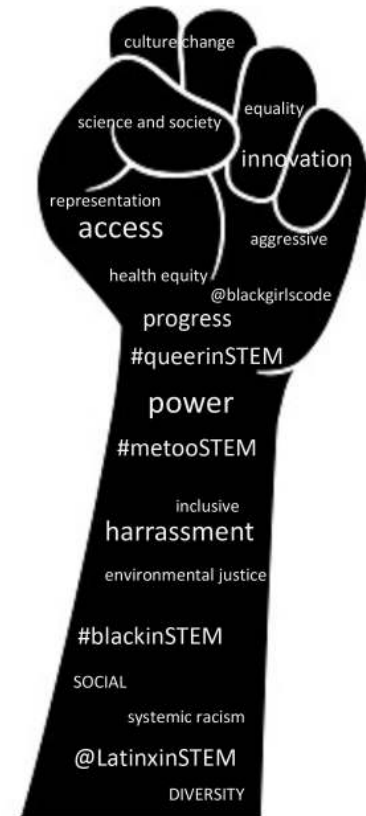
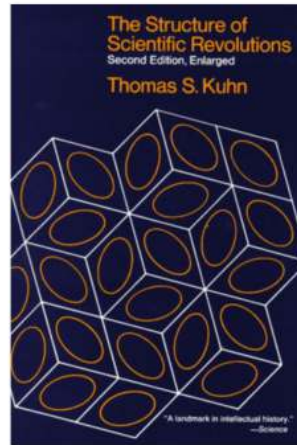
Why Scientists Must Stand for Affirmative Action and against Scientific Racism

The Supreme Court could destroy affirmative action in higher education, and STEM professionals must stand against the white supremacy and scientific racism that fuels arguments against it

By Stacy Farina, K Amacker on October 31, 2022

“Should the SCOTUS overturn *Grutter v. Bollinger*, thus essentially ending affirmative action at historically white institutions of higher education, they must simultaneously order that all states who violated the 1879 *Plessy v. Ferguson* decision by siphoning funds away from black education to support white education must immediately pay those pilfered funds into black public-school districts and HBCUs. Furthermore, they must order that going forward, a moon-shot level investment in the infrastructure of HBCU/HSI/MSI and Tribal Colleges must be put in place to meet the need for equitable education for non-whites in the United States.”

- Quote from: Dr. Joseph L. Graves Jr. *Scientific American* October 31, 2022



Graves JL. Kearney M. Barabino G. Malcolm S. Inequality in science and the case for a new agenda, *Proc. National Acad. Sciences USA*, Perspectives on Racial and Social Justice, 2022.

Key points

- The history of the scientific enterprise demonstrates that it has supported gender and racial inequity.
- Further, its institutions have allowed discrimination, harassment and personal harm of racialized persons and women.
- This has resulted in a sub-optimal and demographically narrow research and innovation system, a concomitant limited lens on research agendas, and less effective knowledge translation between science and society.

- We argue that to reverse this situation, the scientific community must re-examine its values and then collectively embark upon a moonshot-level new agenda.
- This new agenda should be based upon the foundational value that scientific research and technological innovation should be prefaced upon progress towards a better world for all of society.
- The process of how we achieve research outcomes is just as important as the results of research.



Shirley Malcom



Gilda Barabino



Maureen Kearney

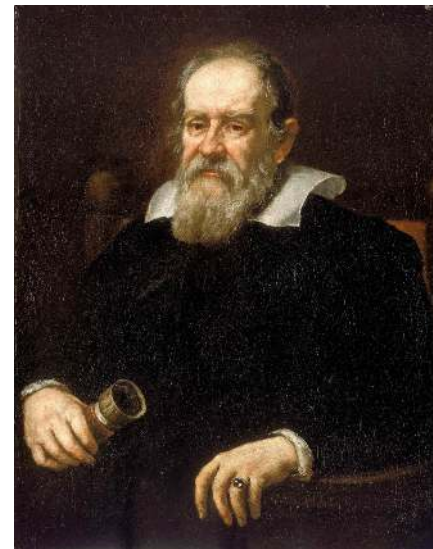
Inequality in historical context

- *“The system of cooperation and competition, secrecy and openness, rewards and punishments that has characterized science from its inception is both social and internal to science itself.”*
- –David Hull
- The internalists hold that the scientific process is characterized by rational evaluation of observations, hypotheses, and experimentation.
- This means that, in the end, what counts as scientific fact results from the cogency of the arguments deployed and the weight of evidence supporting them.

