

Invited, Valued and Welcome? Negotiating Diversity and Equity in Physics

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Negotiating Diversity and Equity in Physics

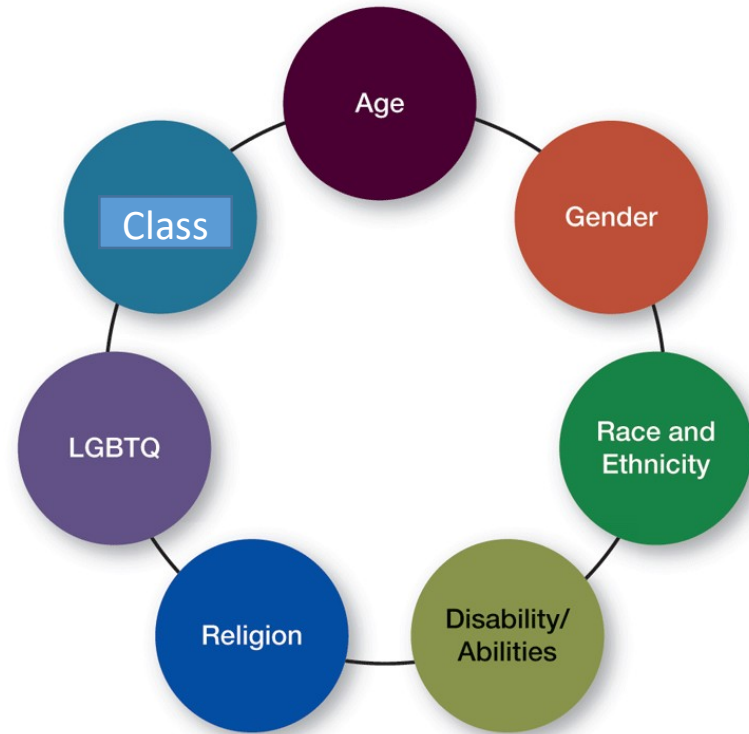
Content

- Theoretical Background – Diversity
- Empirical Findings – Gendered and Raced Politics in STEM
- Practical Experience – Negotiating Equity in Physics
- Conclusion

Theoretical Background

Dimensions/Categories of Diversity

- age
- gender and gender identity
- race, ethnicity, nationality, culture
- physical and mental dis/abilities
- religion and worldview
- sexual orientation, LGBTQ
- social background, class



<https://www.oreilly.com/library/view/fundamentals-of-management/9780135175156/xhtml/fileP7001015690000000000000000000003294.xhtml>

Theoretical Background

Static or Essentialistic Understanding of Diversity

People (or things) differ in some (or many) categories/ dimensions. They **are** different. The difference is essential (just there). We have to accept it and deal with it. It can bring advantages (e.g. gender marketing).



<https://www.spsp.org/news-center/blog/chen-ratliff-essentialism>

Theoretical Background

Dynamic or Deconstructive Understanding of Diversity

Categories of diversity are sociocultural structures to order people. They are concepts which create and support power structures. They can overlap, are **intersectional**. We are **made** different to create and legitimate inequality in society.



<https://www.gendercampus.ch/de/blog/post/diversity-management-kritisch>

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Gendered Physics



- GenderDynamics. Disciplinary Cultures and Research Organizations in Physics. Joined research project in Germany (2012-2015) at three 3 Universities in Berlin
- Ethnographical studies observing solid state physics, chemical physic, particle physics and biophysics research groups at universities, research institutes, and research clusters.
- Findings of Gender Dynamics (Martina Erlemann)
 - Gender is an explicit topic in conversations (mostly affirmative action)
 - Gender is made relevant in interactive settings such as team meetings or informal chats
 - Gender is observable via metaphors members of the institute use to describe their activities in physics

Gendered Physics

„Family and Research are difficult to coordinate“

Familie und Forschung ist schwer zu vereinbaren



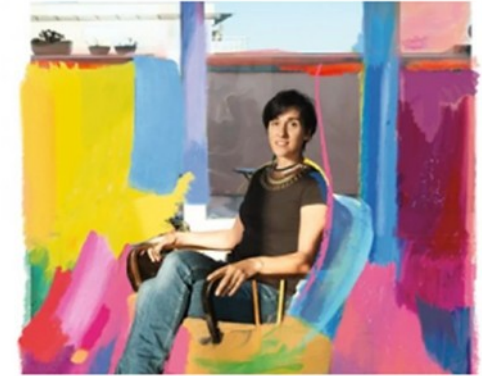
Die Schönheit der Gedanken: Fotini Markopoulou-Kalamara am Schreibtisch ihrer Wohnung in Kanada. In Physikerkreisen ist sie für die eleganten Visualisierungen ihrer Gedanken bekannt.



