
The mystery of the macho trocs p. 839
Exploring an asthma drug for Parkinson's pp. 869 & 893
Blue-light photoenzyme builds hydrocarbons pp. 872 & 913
Science
$15
3 SEPTEMBER 2010
sciencemag.org
AAAS
LEAF
SIZE
Why tropical leaves are larger, p. 917

LETTERS

Edited by **Jennifer Sills**

Intelligent design endangers education

Proponents of creationism and the intelligent design (ID) hypothesis continue to undermine science education across the world (*1*). In the United States as of 2014, public or taxpayer-funded schools in 13 states and the District of Columbia were permitted to teach creationism alongside evolution (*2*). In Brazil, an Institute to advance the ID hypothesis was recently established with the support of a Brazilian private university and assistance of the U.S. Discovery Institute, which sponsors the ID movement (*3*). The inauguration of the new Institute was broadcast by one of the Brazilian television channels and was shared widely on the Internet (*4*). Meanwhile, Turkey has prohibited the teaching of evolution (*5*).

The global scientific community must work to ensure that only science is taught in science classrooms. American scientists, with strong support from American academic societies, have published articles and books pointing out the failures of ID and creationism and the risks of this type of approach in education (*6*–*9*). American science educators have sued in response to procreationism legislation (*10*). Action by scientists was also effective in South Korea. In 2012, creationists convinced publishers to remove examples of evolution from science textbooks. The outraged reaction from scientists led the government, with help from the Korean Academy of Science and Technology, to form a panel of scientific experts. Informed by the panel's conclusions, the government urged publishers to keep the examples in the textbooks (*11*).

The creationist movement is international, with coalitions in multiple countries and funding support that crosses geopolitical borders. The response of scientists and academic societies should be international as well. In an increasingly interconnected world, a scientifically educated population in any one country benefits us all. Scientists should speak out against the recent science education setbacks in Brazil and Turkey.

Heslley Machado Silva

Department of Ecology and Evolutionary Biology University of California, Irvine, CA 92697, USA and Department of Education and Research, University Center of Formiga, Formiga, Minas Gerais, 35570000, Brazil. Email: heslley@uniformg.edu.br

REFERENCES

1. A. Cornish-Bowden, M. L. Cárdenas, *Biol. Res.* **40**, 113 (2007).
2. C. Kirk, "Map: Publicly funded schools that are allowed to teach Creationism," *Slate* (2014); www.slate.com/articles/health_and_science/science/2014/01/creationism_in_public_schools_mapped_where_tax_money_supports_alternatives.html.
3. G. Chancelaria, "Delegação do Discovery Institute-USA desembarca no Mackenzie," *Mackenzie* (2017); http://portal.mackenzie.br/imprensa/noticias/arquivo/artigo/delegacao-do-discovery-institute-usa-desembarca-no-mackenzie/ [in Portuguese].
4. Reportagem do Domingo Espetacular sobre Design Inteligente (2017); www.youtube.com/watch?v=UG0TF27QHq4 [in Portuguese].
5. P. Kingsley, "Turkey drops evolution from curriculum, angering secularists," *New York Times* (2017); www.nytimes.com/2017/06/23/world/europe/turkey-evolution-high-school-curriculum.html.
6. E. C. Scott, M. J. Matzke, *Proc. Natl. Acad. Sci. U.S.A.* **104** (suppl. 1), 8669 (2007).
7. F. J. Ayala, *Proc. Natl. Acad. Sci. U.S.A.* **105**, 3 (2008).
8. F. J. Ayala, *Proc. Natl. Acad. Sci. U.S.A.* **104** (suppl. 1), 8567 (2007).
9. R. T. Pennock, Ed., *Intelligent Design Creationism and Its Critics: Philosophical, Theological, and Scientific Perspectives* (MIT Press, 2001).
10. FindLaw, "Creation, evolution, and Intelligent Design in public schools" (http://education.findlaw.com/curriculum-standards-school-funding/creation-evolution-and-intelligent-design-in-public-schools.html).
11. S. B. Park, *Nature*, 10.1038/nature.2012.11377 (2012).

10.1126/science.aao3245

Scientists should speak out against creationism and intelligent design in science classrooms.