- On the other end of the extreme are the externalists, who hold that a wide variety of factors impact the process of science, particularly social forces and idiosyncratic personal motives.
- The latter perspective acknowledges that the process of science, and scientists themselves, are part of a social order.



Giordano Bruno – burned by inquisition 1600



Galileo, recanted heliocentric universe under threat of torture in 1633.

The difference between these individuals is the subject of W.E.B. DuBois's essay, Galileo Galilei published in 1908. He used it as a metaphor for evaluating the difference between B.T. Washington's capitulation to white supremacy (1905), or a call for a higher function of the Negro college.

- Such an agenda will attract individuals who have been historically excluded from participation in science, but we will need to engage in substantial work to overcome the longstanding obstacles to their full participation.

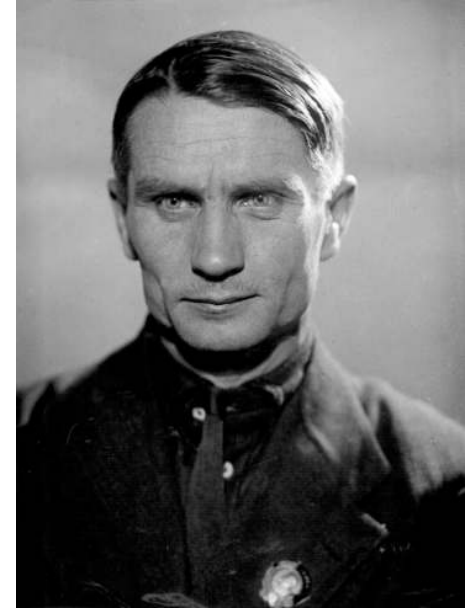


Internalist/Externalist

- A common example of how societal context may misdirect the results of scientific research is that of genetics in the Soviet Union from the 1930's to the 1960's.
- While often cited, the dynamics of the suppression of Mendelian genetics is not well understood.
- A key character in these events was Trofim D. Lysenko (1898-1976). Lysenko had an uneven training in biology, particularly in the scientific method.
- His most important discovery was that some plants required a period of low temperature to develop to flowering stage (vernalization).

Societal context

- He attempted to demonstrate the validity of his theories of vernalization on his father's farm and made claims of success in increasing wheat yield that could not be verified.
- Lysenko publicized these results at a time when Stalin's government was beginning its first 5-year plan to collectivize and improve Soviet agriculture, and in the midst of an acute grain shortage in the country.
- Lysenko's appeal to the Stalinist regime, was in part his heritage (he was the son of peasants.)
- However, the leading biologists in the USSR recognized his ideas were wrong.
- His opposition to Mendelian genetics and the chromosomal theory of inheritance was thoroughly ridiculed at a scientific congress in Moscow in 1936.



The flipped side of the coin

- The rise of race science in the United States is one of the most powerful examples of how the exclusion of entire groups from the scientific enterprise can warp its outcomes.
- The history of evolutionary biology, pursued largely by white males until only recently, is replete with racialized arguments for biological determinism.
- Lysenko's rejection of Mendelian genetics was not rooted in Lamarckism, although his ideas on the importance of environment over genetic determinants of phenotype was consistent with a Lamarckian world view.
- He actually saw himself as a Darwinist, protecting evolution from an overemphasis on genetics

Genetics/Environmentalism

- The dispute between the genetic and environmental determinist camps came to a head at the seventh International Congress of Genetics held in Edinburgh in 1939.
- The Congress issued the *Genetico* manifesto (authored primarily by American scientists) that condemned Nazi race theory (*J. Heredity* 30(9): 371—374, 1939).
- They called for effective birth control and emancipation of women, stressed the importance of social and economic change, and condemned racism against ethnic minorities.