Ein Porträt der Physikerin als Strandmädchen in der Nähe Athens. Ihre griechische Heimat verließ sie mit 19, um in London zu studieren



Die meisten Mütter hätten ein Problem mit Filzstiften auf Türen. Aber Fotini Markopoulou-Kalamara schreibt sie selbst mit Formeln voll, wenn sie mit ihren Kollegen über physikalische Fragen diskutiert. Ihr Sohn wurde vor 20 Monaten in Berlin geboren.



WISSEN

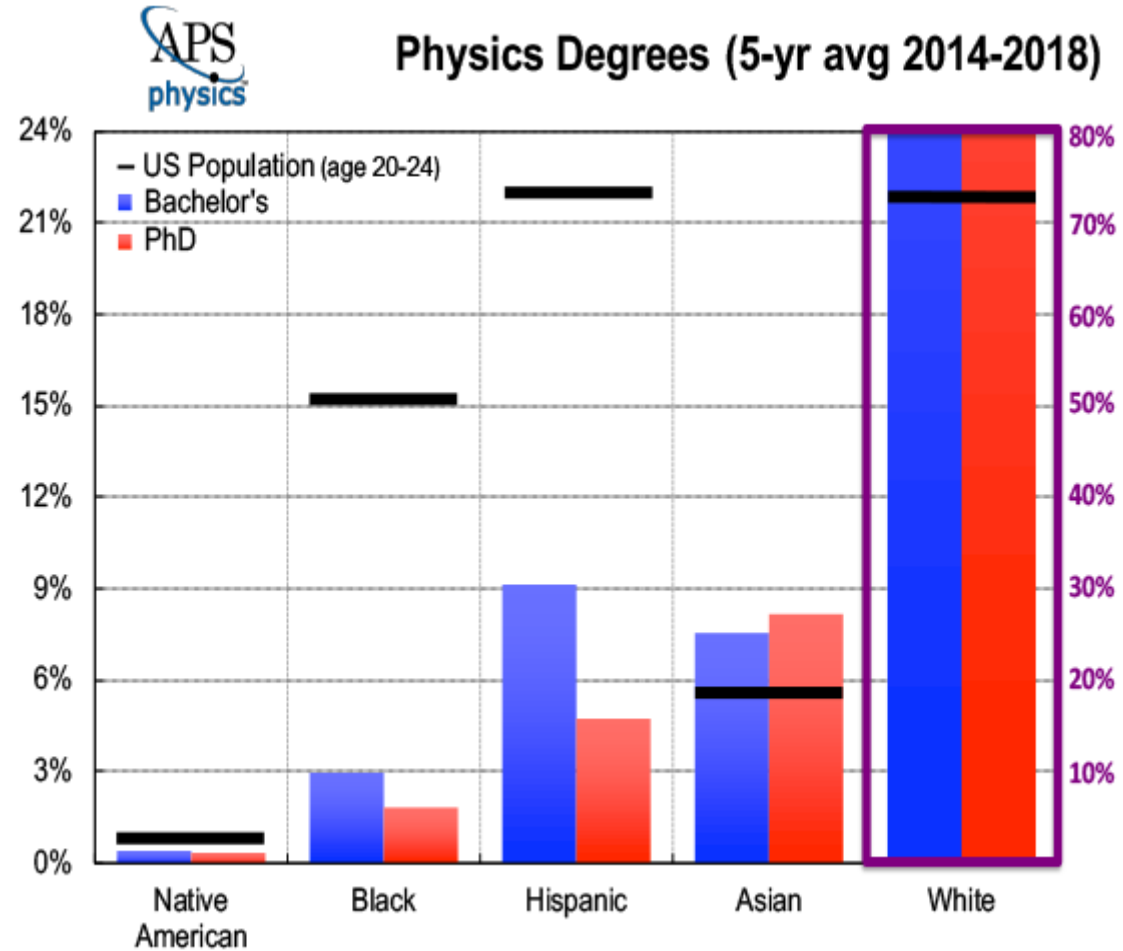
Die 40-jährige Fotini Markopoulou-Kalamara

»Physiker denken nicht über Gott nach, weil er ein wenig langweilig ist.« Ein Gespräch mit Deutschlands modernster Physikerin über den Hunger nach Erkenntnis und die Grenzen des Vorstellbaren.

