December 2021

MISOGYNY'S COLD SHOULDER

In "Women on Ice" [Observatory], Naomi Oreskes describes how she applied to a geologist position at the British Antarctic Survey (BAS) in 1981 and was rejected because she was a woman. I applied to the BAS in 1972, when they were looking for meteorological observers. I received a response similar to Oreskes's. There was no mention of tents, but the letter essentially said, "It is not that we are misogynists, but we do not have facilities for women." Ah, well. I went off and did something else!

Christine Vibert *Jersey, British Isles*

I continue to be angered by the ways women in science are treated. I am reminded of a former student's experience with her male high school guidance counselor: When she told him she intended to study biochemistry at a university and then head to medical school to pursue a career in research, he shrugged and asked, "Wouldn't it just be easier to be a nurse?" Although I teach in the humanities, I will forever champion young women in whatever direction their dreams take them. I heard from my former student several years later: she was preparing to graduate from medical school and to receive a Ph.D. in biochemistry.

Virgil Miller
Madison Area Technical College

AI AND PREJUDICE

I became concerned when reading "Spying on Your Emotions," John McQuaid's article on companies using artificial intelligence to analyze people's feelings. As an autistic person, I am hyperaware of the discrimination autistic individuals face in the workforce for what are, in essence, cultural differences between them and their neurotypical counterparts. The emotion-reading technology described sounds like it will reinforce the deep, if often unconscious, prejudices against autistic people that already exist.

Lack of eye contact is a common autistic trait that most neurotypical people believe indicates a lack of trustworthiness. The article did not allay my concerns when researcher Rosalind Picard related an anecdote about a colleague who disagreed with her and, to illustrate cluelessness, said that person "looked at my feet the whole time."

Michael A. Levine *via e-mail*

"I continue to be angered by the ways women in science are treated."

VIRGIL MILLER
MADISON AREA TECHNICAL COLLEGE

MERGING GALAXIES

"Cosmic Crashes," by Aaron S. Evans and Lee Armus, shows a simulation of the Milky Way and Andromeda colliding. No mention is made of dark matter, but it must have a significant effect on the dynamics of galaxy mergers. Do we know enough about it to make such detailed merger models?

Paul Colbourne *Ottawa*

Until now, I had not considered that galactic "collisions" only minimally involve component stars. As Evans and Armus explain, "most stars just pass right by one another during the event." I'm curious about those other poor stars that don't simply pass by. What effect do they have on the event?

Philip Jan Rothstein *Brookfield, Conn.*

THE AUTHORS REPLY: To answer Colbourne: There is still a lot about dark matter that is unknown, but it is thought that galaxies are surrounded by dark matter halos that explain the motion of their stars and of galaxies in groups and clusters. Dark matter makes up the vast majority of all matter but reveals itself only through gravity. Merger models routinely incorporate simple models of dark matter distribution, which greatly improves their ability to reproduce observed properties of galactic mergers, for example, by absorbing much of the orbital energy during the collision.

Regarding Rothstein's question: Stars are powered by fusion reactions in their core. The sun derives its energy by fusing hydrogen into helium. Stellar collisions can increase the mass of the remnant star, and more massive stars burn brighter and hotter, producing more energy. This happens in dense stellar clusters and could also be enhanced in a galactic merger. Yet these rare collisions would be energetically insignificant, compared with the energy generated by the nuclear starburst—or by a rapidly accreting supermassive black hole that just received a supply of fuel from the galactic merger. Both phenomena can easily surpass 100 billion times the sun's luminosity.

WORKING GROUP NEEDED

In "IPCC, Your Job Is Partly Done" [Observatory, November 2021], Naomi Oreskes calls for the closure of the physical science Working Group I (WGI) of the Intergovernmental Panel on Climate Change (IPCC). She argues that because human influence on global temperature is now clear, WGI's job is finished. We could not disagree more.

The world has just been surprised by a series of extreme climate events. Quantifying the human role in global heating is the beginning rather than the end of evaluating current and future risks to communities. The physical science evaluation of those risks is a cornerstone for societal action.

The IPCC's primary function is the assessment of scientific information that is sorely needed to make progress within the international United Nations Framework Convention on Climate Change (UNFCCC) and its policy instruments, particularly the Paris Agreement. Closing WGI would be a serious mistake and counterproductive in confronting the problem for three reasons.