MEN AND MICE AT EDINBURGH

Reports from the Genetics Congress

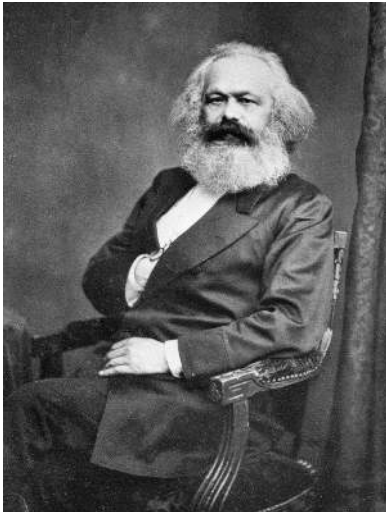
THE Seventh International Congress is now history. The crisis, which had threatened all summer, broke just as the Congress convened, though war was not actually declared until after the Congress adjourned. Conditions for holding an International Congress could hardly have been worse, but nearly two hundred Americans went in spite of the uncertainty. The final program of the Congress, issued just before it convened, closed with the following statement: "To construct a program of this kind is always difficult: in these days it is almost impossible. Those who recognize its faults, and they are many, will surely excuse them when they learn that

The matter of men insofar as the Genetics Congress dealt with it, and in the light of our present information, is contained in an unofficial statement (published in full below) termed by some signers, "The Geneticists' Manifesto." It was prepared in response to a question cabled by Watson Davis, editor of *Science Service*, to a number of geneticists in Great Britain, asking "How could world's population improve most effectively genetically?" The statement below was prepared jointly by a group of those to whom it was addressed; it was signed originally by Crew, Haldane, Harland, Hogben, Huxley, Needham and Muller. Dr. Muller writes about this

Original Signatories: Crew, FAE. Haldane JBS. Harland SC. Hogben LT. Huxley JS. Muller HJ. Needham J. After: Child GP. David PR. Dahlberg G. Dobzhansky Th. Emerson RA. Gordan C. Hammond J. Huskins CL. Landauer W. Plough HH. Price E. Schultz J. Steinberg AG. Waddington CH.

The tradition of all dead generations weighs like a nightmare on the brains of the living.

- The historical forces discussed above have led to a science system within the United States that remains restricted to an exclusionary subset of society.
- That fact influences everything else about science: **who participates in science, who sets research agendas, who benefits from science, and the degree to which scientific outcomes are accepted by the public.**



Marx K. The 18th Brumaire of Louis Bonaparte, 1852.

Efforts towards justice

- Many excellent efforts and investments have been made to correct these deficiencies, yet the exclusionary legacy of racism and sexism endures, infecting all major components of today's science system — **from pre-college STEM education, to the culture and norms of the scientific workforce, to the translation of scientific and technological advances to society and policy.**
- While the fundamental problem crossing over these components is clearly inequity, inequity manifests in various unique ways (**e.g., unequal access, conscious and unconscious bias, power dynamics, biased research agendas, devaluation of diversity**).

- Importantly, today's unequal science system in which racialized populations and women are provided inferior resources to facilitate their educations cannot be solely attributed to historical legacy – **harassment, exclusion, and bias are active issues in science today, and newer issues are now emerging (e.g., resistance and backlash in the face of calls for change and accountability).**
- e.g. Recent pushback over the naming of awards in the Society for the Study of Evolution.
- Revelation E.O. Wilson's closet support for leading scientific racists such as J.P. Rushton.

A closer look at E.O. Wilson's archives reveals support for racist research

Wilson's papers at the Library of Congress include correspondence with a psychologist who exalted racial stereotypes.