Illustrations taken from: Peter Praschl (Interview): Die 40-jährige Fotini Markopoulou-Kalamara. Süddeutsche Zeitung Magazin. Nr. 10 vom 9. März 2012. Schwerpunktheft: Mit 20 hat man noch Träume, mit 100 erste recht. Zehn Jahrzehnte, zehn Gespräche. Fotos ebenda.

Raced Physics

- Physics Degrees by **Race/Ethnicity** (USA 2018)
- Native Americans, Black People and Hispanics in Physics



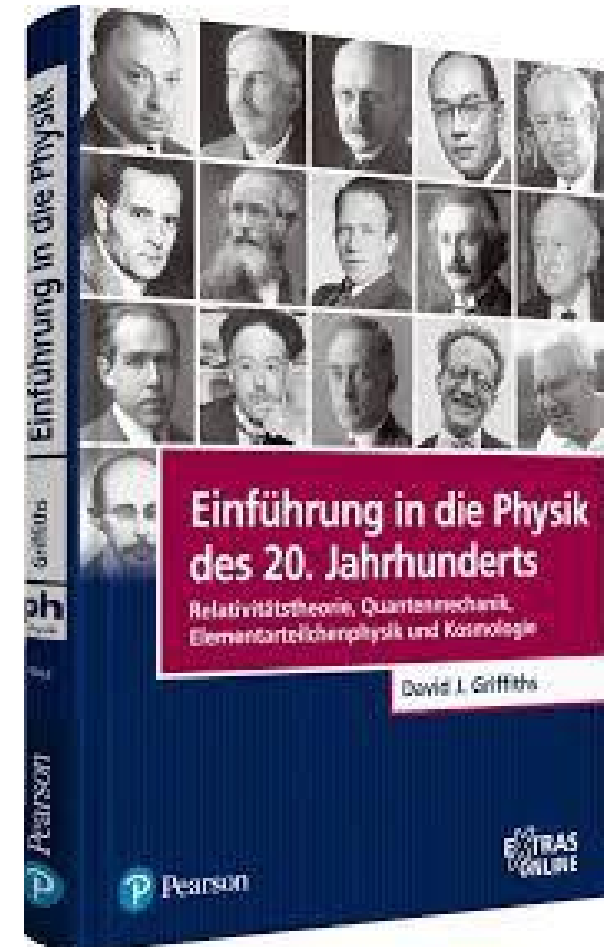
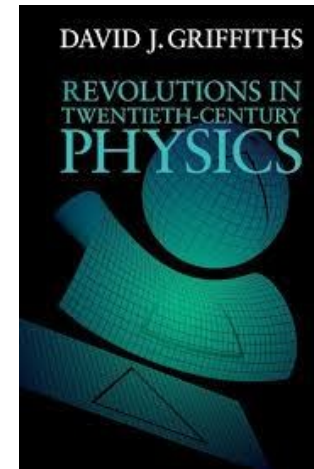
Source: IPEDS, US Census, and APS

<https://www.aps.org/programs/education/statistics/degreesbyrace.cfm>

Raced Physics

Science books

- Original (US-American version):
Revolutions in twentieth century physics
(*Cambridge University Press 2013*)
- German version:
Einführung in die Physik des 20. Jahrhunderts
(= Introduction to 20th century physics)
(*Pearson Deutschland GmbH 2015*)



Bookcover
Hideki Yukawa
among Western
male physicists

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Negotiating Equity in Physics (Teaching)