First, attribution studies have evolved from global indicators to regional and local extreme climate events. These findings are extremely relevant to policy in the discussion of loss and damages at the level of the UNFCCC and beyond. Second, emerging ki-

lometer-scale global and regional climate models have not yet been assessed, but they are a prerequisite for the next generation of the WGI Interactive Atlas on regional climate change, a key instrument for policy makers. Third, quantifiable information to evaluate adaptation and mitigation options requires the combination of physical and impact models. If vulnerable countries ask, for example, how their water resources will change in the coming decades, only carefully evaluated climate model information can deliver the key numbers on which policies should be based. The presence of a WGI community within the IPCC, providing this basis, remains indispensable for Working Groups II and III to fulfill their tasks.

The burden on the WGI scientists should indeed be reduced so that they can focus on the physical understanding needed to best support these policy needs with confidence. In our view, the problem is the proliferation of scenarios and the expectation that they be used with the latest and most expensive climate models. Since the fourth IPCC assessment cycle, this has created an unnecessary spiral in which valuable resources have been wasted. But comprehensive scientific assessments, including the physical science basis, will continue to clarify and inform and help to build the political will required to face this global challenge.

THOMAS F. STOCKER
University of Bern and co-chair, WGI, Fifth Assessment Report (AR5), IPCC

SUSAN SOLOMON *Massachusetts Institute of Technology and co-chair, WGI, Fourth Assessment Report (AR4), IPCC*

QIN DAHE
China Meteorological Administration and co-chair, WGI, AR4 and AR5, IPCC

VALERIE MASSON-DELMOTTE
University of Paris-Saclay and co-chair, WGI, Sixth Assessment Report (AR6), IPCC

PANMAO ZHAI
China Meteorological Administration and co-chair, WGI, AR6, IPCC

ERRATUM

"Radioactive Recycling," by Nikk Ogasa [Advances], incorrectly said americium and curium have forms that decay much more slowly than uranium. The most stable isotopes of americium and curium decay faster than uranium's most stable isotopes.

SCIENTIFIC AMERICAN®
ESTABLISHED 1845

EDITOR IN CHIEF
Laura Helmuth

MANAGING EDITOR **Curtis Brainard** COPY DIRECTOR **Maria-Christina Keller** CREATIVE DIRECTOR **Michael Mrak**

EDITORIAL
CHIEF FEATURES EDITOR **Seth Fletcher** CHIEF NEWS EDITOR **Dean Visser** CHIEF OPINION EDITOR **Megha Satyanarayana**

FEATURES
SENIOR EDITOR, SUSTAINABILITY **Mark Fischetti**
SENIOR EDITOR, MEDICINE / SCIENCE POLICY **Josh Fischman**
SENIOR EDITOR, SPACE / PHYSICS **Clara Moskowitz**
SENIOR EDITOR, SCIENCE AND SOCIETY **Madhusree Mukerjee**
SENIOR EDITOR, TECHNOLOGY / MIND **Jen Schwartz**
SENIOR EDITOR, EVOLUTION / ECOLOGY **Kate Wong**

NEWS
SENIOR EDITOR, MIND / BRAIN **Gary Stix**
SENIOR EDITOR, SPACE / PHYSICS **Lee Billings**
SENIOR EDITOR, HEALTH AND MEDICINE **Tanya Lewis**
ASSOCIATE EDITOR, TECHNOLOGY **Sophie Bushwick**
ASSOCIATE EDITOR, SUSTAINABILITY **Andrea Thompson**
ASSISTANT NEWS EDITOR **Sarah Lewin Frasier**

MULTIMEDIA
CHIEF MULTIMEDIA EDITOR **Jeffery DelViscio**
SENIOR EDITOR, AUDIENCE ENGAGEMENT **Sunya Bhutta**
SENIOR EDITOR, COLLECTIONS **Andrea Gawrylewski**

ART
SENIOR GRAPHICS EDITOR **Jen Christiansen**
PHOTOGRAPHY EDITOR **Monica Bradley**
ART DIRECTOR, ONLINE **Ryan Reid**
ASSOCIATE GRAPHICS EDITOR **Amanda Montañez**
ASSOCIATE PHOTO EDITOR **Liz Tormes**

COPY AND PRODUCTION
SENIOR COPY EDITORS **Angelique Rondeau, Aaron Shattuck**
MANAGING PRODUCTION EDITOR **Richard Hunt**
PREPRESS AND QUALITY MANAGER **Silvia De Santis**