BY MICHAEL SCHULSON/UNDARK | PUBLISHED FEB 21, 2022 10:26 AM

SCIENCE

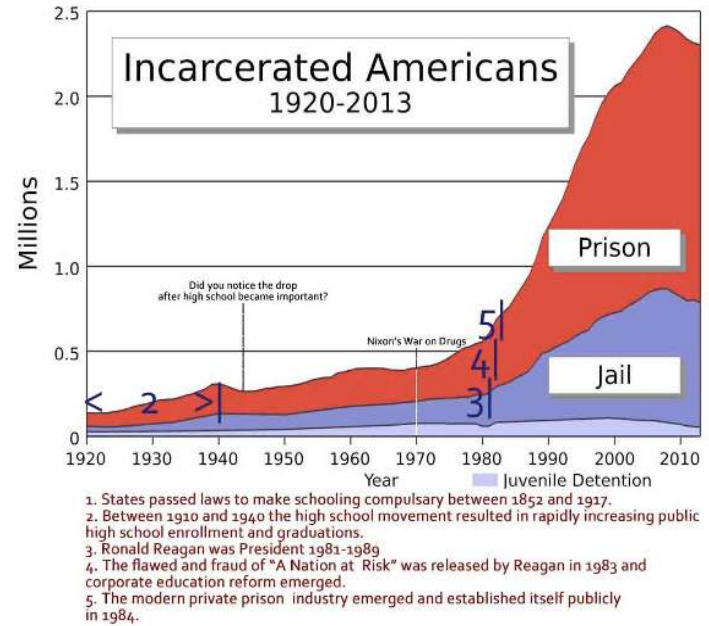
What does the way forward look like?

- Today, there are institutions making outsized commitments to the education and career development of historically excluded groups.
- HBCUs today enroll about 9% of Black students in colleges and universities yet award 17.2% of engineering bachelor's, 27.8% of physical sciences bachelor's, 25.5% of mathematics bachelor's, 24.7% of biological sciences bachelor's and 29.9 % of agriculture bachelor's degrees.
- HBCUs are disproportionately represented among baccalaureate institutions for Blacks who receive PhDs in the sciences, just as High Hispanic Enrollment institutions are for Latinx populations.
- **We argue that any institution that makes a real commitment to anti-racism can achieve these kinds of results.**

Values and priorities

- At its core, we argue that our science culture is built upon values. Thus, an important question is ‘what do we value in science vs. what do we measure and reward?’
- Do incentive systems in the STEM workforce provide accountability for doing the wrong things and rewards for doing the right things?
- Traditionally established measures of success (e.g., number of grant dollars and publications, impact factors, social media metrics) select for **highly competitive** rather than **collaborative** environments, a style of mentoring that elevates the success of mentors more than that of mentees, and potentially **harmful environments** for groups underrepresented in science.

- One traditional value in science that reinforces current workforce culture is “the meritocracy” – the tenet that advancement in science is based on an individual’s capabilities and merits.
- This core value is what underlies many of our longstanding practices - entrance criteria, hiring procedures, peer review practices, promotion criteria, and others.
- However, our society does not provide equality of opportunity, and our science system does not as well; we have never been a meritocracy.



Incarceration rates:

African Am./European Am. 7.3/1.0

LatinaX/European Am. 3.0/1.0

Wealth

European Am./African Am. 10/1

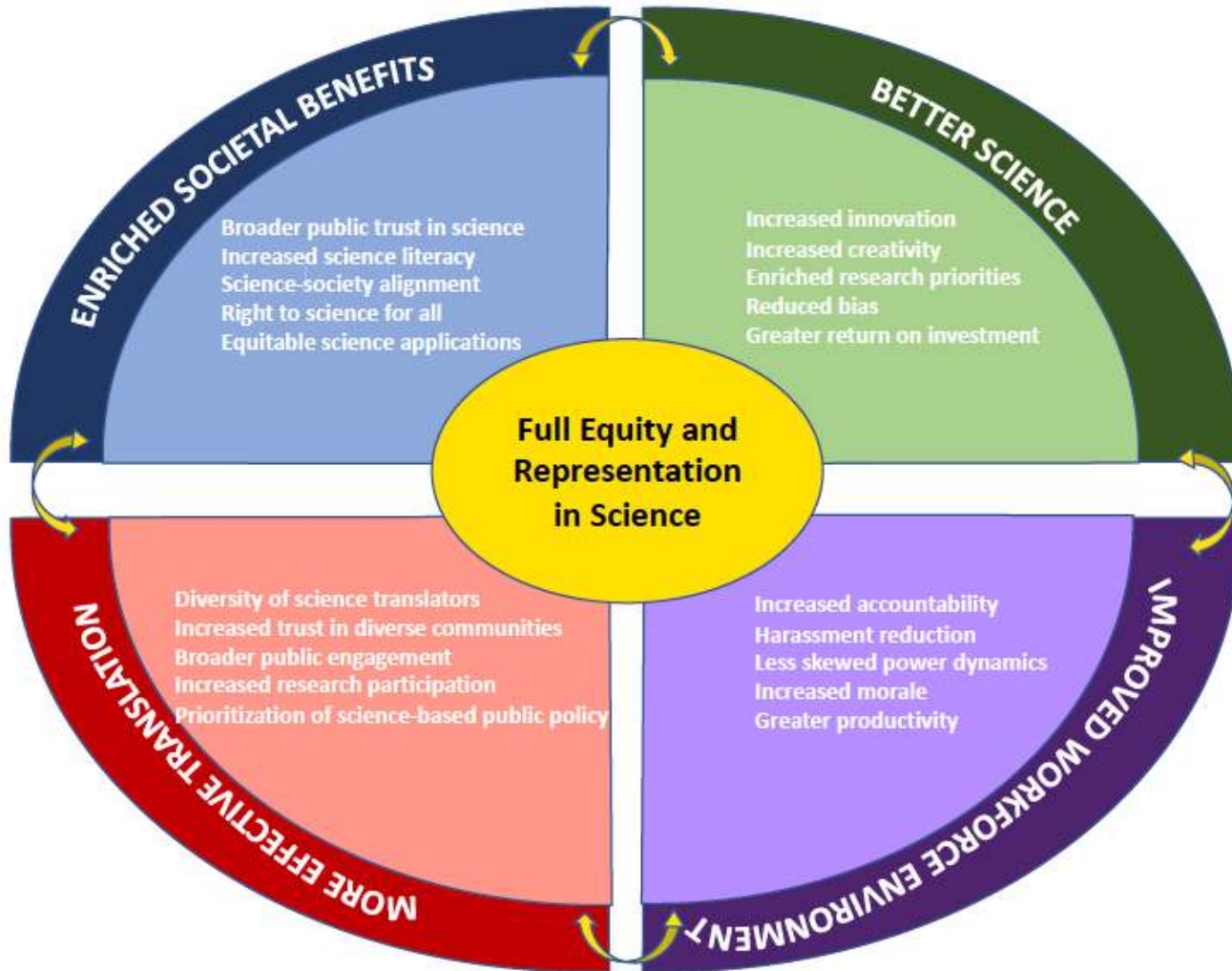
Wealth of Universities

HWI University	Billions	HBCU	Billions
Harvard	41.80	Howard	0.712
Yale	31.10	Spelman	0.377
Stanford	28.90	Hampton	0.280
Princeton	25.90	Morehouse	0.157
MIT	18.30	Meharry Medical	0.156
Texas A&M*	12.70	NCATSU*	0.073
Total HWI	158.70	Total HBCU	1.755
Ratio	90.4		

Endowment in 2020 dollars, * Comparison of the largest public HBCU to a similar HWI land grant institution. Consider these differences in the light of the worth of enslaved labor from 1776 – 1865 was over 18.5 quadrillion dollars in 2018 currency)!

Mobilizing for a new agenda

- Given the continued lack of equity and inclusion in today's scientific enterprise, the consequences of that for science and society, and the challenges to reform discussed above, we suggest that the scientific community bears a collective responsibility to frame a more just science agenda and to work towards transformative systemic change.
- The systems that we have become comfortable with are sustaining an inequitable enterprise that favors narrow participation in science.



