

In Defense of Merit in Science: Supplemental Information

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S1. Examples of Postmodern and Critical Theory Rejection of Science, Reason, Logic, Objective Reality, Enlightenment

Our paper is not a review of these literatures, which are vast. What is presented here is not “representative” of anything except the *particular vein* of postmodern and critical theory thought that rejects science, reason, etc.

Source: Delgado, R. & Stefancic, J. (2001). *Critical race theory: An introduction*. NY: NYU Press. According to *Google Scholar*, this book was cited 14,723 times (as of 12/15/2022).

Select quotes:

For the critical race theorist, objective truth, like merit, does not exist, at least in social science and politics. In these realms, truth is a social construct created to suit the purposes of the dominant group.

[referring to CRT's future prospects]:

The narrative turn and storytelling scholarship seem well on their way toward acceptance, as does the critique of merit.

Critical race theory's contribution to the defense of affirmative action has consisted mainly of a determined attack on the idea of merit and standardized testing.

Merit [definition in Delgado & Stefancic, 2001]: Individual worthiness; critical race scholars question the view that people may be ranked by merit and that distribution of benefits is rational and just.

Source: *Encyclopedia Britannica*, <https://www.britannica.com/topic/postmodernism-philosophy>.

Select quotes:

postmodernism, also spelled **post-modernism**, in [Western philosophy](#), a late 20th-century movement characterized by broad [skepticism](#), subjectivism, or relativism; a general suspicion of [reason](#); and an [acute](#) sensitivity to the role of [ideology](#) in asserting and maintaining political and economic power.

[M]any of the doctrines characteristically associated with postmodernism can fairly be described as the straightforward denial of general philosophical viewpoints that were taken for granted during the 18th-century [Enlightenment](#) [including]:

1. There is an objective natural reality, a reality whose existence and properties are logically independent of human beings
2. The descriptive and explanatory statements of scientists and historians can, in principle, be objectively true or false. The postmodern denial of this viewpoint—which follows from the rejection of an objective natural reality—is sometimes expressed by saying that there is no such thing as Truth.
3. Through the use of reason and [logic](#), and with the more specialized tools provided by [science](#) and [technology](#), human beings are likely to change themselves and their societies for the better. It is reasonable to expect that future societies will be more humane, more just, more [enlightened](#), and more prosperous than they are now. Postmodernists deny this Enlightenment faith in science and technology as instruments of human progress.
4. Reason and logic are universally valid—i.e., their laws are the same for, or apply equally to, any thinker and any domain of knowledge. For postmodernists, reason and logic too are merely conceptual constructs and are therefore valid only within the established intellectual traditions in which they are used.

This means that the discourse of modern [science](#), when considered apart from the evidential standards internal to it, has no greater purchase on the [truth](#) than do [alternative](#) perspectives, including (for example) [astrology](#) and [witchcraft](#).

Source: Jones, K., and Okun, T. (2001). *White Supremacy Culture*. Retrieved from: https://www.whitesupremacyculture.info/uploads/4/3/5/7/43579015/okun_-_white_sup_culture_2020.pdf

This is some sort of handout, probably to be used in training or consciousness-raising sessions. Nonetheless, it not only seeks to distill core critical race theory ideas, it has been cited well over 100 times according to *Google Scholar* (quite an accomplishment for a handout). It is cited in articles and books with titles like: *Decolonizing Wealth, Towards intersectional and feminist participatory ML, Developing and reflecting on a Black disabilities pedagogy*.

Quotes:

White Supremacy Culture involves: perfectionism, urgency, belief that there is one right way to do things, individualism.

We note that no evidence was presented for any of this and that these can be viewed as pejorative terms for values related to merit in most cases. Modify perfectionism to “caring about doing something well,” “urgency” to “timely,” “belief that there is one right way” to “some ways really are better than others at accomplishing many things” and “individualism” to “taking personal responsibility and wanting credit due where credit was earned” and this critical analysis of “White Supremacy Culture” collapses.

Source: Tweets by Chandra Prescod-Weinstein, an award-winning physicist.



Source: Lyotard, J. F. (1984). *The postmodern condition: A report on knowledge*. University of Minnesota Press. According to *Google Scholar*, this book was cited 38,431 times (as of 12/15/2022).

Quotes:

Science has always been in conflict with narratives. Judged by the yardstick of science, the majority of them prove to be fables. But to the extent that science does not restrict

itself to stating useful regularities and seeks the truth, it is obliged to legitimate the rules of its own game. It then produces a discourse of legitimation with respect to its own status, a discourse called philosophy. I will use the term modern to designate any science that legitimates itself with reference to a meta-discourse of this kind making an explicit appeal to some grand narrative, such as the dialectics of Spirit, the hermeneutics of meaning, the emancipation of the rational or working subject, or the creation of wealth.

Simplifying to the extreme, I define postmodern as incredulity toward metanarratives.

Source: Sandel, M.J. (2020). *The Tyranny of Merit*, Picador, New York.