CONTRIBUTORS
EDITORS EMERITI **Mariette DiChristina, John Rennie**
EDITORIAL **Amy Brady, Katherine Harmon Courage, Lydia Denworth, Ferris Jabr, Anna Kuchment, Michael D. Lemonick, Robin Lloyd, Steve Mirsky, Melinda Wenner Moyer, George Musser, Ricki L. Rusting, Dava Sobel, Claudia Wallis, Daisy Yuhas**
ART **Edward Bell, Zoë Christie, Lawrence R. Gendron, Nick Higgins, Kim Hubbard, Katie Peek, Beatrix Mahd Soltani**

EXECUTIVE ASSISTANT SUPERVISOR **Maya Harty**
SENIOR EDITORIAL COORDINATOR **Brianne Kane**

SCIENTIFIC AMERICAN CUSTOM MEDIA
EDITORIAL DIRECTOR, CONTENT SERVICES **Cliff Ransom**
CREATIVE DIRECTOR **Wojtek Urbanek**
MULTIMEDIA EDITOR **Kris Fatsy**
MULTIMEDIA EDITOR **Ben Gershman**
ENGAGEMENT EDITOR **Dharmesh Patel**
ACCOUNT MANAGER **Samantha Lubey**

PRESIDENT
Kimberly Lau

EXECUTIVE VICE PRESIDENT **Michael Florek**
VICE PRESIDENT, COMMERCIAL **Andrew Douglas**
PUBLISHER AND VICE PRESIDENT **Jeremy A. Abbate**
VICE PRESIDENT, CONTENT SERVICES **Stephen Pincock**

CLIENT MARKETING SOLUTIONS
MARKETING DIRECTOR, INSTITUTIONAL PARTNERSHIPS AND CUSTOMER DEVELOPMENT **Jessica Cole**
PROGRAMMATIC PRODUCT MANAGER **Zoya Lysak**
DIRECTOR, INTEGRATED MEDIA **Matt Bondlow**
BUSINESS DEVELOPMENT **Stan Schmidt**
HEAD, PUBLISHING STRATEGY **Suzanne Fromm**

CONSUMER MARKETING & PRODUCT
DEVELOPMENT TEAM LEAD **Raja Abdulhaq**
HEAD, MARKETING **Christopher Monello**
SENIOR PRODUCT MANAGER **Ian Kelly**
SENIOR WEB PRODUCER **Jessica Ramirez**
SENIOR COMMERCIAL OPERATIONS COORDINATOR **Christine Kaelin**
MARKETING & CUSTOMER SERVICE ASSISTANT **Justin Camera**

ANCILLARY PRODUCTS
ASSOCIATE VICE PRESIDENT, BUSINESS DEVELOPMENT **Diane McGarvey**
CUSTOM PUBLISHING EDITOR **Lisa Pallatroni**

CORPORATE
HEAD, COMMUNICATIONS, USA **Rachel Scheer**
PRESS MANAGER **Sarah Hausman**

PRINT PRODUCTION
PRODUCTION CONTROLLER **Madelyn Keyes-Milch**
ADVERTISING PRODUCTION MANAGER **Michael Broomes**

LETTERS TO THE EDITOR
Scientific American, 1 New York Plaza, Suite 4600, New York, NY 10004-1562 or editors@sciam.com
Letters may be edited for length and clarity. We regret that we cannot answer each one.
Join the conversation online—visit *Scientific American* on Facebook and Twitter.

HOW TO CONTACT US

Subscriptions
For new subscriptions, renewals, gifts, payments, and changes of address: U.S. and Canada, 800-333-1199; outside North America, 515-248-7684 or scacustserv@cdsfulfillment.com

Submissions
To submit article proposals, follow the guidelines at www.ScientificAmerican.com. Click on "Contact Us." We cannot return and are not responsible for materials delivered to our office.

Reprints
To order bulk reprints of articles (minimum of 1,000 copies): **RandP@sciam.com.** Reprint Department, Scientific American, 1 New York Plaza, Suite 4600, New York, NY 10004-1562; 212-451-8415. For single copies of back issues: 800-333-1199.

Permissions
For permission to copy or reuse material: Permissions Department, Scientific American, 1 New York Plaza, Suite 4600, New York, NY 10004-1562; RandP@sciam.com; www.ScientificAmerican.com/permissions. Please allow six to eight weeks for processing.

Advertising
www.ScientificAmerican.com has electronic contact information for sales representatives of Scientific American in all regions of the U.S. and in other countries.