Example	References
Ensuring equitable STEM educational opportunities	(44, 45, 46)
Drawing from best practices at HBCU's, MSI's, HHEI's, and tribal colleges	(22)
Challenging and eliminating admissions practices that exclude minority applicants	(47)
Supporting persistence through STEM transitions from undergraduate to graduate school to STEM careers	(48)
Changing mentoring norms and practices from a 'weed-out culture' to a 'support learning and success' culture	(49)
Reimagining hiring, promotion, advancement and retention for equity	(50, 51)
Bringing leaders and stakeholders together to create and implement new models that reduce harmful power dynamics and harassment	(31, 52)
Rethinking incentive systems	(53)
Using self-assessment processes for systemic institutional change	(54, 55)
Creating new initiatives to address structural bias and create culture change	(56)
Fostering greater understanding of implicit and explicit bias and requiring associated training	(57)
Diversifying peer review	(58)
Mobilizing the unique role of scientific professional societies to create culture change	(59, 60)

References

- A. Harris. *The State Must Provide: Why America's Colleges Have Always Been Unequal—and How to Set Them Right*. Harper Collins (2021).
- S. Shattuck, I. Cheney. *Picture A Scientist*. (Uprising Productions, 2020).
- C. Morrel. Stem Equity Initiative. <https://stemequityinitiative.org/>
-
- National Science Foundation. *STEM Education for the Future. A Visioning Report for STEM Education for the Future* (2020).
-
- Change the Equation. *Ending the Double Disadvantage. Ensuring STEM Opportunities in our Poorest Schools*.
-
- Redden, E. *Confronting Racism in Admissions*. Inside Higher Education, Oct 2020.
-
- J. Bauer-Wolf. *Early Departures*. Inside Higher Education, Feb 2019.
-
- T.J. Weston, E. Seymour, A. K. Koch, B. M. Drake. *Weed-Out Classes and Their Consequences*. Talking About leaving Revisited, 2019, pp. 197-243.
-

- N. Bhalla. Strategies to improve equity in faculty hiring. *Mol Biol Cell* **30**, 22 (2019).
-
- National Science Foundation. ADVANCE: Organizational Change for Gender Equity in STEM Academic Professions (ADVANCE).
<https://www.nsf.gov/pubs/2019/nsf19552/nsf19552.htm>
-
- National Academy of Sciences. *Action Collaborative on Preventing Sexual Harassment in Higher Education*. <https://www.nationalacademies.org/our-work/action-collaborative-on-preventing-sexual-harassment-in-higher-education#sl-three-columns-b7d24287-489e-45b3-9806-98f54cbb29cd>
-
- National Academies of Science, Engineering, and Medicine. 2020. *Re-envisioning Promotion and Advancement for STEM Faculty: Proceedings of a Workshop—in Brief*. Washington, DC: The National Academies Press.
<https://doi.org/10.17226/25742>.
-
- American Association for the Advancement of Science. SEA Change, STEMM Equity Achievement. <https://seachange.aaas.org/>
-

- National Science Foundation. Inclusion Across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF INCLUDES). <https://www.nsf.gov/pubs/2020/nsf20569/nsf20569.htm>
-
- National Institutes of Health. UNITE. <https://www.nih.gov/ending-structural-racism/unite>
-
- J. L. Eberhardt. Biased: Uncovering the Hidden Prejudice That Shapes What We See, Think and Do. Penguin Random House, 2019.
-
- D. Murray, K. Siler, V. Larivière, W. M. Chan, A. M. Collings, J. Raymond, C. R. Sugimoto. Author-reviewer homophily in peer review. *bioRxiv*. 2019. doi: 10.1101/400515.
-
- Societies Consortium on Sexual Harassment in STEMM. <https://societiesconsortium.com/about/leadership/>
-
- National Science Foundation. Leading cultural change through professional societies of biology. <https://www.nsf.gov/pubs/2021/nsf21049/nsf21049.jsp>
-