Proposed alternative to merit:

Of the 40,000-plus applicants, winnow out those who are unlikely to flourish at Harvard or Stanford, those who are not qualified to perform well and to contribute to the education of their fellow students. This would leave the admissions committee with, say, 30,000 qualified contenders, or 25,000, or 20,000.

Rather than engage in the exceedingly difficult and uncertain task of trying to predict who among them are the most surpassingly meritorious, choose the entering class by lottery.

S2. Examples of Feminist Perspectives That Embrace Objectivity, Empiricism, Science and Robust Discourse as Part of Truth-Seeking

Feminist scholarship is also vast, and our paper was not a review of it, or even of these sources. They are presented here as examples of feminist scholarship which, regardless of whatever other points they make, accept and embrace empiricism, objectivity, and free and robust social discourse on scientific issues.

Source: Harding, S. (1992). After the neutrality ideal: Science, politics and "strong objectivity." *Social Science Research*, 59, 567-587.

Quotes:

Thus standpoint [epistemological] approaches differ from interpretive ones. Because standpoint theory is persistently misread as a kind of "perspectivalism" that generates relativistic interpretations of nature and social relations, I shall risk repetition here. To start thought from marginal lives is not to take as incorrigible- as the irrefutable grounds for knowledge- what marginal people say or interpretations of their experiences. Listening carefully to what marginalized people say- with fairness, honesty, and detachment- and trying to understand their life worlds are crucial first steps in gaining less partial and distorted accounts of the entire social order; but these could not be the last step.

As the history of thought shows, thinkers who are not themselves members of marginalized groups can generate these accounts that maximize strong objectivity. John Stuart Mill was not a woman, though he produced one of the most powerful feminist analyses that begins thinking about social relations between the genders from the perspective of women's lives.

Source: Longino, H. (1990). *Science as social knowledge: Values and objectivity in scientific inquiry*. Princeton, N.J.: Princeton University Press.

Quotes:

The view of scientific knowledge and reason that I have developed and applied in this book turns out to be an empiricist one.

If scientific inquiry is to provide knowledge, rather than a random collection of opinions, there must be some way of minimizing the influence of subjective preferences and controlling the role of background assumptions.

...objectivity is analyzed as a function of community practices rather than as an attitude of individual researchers...

S3. Anything Can be Problematized, Some Examples

CSJ typically “problematizes” things in order to, supposedly, reveal the depths of white supremacy, Euro-colonial hegemony, patriarchy, etc. And it is certainly true that some practices can be identified that unambiguously reflect these (e.g., slavery, conquering non-European countries and establishing colonies, prohibiting women from voting).

However, CSJ advocates attempts to “problematize” things has reached fad status, and a reasonably intelligent person trained in CSJ can problematize anything. Like the boy who cried wolf, such analyses no longer deserve credibility. First, we just show how easy it is to “problematize” some trivial everyday events.

Dog-walking: Owning dogs while people live in abject poverty and are starving reflects the height of neo-liberal exploitation and the callous nature of hegemonic systems of inequality and injustice.

Saying to a friend as you meet them: “It’s a beautiful day today.” The problematizing response: “That is so racist. It may be beautiful to you, but to the Black men unjustly incarcerated at the hands of the American White supremacist criminal justice system it is just another day surrounded by stone walls and iron bars.”

Just in case one might be tempted to dismiss these examples as us creating an absurd strawman argument with which no advocate of CSJ would ever advance, we present these:

Calls to rename The Masters Golf Tournament and “master bedroom” because “master” is racist:

<https://www.theblaze.com/news/the-masters-name-change-racist>

<https://www.yahoo.com/now/from-master-bedrooms-to-blacklists-what-will-it-take-to-change-racist-terms-in-our-everyday-language-193858660.html>

Oxford students vote to replace clapping with silent “jazz hands” because clapping is ableist:

<https://www.thetimes.co.uk/article/oxford-students-vote-to-replace-clapping-with-silent-jazz-hands-w25dsspd0>

Ex-British Member of Parliament calls Kelloggs cereal Rice Crispies racist because the elves that appear on the box are White:

<https://www.bbc.com/news/uk-england-cambridgeshire-53060894>

A chemistry education paper (published by the American Chemical Society) presents a course (taught at East Carolina University) in which “Unit 3 explored the development and interrelationship between quantum mechanics, Marxist materialism, Afro-futurism/pessimism, and postcolonial nationalism. To problematize time as a linear social construct, the Copenhagen interpretation of the collapse of wave-particle duality was utilized.”

<https://pubs.acs.org/doi/full/10.1021/acs.jchemed.2c00293>

The Inclusivity Style Guide of the American Chemical Society recommends to avoid using words and expressions such as “double-blind studies,” “open our eyes,” “healthy weight,” “breastfeed,” “dark times,” “voodoo economics,” “black market,” “the New World,” “cakewalk,” “elders,” “champion,” and “other” (the latter in the context of forms collecting demographic information):

<https://www.acs.org/about/diversity/inclusivity-style-guide.html>

School of Social Work at the University of Southern California and the State of Michigan Department of Health and Human Services have banned the word “field” as racist and anti-immigrant (because slaves used to work in the fields):

<https://lawrencekrauss.substack.com/p/apparently-social-work-may-no-longer>

White people are racist if they speak up:

<https://www.washingtonpost.com/opinions/2020/06/03/best-white-statement-may-be-shut-up-listen/>

and they are racist if they stay silent:

<https://www.afsc.org/image/white-silence-violence>

This latter contradiction is trenchant because if the exact opposite behaviors can be “problematized” doing so is rendered completely meaningless.