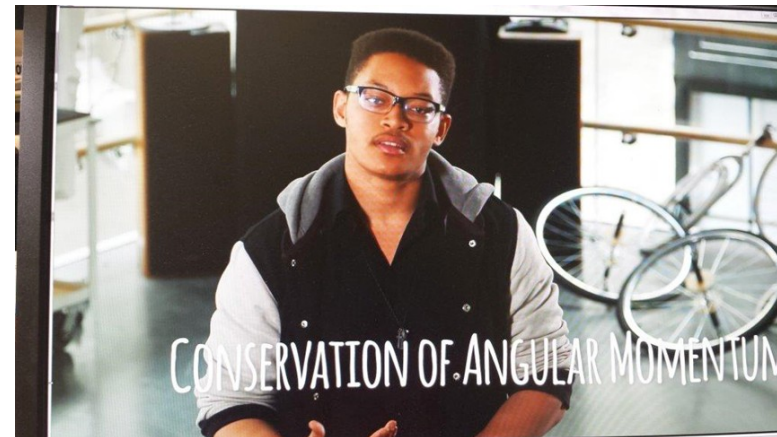
I make visible a greater diversity of past and present physicists with different gender, class affiliations, ethnic, cultural, national, or religious backgrounds to increase the picture of the appropriate physicist and to show role models to all of my students.



Michael Faraday, bookbinder



Émilie du Châtelet, noblewoman



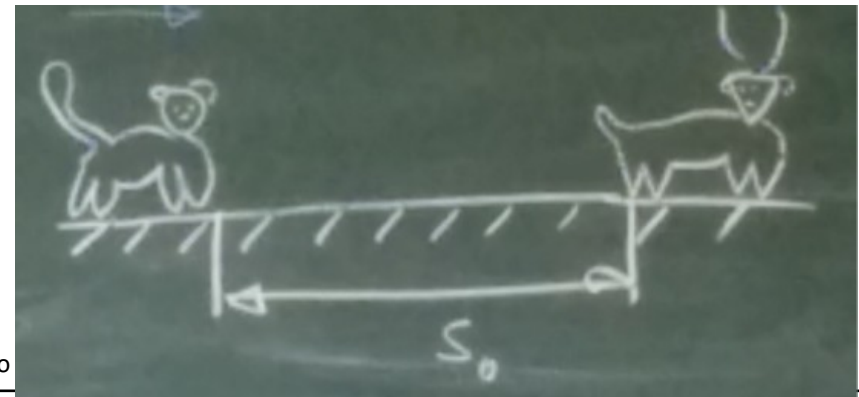
Ryan, teaching physics at MIT (*MITK12Videos*)

Ryan Robinson

Negotiating Equity in Physics (Teaching)

Reveal old fashioned narratives

- In a task on kinematics a lion is chasing after an antelope and the students calculate if the antelope will escape or be caught.
- The task explains kinematics. Moreover, it explains thinking patterns of physics.
- The students watch a short documentary about lionesses teaming up to hunt a zebra. Then we discuss how natural movement patterns such as acceleration and braking, change of direction, and the necessary teamwork of a pride hunting together end up as rectilinear and regular movements in the task.
- Furthermore, the students question the still prevailing cultural scripts of the lone hero and of active masculinity and passive (or overlooked) femininity in physics.



Own drawing and foto

Negotiating Equity in Physics (Teaching)

Make the familiar strange

- Physics in textbooks or lectures is mostly explained via male scientists, sportsmen, racing cars, weapons, and machines.
- Choosing “atypical” sports or genders for learning tasks challenges hegemonic presentations of physics and masculinity. It opens up a space for non-hegemonic masculinities and the reflection of normative examples.



Evgeny Plushenko, former Russian Figure Skater
https://figureskating.fandom.com/wiki/Evgeni_Plushenko?file=Evgeni_Plushenko.jpg

Negotiating Equity in Physics (Teaching)

Enact material-discursive change

- Demonstration of the Conservation of the Angular Momentum
- With both arms stretched out in a horizontal line, the moment of inertia (“shape”) is great and the angular acceleration of the rotation (“spin”) is slow. Keeping the weights close to the body, the mass moment of inertia is small and the angular acceleration increases.
- Use one heavy weight only, instead of two!



<http://www.phys.virginia.edu/LectureDemo/Manual/M13g.html>

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Equity in Physics- Conclusion

- ‘Not surprisingly, physics does an extremely good job at keeping people out’ (Anna Danielsson, 2022).
- Change is possible – and necessary – not only on the level of people in science. Change can and should go deeper. It is time for a change in the professional culture and for new narratives welcoming diversity in physics research and teaching.

References

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