We thank Andrew Doyle for compiling the sources some of which are mentioned in this list and posting them on Twitter. You can find many more like this here:

<https://twitter.com/TitaniaMcGrath/status/1281024006792060929>

S4. “Equitable Hiring”

A set of resources put together by the Rutgers Psychology Diversity and Climate Committee. They are presented here because, despite the use of social justice terms and framing, what these resources advocate is being alert to potential bias in order to engage in fully merit-based hiring. This can be seen in the repeated emphasis on maintaining the same standards for different applicants, which presumes the existence and value of having standards.

Social Area Graduate DCC Tip of the Month: November 2022

Hiring with Equity in Mind

This month's DCC tip highlights equitable hiring practices to keep in mind while attempting to build a more diverse, equitable, and inclusive program, lab, or department.

Create Consistency & Reduce Ambiguity

Consistency means keeping the same practices, assessments, and standards in place for each candidate. This way, deviations in performance can be attributed to the candidate rather than differences in the hiring process itself.

Consider which pieces of recruitment and hiring are kept consistent, which are variable, and why.

By critically evaluating hiring practices, we can identify inconsistencies that may lead to equity gaps.

Beware of ambiguity, which opens decisions to implicit bias.

How to reduce ambiguity:

- Create uniform and consistent hiring criteria or hiring rubrics utilized by the whole hiring committee
- Define success criteria to inform decisions when presented with multiple qualified candidates

Reconsider "Culture Fit"

"Culture fit" means alignment with an organization's values and mission, as well as the potential employee's ability to "fit in" with other members of the community.

Culture fit can lead to biased hiring and groupthink, hinder diversity, and reinforce existing biases.

Culture fit is often considered in hiring practices, but:

- Culture fit can never be clearly defined
- As a result, inconsistency and bias can color decisions made by considering "culture fit"
- Culture fit can also reduce organizational diversity by encouraging the hiring of others "like us"

Challenge First Impressions

We make first impressions based on dress, speech, personality traits, punctuality, and other factors.

All of these factors go through our own filters that represent our own values.

As a result, they can be subject to bias.

Challenge your first impressions by asking:

- Why do I believe people should dress or act in a certain way?
- Is my expectation something the potential employee may not know? How might someone else see the situation differently?
- What does this impression actually reflect about the potential employee's future performance?

Take Away Tips

1. Create and maintain consistent hiring practices, and be transparent about hiring criteria.
2. Beware of ambiguity, which can open decisions to bias.
3. Reflect on how "culture fit" criteria may reproduce homogeneity within your program or lab.
4. Second guess your first impressions! Consider how they may be colored by your own values, and how well they actually predict employee success.
5. Equitable practices require continual self-reflection. We're all in this together!

References to "Equitable Hiring" resources:

<https://www.aam-us.org/2021/08/25/what-does-a-truly-equitable-recruiting-process-look-like/>

https://horsley.yale.edu/sites/default/files/files/IB_Strategies_033012.pdf

<https://www.iasp-pain.org/publications/relief-news/article/race-bias-and-ambiguity/>

<https://www.hbs.edu/recruiting/insights-and-advice/blog/post/actively-addressing-unconscious-bias-in-recruiting>

<https://hbr.org/2019/06/how-to-reduce-personal-bias-when-hiring>

<https://www.managementcenter.org/article/mitigate-bias-in-hiring-with-a-simple-rubric/>

<https://www.forbes.com/sites/paulspiegelman/2021/03/01/is-hiring-for-culture-fit-perpetuating-bias/?sh=253cebeb55e8>

<https://www.shanesnow.com/teamwork/culture-add>

<https://insight.kellogg.northwestern.edu/article/cultural-fit-discrimination>

https://www.umass.edu/employmentequity/sites/default/files/What_Works.pdf

S5. Biographical Sketches of the Authors

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Dorian Abbot is an Associate Professor of the Geophysical Sciences at the University of Chicago. He received his AB in Physics and PhD in Applied Mathematics from Harvard. He uses mathematical and computational models to understand and explain fundamental problems in Earth and Planetary Sciences. He has worked on problems related to climate, paleoclimate, planetary habitability, planetary dynamics, and exoplanets.

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Andreas Bikfalvi was born in Hungary and raised in Germany, and has French and German citizenship. He is a trained MD, PhD. After obtaining his medical degree in France, he completed a residency in hematology and oncology at the University of Kiel (Germany). He earned a PhD at INSERM in Paris followed by two post-doctorates In Paris and New York (NYU Medical Center). He then joined the University of Bordeaux as a Professor of Cell and Molecular Biology and created there a laboratory, which evolved into a department and which he headed from 2000-2021. Since 2000, Bikfalvi's laboratory has been affiliated with the French National Institute of Health (INSERM). During his career, he pursued two main research themes, tumor and vascular biology, and this in a basic and translational research perspective. In the tumor biology field, his laboratory's primary focus are malignant brain tumors and renal cell

carcinoma. In the vascular biology field, his laboratory is working on the regulation of vascular development and on artificial vascular systems. He developed unique *in vitro* and *ex vivo* models allowing large-scale genomic approaches and he also focused on mechanistic studies involving the identification of the key players. Bikfalvi won several awards (Cancer Research Award from the French Academy of Medicine) as well as 2 book awards, and he is a senior Member of The “Institut Universitaire de France” (IUF).

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April Bleske-Rechek is a Professor of Psychology at the University of Wisconsin–Eau Claire (UWEC). Bleske-Rechek received her PhD from the University of Texas at Austin. Following two years as a research associate at Vanderbilt University in Nashville, Tennessee, she joined UWEC’s psychology department in 2003, where she directs the Individual Differences and Evolutionary Psychology lab. Bleske-Rechek’s research is focused on scientific reasoning and evolutionary analyses of individual and group differences in abilities, interests, and personality.

Walter Bodmer, Professor of Genetics, Department of Oncology, Medical Sciences Division, Hertford College, University of Oxford; <https://orcid.org/0000-0001-6244-9792>; walter.bodmer@hertford.ox.ac.uk



Sir Walter Bodmer is Professor of Genetics in the Department of Oncology at Hertford College, University of Oxford. Bodmer was born in Frankfurt, Germany, but in 1938, at the age of two-and-a-half, he and his family fled the Nazis and settled in Manchester, England. Following his BA in mathematics he did his PhD in population genetics under Sir Ronald Fisher at Cambridge University and then post-doctoral work in molecular biology under Joshua Lederberg at Stanford. From 1962 until 1970, he served on the faculty of the Genetics Department in the Stanford University Medical School, attaining the rank of Full Professor. In 1970, he returned to England to become Professor of Genetics at Oxford University. In 1979, he became Director of Research, and later Director General, of the Imperial Cancer Research Fund. He was Principal of Hertford College Oxford from 1996 to 2005. In 1974 he was elected a Fellow of the Royal Society; an International Member of the US National Academy of Sciences in 1981, and knighted in 1986. In 2013, he was awarded a Royal Medal from the Royal Society for seminal contributions to population genetics, gene mapping and understanding of familial genetic disease.

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Peter Boghossian is a Founding Faculty member at the University of Austin, Texas, a founder of and advisor to the Foundation Against Intolerance & Racism (FAIR), and the director of the National Progress Alliance. Boghossian has a teaching pedigree spanning more than 25 years that focuses on the Socratic method, scientific skepticism, and critical thinking. Boghossian's dissertation explored increasing the moral reasoning of prison inmates and aiding their desistance from crime. Boghossian's most recent book is *How to Have Impossible Conversations*, and his writing can be found in *The New York Times*, *The Wall Street Journal*, *The Philosophers' Magazine*, *Scientific American*, *Time Magazine*, *Skeptic*, *National Review*, and elsewhere. His work is centered on bringing the tools of professional philosophers to a wide variety of contexts to help people think through what seem to be intractable problems.

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Joseph Ciccolini, PharmD PhD is a Full Professor of Pharmacokinetics at Aix Marseille University and Clinical Pharmacologist at La Timone University Hospital of Marseille, France. He is a group leader at the SMARTc platform in Pharmacokinetics and also a group leader at the COMPO research unit (Cancer Research Center of Marseille, Inserm U1068). Ciccolini currently chairs the Digipharm Master Degree program dedicated to Digital Tools in Pharmaceutical Sciences at Aix Marseille University. His expertise in clinics is mostly based on controlling the pharmacokinetics variability of anticancer agents, ranging from canonical cytotoxics or oral targeted therapies to the most-advanced biotherapies such as immune-oncology drugs. He has contributed to the development of adaptive dosing strategies, such as pharmacogenetic-based dosing algorithms, to secure the administration of several anticancer agents. Ciccolini has been the principal or co-principal investigator of several clinical trials investigating the

pharmacokinetics, pharmacodynamics, and pharmacogenetics of a variety of anticancer drugs. He has co-authored more than 150 international papers in both experimental and clinical pharmacokinetics and owns several patents in the field. He is the current Secretary of the PAMM-EORTC European group dedicated to promoting pharmacokinetics, pharmacodynamics, and pharmacometrics in oncology. In a parallel life, Ciccolini is a bee-keeper and honey-maker in Corsica, France.

Jerry Coyne, Professor Emeritus, Department of Ecology and Evolution, University of Chicago, Chicago, Illinois, USA



Jerry Coyne is Professor Emeritus in the Department of Ecology and Evolution at the University of Chicago. His scientific work is on the genetics of species formation, the problem raised (but not solved) by Darwin in *On the Origin of Species*. Besides more than 125 scientific papers, Jerry has written a scholarly book about his research area (*Speciation*) and two popular books, *Why Evolution is True* (a New York Times bestseller) and *Faith versus Fact: Why Science and Religion are Incompatible*. He's also written more than 160 popular articles and book reviews in places like *The New York Times*, *The Washington Post*, *The New Republic*, *The Times Literary Supplement*, *The Guardian*, *Slate*, and *The Nation*. He is an elected member of the American Academy of Arts and Sciences and a recipient of the 2011 "Emperor Has No Clothes" Award from the Freedom from Religion Foundation as well as the 2015 Richard Dawkins Award for his defense of evolutionary biology. Coyne's blog, *Why Evolution is True*, has more than 73,000 subscribers, and discusses not only the latest research in evolutionary biology, but also a variety of unrelated issues, including philosophy, politics, food, and cats.

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Jürgen Gauss is professor for theoretical chemistry at the Johannes Gutenberg-Universität Mainz in Germany. He was born and educated in Germany and received his diploma and PhD from the Universität zu Köln. After postdoctoral stays with Eric J. Heller at the University of Washington in Seattle and Rodney J. Bartlett at the University of Florida in Gainesville, he completed his habilitation at the Universität Karlsruhe under the guidance of Reinhart Ahlrichs, before moving as a professor to the Johannes Gutenberg-Universität Mainz. His research deals with the development and application of high-accuracy quantum-chemical methods and, together with John F. Stanton, he is one of the principal authors of the generally available *CFOUR* Program package for quantum-chemical calculations. Among the prizes he received are the medal of the International Academy of Quantum Molecular Science and the Gottfried Wilhelm Leibniz prize of the Deutsche Forschungsgemeinschaft. Gauss is an elected member of the International Academy of Quantum Molecular Science and of the Norwegian Academy of Sciences and Letters. Currently, he serves as a chair of the department of chemistry at the Johannes Gutenberg-Universität Mainz.

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Peter Gill is the Schofield Professor of Chemistry at the University of Sydney in Australia. He was born and educated in New Zealand, receiving his BSc and MSc from the University of Auckland. He obtained his PhD from the Australian National University in Canberra and then did a postdoc with the future Nobel laureate, John Pople at Carnegie Mellon University in Pittsburgh. He subsequently held academic positions at Massey University, the University of

Cambridge, the University of Nottingham and the Australian National University before moving to Sydney. His research is concerned primarily with the development of new ways to solve the Schrödinger equation for molecules and he founded the international Q-Chem software collaboration. He has received the Dirac and Schrödinger medals from WATOC, the Pople and Fukui medals from APATCC, and the Craig Medal from the Australian Academy of Science. He is an elected member of the International Academy of Quantum Molecular Science and a fellow of the Australian Academy of Science. He is currently the president of WATOC.

Svetlana Jitomirskaya, Elaine M. Hubbard Chair, Department of Mathematics, Georgia Institute of Technology, Atlanta, Georgia, USA, and Distinguished Professor of Mathematics, University of California–Irvine, Irvine, California, USA; szhitomi@uci.edu



Svetlana Jitomirskaya was born and raised in Kharkiv, Ukraine, and received her MS and PhD degrees at Moscow State University. Upon obtaining her PhD in 1991, she joined the faculty at UC Irvine, originally as a part-time lecturer. She was appointed as a tenure-track assistant professor there in 1994, and rose through the ranks to her current position of Distinguished Professor of Mathematics. As of July 2022, she will concurrently serve as the inaugural Elaine M. Hubbard Chair at the Georgia Institute of Technology. Jitomirskaya studies various mathematical aspects of the spectral theory of Schrödinger operators. She has contributed to solutions of several long-standing open problems. Jitomirskaya is a member of the American Academy of Arts & Sciences and the National Academy of Sciences. She has received the AMS Ruth Lyttle Satter prize, the APS and AIP Dannie Heinemann prize in mathematical physics, and will be a plenary speaker at the 2022 the International Congress of Mathematics.

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Lee Jussim is Distinguished Professor of Psychology at Rutgers University, where he recently completed his second term as Department Chair. He has published over 100 articles and chapters and six books with a seventh, on best practices in the behavioral sciences, forthcoming. His scholarship addresses stereotypes, prejudice, expectancy effects and accuracy; how dysfunctional academic norms in everything from peer review to methods to political biases threaten the validity of much work produced by the social sciences; and, more recently, radicalization in academia and the wider society. His book, *Social Perception and Social Reality*, contested the psychological canon that social perception was mostly bias, and received the American Publishers Award for best book in Psychology in 2012. He is a founding member of the Heterodox Academy and the Academic Freedom Alliance. He is in the process of founding the Society for Open Inquiry in the Behavioral Sciences, which aspires to be an antidote to the denunciatory, censorious turn in academia. Visits to his Psychology Today blog, Rabble Rouser, recently exceeded a cool million.

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Anna Krylov is a Professor of Chemistry at the University of Southern California. Born and raised in the USSR, Krylov received her M.Sc. from Moscow State University and her Ph.D. from the Hebrew University in Jerusalem. Following postdoctoral training at the University of California, Berkeley, she joined USC's chemistry department in 1998. Krylov's research is focused on theoretical and computational quantum chemistry. She develops theoretical models

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Glenn C. Loury is Merton P. Stoltz Professor of Economics at Brown University. He holds the B.A. in Mathematics (Northwestern) and the Ph.D. in Economics (MIT). As an economic theorist he has published widely and lectured throughout the world on his research. He is also among America's leading critics writing on racial inequality. He has been elected as a Distinguished Fellow of the American Economics Association, as a Member of the American Philosophical Society and of the U.S. Council on Foreign Relations, and as a Fellow of the Econometric Society and of the American Academy of Arts and Sciences.

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Luana Maroja is Professor of Biology at Williams College, MA. Born and raised in Brazil, Maroja received her MSc from the University of Rio de Janeiro, Brazil and her PhD from Cornell University, USA. Following postdoctoral training at the University of Cambridge, UK, she joined Williams College Biology department in 2010. Maroja's research is focused on population genetics and speciation. She studies hybrid zones and investigates gene flow across species and in the species barriers that maintain species isolation.

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John McWhorter teaches linguistics, American Studies and music history at Columbia University, writes twice weekly for The New York Times, and hosts the linguistics podcast *Lexicon Valley*. He has written over twenty books, including last year's *Nine Nasty Words* and *Woke Racism*, as well as *Losing the Race*, *Our Magnificent Bastard Tongue*, *Words on the Move*, and *The Language Hoax*. He has authored several courses on linguistics and language for the Great Courses company, and has also written regularly for *Time*, *The New Republic*, and *The Atlantic*.

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Sadredin (Dean) Moosavi is a contingent faculty member of Earth Science at Rochester Community Technical College. He received his MS and PhD in Earth Science with a Specialization in Geochemical Systems from the University of New Hampshire in 1998. His biogeochemistry work focused on controls on methane production and oxidation in boreal and arctic ecosystems along with geomorphological studies studying the effects of hurricanes and the BP oil spill on coastal erosion of barrier islands. As a geoscience educator Dr. Moosavi has worked on improving public understanding of the geosciences by focusing on preparation of pre and in-service science teachers and work with undergraduate students using place-based educational techniques. He has worked across the educational spectrum from professional societies (Geological Society of America), a public high school (Oyster River, Durham, NH) to community colleges (Rochester Community Technical College), comprehensive undergraduate institutions (Minnesota State University Mankato), selective liberal arts colleges (Gustavus Adolphus), and tier one research universities (Tulane University).

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Patricia Nayna Schwerdtle is a global public health academic who is completing her PhD in the Faculty of Medicine at the Heidelberg Institute of Global Health, Heidelberg University,

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Judea Pearl is chancellor professor of computer science and statistics at UCLA, where he directs the Cognitive Systems Laboratory and conducts research in artificial intelligence, human cognition, and philosophy of science.

He has authored three fundamental books, *Heuristics* (1984), *Probabilistic Reasoning in Intelligent Systems* (1988), and *Causality* (2000, 2009). More recently, he co-authored *The Book of Why* (2018, with Dana Mackenzie), which brings causal analysis to a general audience.

Pearl is a member of the National Academy of Sciences and the National Academy of Engineering. In 2011 he won Technion's Harvey Prize and the ACM's A.M. Turing Award "for fundamental contributions to artificial intelligence through the development of a calculus for probabilistic and causal reasoning." In 2022 he won a BBVA Foundation Frontiers of Knowledge Award for "laying the foundations of modern artificial intelligence."

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Marisol Quintanilla-Tornel is an assistant professor of nematology at Michigan State University. She grew up on a family farm in Chile that produces table grapes and diverse other crops, and received her master's and doctoral degrees at Michigan State University. Marisol's research interest is finding applied solutions to plant parasitic nematodes in field, vegetable, fruit, and ornamental crops.

H. Fritz Schaefer III, Graham Perdue Professor of Chemistry and Director of the Center for Computational Quantum Chemistry, University of Georgia, Athens, Georgia, USA



H. Fritz Schaefer III is the Graham Perdue Professor of Chemistry and Director of the Center for Computational Quantum Chemistry at the University of Georgia. Born in Grand Rapids, Michigan, USA, Schaefer received a BS degree in chemical physics from the MIT and a PhD degree in chemical physics from Stanford University. Prior to joining the University of Georgia, he served as a professor of chemistry at the University of California, Berkeley and as the Wilfred T. Doherty Professor of Chemistry at the University of Texas, Austin, where he was also the inaugural Director of the Institute for Theoretical Chemistry. Professor Schaefer's research involves the use of state-of-the-art computational hardware and theoretical methods to solve important problems in molecular quantum mechanics. One of the world's most highly cited scientists, Schaefer is the author of more than 1700 scientific publications. Professor Schaefer's major awards include the American Chemical Society's Award in Pure Chemistry, Award in Theoretical Chemistry, Leo Hendrik Baekeland Award, Ira Remsen Award, and Peter Debye Award in Physical Chemistry; the Schrödinger Medal; the Centenary Medal of the Royal Society of Chemistry; the Gold Medal of the American Institute of Chemists; the Joseph O. Hirschfelder Prize of the University of Wisconsin; the Ide P. Trotter Prize of Texas A&M University; an Alexander von Humboldt Award; the SURA Distinguished Scientist Award; and the Chemical Pioneer Award of the American Institute of Chemists. He is a Fellow of the American Academy

of Arts and Sciences, the Royal Society of Chemistry, the American Chemical Society, the Alfred P. Sloan Foundation, the John S. Guggenheim Foundation, the American Physical Society, and the American Association for the Advancement of Science; an Honorary Fellow of the Chemical Research Society of India; and the recipient of 31 honorary degrees. Schaefer served as Editor-in-Chief of the London-based journal *Molecular Physics* for ten years. He is currently Associate Editor for the journal *Physical Chemistry Chemical Physics*. He was also the longest serving President of the World Association of Theoretical and Computational Chemists.

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Peter R. Schreiner studied chemistry in his native city at the University of Erlangen-Nürnberg, Germany, where he received his Dr. rer. nat. in Organic Chemistry. Shortly thereafter, he obtained a PhD in Computational Chemistry from the University of Georgia, USA. He became head of the institute in Giessen in 2002. His research interests include organic reaction dynamics and reactive intermediates, quantum mechanical tunneling as well as London dispersion interactions as probed in the realm of nanodiamonds and organocatalysis. Schreiner is an elected member of the Leopoldina–German National Academy of Sciences, the North Rhine-Westphalian Academy of Sciences, Humanities, and the Arts, the Academy of Science and Literature (Mainz), and is a Fellow of the Royal Society of Chemistry. He received the Dirac Medal (2003), the Adolf-von-Baeyer Memorial Award of the German Chemical Society in 2017, the RSC Award in Physical Organic Chemistry of the RSC in 2019, the Academy Award of the Berlin-Brandenburg Academy of Science in 2020, and the ACS Arthur C. Cope Scholar Award 2021. He has been a visiting professor at the CNRS in Bordeaux, the Technion in Haifa, the Australian National University in Canberra, and the University of Florida in Gainesville. Schreiner is Editor-in-Chief of *Wires Computational Molecular Science*, an Editor of the *Journal of Computational Chemistry*, and Associate Editor of the *Beilstein Journal of Organic Chemistry*.

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Peter Schwerdtfeger took his first degree in Chemical Engineering (Aalen), and studied both chemistry and mathematics at Stuttgart University where he received his PhD. He habilitated at Marburg University, held a position as a software analyst at Stuttgart University before receiving a Feodor-Lynen fellowship of the Alexander von Humboldt Foundation to join Auckland University and the ANU (Canberra). He has been a member of staff at Massey as a Professor for 18 years. During this time, he has earned many awards, amongst them the Prince & Princess of Wales Science Award, the Hector medal, Memberships of the Royal Society New Zealand, the International Academy of Quantum Molecular Science and the Finnish Academy of Science and Letters, a James Cook Fellowship, the Humboldt Research Prize, the Fukui Medal, the Rutherford Medal, and most recently the Dan Walls Medal in physics. He has served on numerous research and management committees, international societies and editorial boards. His current research interest is in fundamental chemistry and physics including special relativity, quantum mechanics and quantum field theory. Hobbies include classical music, literature and philosophy, and university politics (believe it or not).

Dan Shechtman, Nobel laureate, The Technion–Israel Institute of Technology, Haifa, Israel; Department of Materials Science and Engineering, College of Engineering, Iowa State University, Iowa, USA



Dan Shechtman received his doctorate at the Technion–Israel Institute of Technology in Haifa in 1972. Following three years of post-doctoral work in the USA, he returned to his Alma Mater and recently retired as distinguished professor. He was awarded, alone, the 2011 Nobel Prize in Chemistry for the discovery of quasicrystals. Shechtman's at-first-controversial discovery of quasicrystals and quasi-periodicity in 1982 fundamentally changed the way scientists look at

solid matter—it caused a paradigm shift in crystallography. A crystal structure of quasicrystals had, until then, been considered impossible. The Royal Swedish Academy of Sciences awarded Shechtman the Nobel Prize for the creation of a new cross-disciplinary branch of science, which enriched chemistry, physics and mathematics. Shechtman’s current research efforts center on development of magnesium alloys for a variety of applications. Shechtman is also involved in educational projects. At the Technion he initiated and taught a class in technological entrepreneurship beginning in 1987. More than 10,000 engineers and scientists in Israel have taken part in this famous program. He also founded a scientific program for 5-year-old children and since 2011 he has promoted scientific education worldwide. Each year, he delivers almost 100 lectures about his discovery of quasicrystals, as well as about the importance of science for society, the significance of education, and the importance of technological entrepreneurship for wellbeing and peace in the world. Shechtman is a member of several science academies and an honorary member of various professional associations around the world. Besides the Nobel Prize, he has received other prestigious awards including the Wolf Prize in Physics, the Gregori Aminoff Prize of the Royal Swedish Academy of Sciences, and the EMRS Award (European Materials Research Society).

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Mikhail Shifman is the Ida Cohen Fine Professor of Theoretical Physics at William I. Fine Theoretical Physics Institute, University of Minnesota. Born in 1949 in Riga, Latvia (then the USSR), he received his education in Moscow. He is the author of over 400 papers in all areas of high-energy physics — some of them are among the most cited in the field. He carried out breakthrough research in Yang-Mills theories at strong coupling, including the first exact results in supersymmetry, discovered the penguin mechanism of flavor-changing weak decays and suggested invisible axions. In 2016 he was awarded the Dirac Medal for achievements in Theoretical Physics. Since 2018 Shifman is a member of the US National Academy of Sciences. Recently, Shifman authored a number of textbooks on QFT and books on history of quantum science between two wars (e.g. *George Placzek: A Nuclear Physicist's Odyssey*, 2018).

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Jay Tanzman is a freelance statistician working in the areas of biomedicine and the social sciences. He has designed and analyzed clinical and field trials in such diverse areas as cardiac medicine, dentistry, human nutrition, and education. He has also worked with prominent experimental psychologists to critically examine the statistical practices used in their field. The collaboration's highly cited discovery of widespread systematic statistical errors in psychology articles in the journal *Science* led to increased emphasis on reproducibility in experimental psychology and to greater analytical rigor in the field.

Bernhardt L. Trout, the Raymond F. Baddour, ScD, (1949) Professor of Chemical Engineering, Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA; <https://orcid.org/0000-0003-1417-9470>; trout@mit.edu; <http://web.mit.edu/troutgroup/>



Bernhardt L. Trout is the Raymond F. Baddour, ScD, (1949) Professor of Chemical Engineering at MIT. He received his SB and SM degrees from MIT and his PhD from the University of California at Berkeley. In addition, he performed post-doctoral research at the Max-Planck Institute. Trout's research focuses on the development of advanced manufacturing processes and rational tools for formulation and product design, primarily liquid formulations, but also lyophilized formulations. A major aspect of his research focuses on developing both microscopic and macroscopic models to design stable formulations efficiently. In 2007, with several colleagues from MIT, he set up the Novartis-MIT Center for Continuous Manufacturing with the objective of transforming pharmaceutical manufacturing. Among other outputs, this led in 2011 to the first end-to-end fully integrated and automated pharmaceutical process (bench scale). He was also Co-Chair of the Singapore-MIT Alliance Program on Chemical and Pharmaceutical Engineering. In addition to Novartis, he has worked with many other pharmaceutical companies in research or consulting. He has also developed a host of computational methods for the design of biologics products taking into account developability and manufacturability and continues to work in the field of continuous manufacturing. He

recently started a project with the FDA on a continuous lyophilization process. In addition, he is Co-Chair of the International Symposium on Continuous Manufacturing of Pharmaceuticals. He has published over 200 papers and has 18 patents issued or pending.

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Arieh Warshel is a Distinguished Professor of Chemistry and Biochemistry at the University of Southern California, where he holds the Dana and David Dornsife Chair in Chemistry. Prof. Warshel pioneered the field of computational enzymology, being the driving force behind the development of computer simulations of the functions of biological systems that have allowed scientists to understand how life processes operate on the protein level. Marrying classical and quantum mechanics, he and colleagues Martin Karplus and Michael Levitt received the Nobel Prize for developing powerful computer models that researchers use to understand complex chemical interactions and create new drugs. Warshel was born in Kibbutz Sde-Nahom in Israel and earned his Summa Cum Laude BSc in chemistry from the Technion in 1966. He went on to earn his master's and doctoral degrees from the Weizmann Institute of Science, where he was a senior scientist and associated professor as well as an EMBO fellow at the MRC in Cambridge England, before joining the University of Southern California in 1976. He is a member of the National Academy of Science, an Honorary Fellow of the Royal Society of Chemistry, and a Fellow of the American Association for the Advancement of Science. He is also a foreign member of the Russian Academy of Science. Warshel's numerous awards include the Tolman Medal, the RSC's Soft Matter and Biophysical Chemistry Award, and the Biophysical Society's Founders Award. He has received honorary doctorates from the Technion, Bar Ilan University, the University of Uppsala, Lodz University, and the Chinese University of Hong Kong.

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James West is a professor of medicine in the division of allergy, pulmonary, and critical care medicine. He spent his early life in South America (his first language was Spanish), Europe, and the Middle East, before moving to the U.S. permanently as a teenager. He received his PhD degree (in condensed matter physics) from the Georgia Institute of Technology. His research interests include pulmonary vascular disease, lung fibrosis, and heart fibrosis and failure, using a combination of cell culture, mouse models, and patients. He also is involved in several projects in improving livestock health.