Scientists need social media influencers

Katy Perry has more than 100 million followers on Twitter. Meanwhile, celebrity scientist Neil deGrasse Tyson has only 8.7 million followers. Communicating with the public through social media is time-consuming, and most scientists are not trained for it. In fact, most of all scientists' Twitter followers are other scientists from their own discipline (*1*). We need inventive strategies to educate the public, particularly in critical fields such as climate change, biodiversity loss, and sustainability. Social media influencers—individuals with strong social and cultural impact over a broad audience, such as actors, singers, writers, supermodels, creators of popular Youtube videos, and athletes—can help to spread important messages of science.

For instance, scientists, environmentalists, and well-known nongovernmental organizations worked to convince Brazilian president Michael Temer not to sign a decree reducing the Amazon Protected Areas (*2*). They learned the president's decision only after Brazilian top model Gisele Bündchen asked him in a tweet to "say NO to reducing protection in the Amazon." Amid deep budget cuts to the Ministry of the Environment and a severe economic and political crisis, the president responded to her with a tweet saying that all changes in the decree would be rejected (*3*). In cases like this, extensive campaigns or scientific reports may substantially benefit from the high-profile backing or rebuke from a social media influencer.

If celebrities have the power to change what people eat and how people dress, why not leverage this influence to inspire people to embrace more rational and scientific-based attitudes? This strategy can benefit the celebrities as well as scientists and the public. For example, Gisele's tweet to the Brazilian president received much more attention (likes and retweets) than her other recent posts and was extensively covered by the Brazilian and international press (*3*, *4*). By raising awareness for scientific causes and encouraging positive change, social media influencers could potentially broaden their audience.

As part of their public communication strategy, scientists should consider engaging with social media influencers, especially those who have indicated an

PHOTO: OWENPRICE/ISTOCKPHOTO

Downloaded from http://science.sciencemag.org/ on August 31, 2017

Published by AAAS

interest in promoting science. Scientists should propose a mutually beneficial partnership, in which they provide facts, findings, and arguments that can be used to accurately spread scientific messages, and those with social media followings spread the information to a wide audience. In a world of "alternative facts," a powerful voice—or tweet—can help to improve the communication gap between scientists and the public.

Mauro Galetti* and Raul Costa-Pereira
São Paulo State University (UNESP), Rio Claro, 13506-900 SP, Brazil.
*Corresponding author. Email: mgaletti@rc.unesp.br

REFERENCES

1. Q. Ke, Y.-Y. Ahn, C. R. Sugimoto, *PLOS ONE* **12**, e0175368 (2017).
2. D. Phillips, "Brazil's plan to roll back environment laws draws fire: 'The danger is real,'" *The Guardian* (2016).
3. J. Watts, "Brazil's president announces plan to protect forest–after plea from Gisele," *The Guardian* (2017).
4. "Amazônia: Temer diz a Gisele Bündchen que vetou reduzir área de preservação" (2017); http://g1.globo.com/politica/noticia/temer-anuncia-a-gisele-bundchen-no-twitter-veto-a-trechos-de-mp-que-beneficiavam-desmatadores.ghtml [in Portuguese].

10.1126/science.aao1990

Yachay's promise

In his News In Depth story "Turmoil imperils research university in Andes" (28 July, p. 340), E. Rodríguez Mega reported the frustrations of the recently dismissed administrators at Yachay Tech University in Ecuador. These administrators, as well as the rector (author C.C.-C.), all signed contracts indicating that they could be dismissed at any time. As members of the new leadership team, we write to express our confidence in the future of Yachay Tech University.

We are working to make Yachay Tech a world-class public research university that will help Ecuador to become a knowledge-based economy. Yachay is the first residential campus in the country. It is free to attend and has need-blind admissions. Each of its five schools consists of two departments, one concentrating on basic science and the other focusing on technology and engineering. All students receive common science, technology, engineering and mathematics training in the first 2 years and then 3 years of specialized instruction in English. We aim to hire only research-active faculty (100% with Ph.D. degrees) and to maintain a low student-to-faculty ratio that can support education through research from the undergraduate to postdoctoral levels (*1*).

In addition to our current programs, we are developing subject Ph.D.s as well as interdisciplinary research programs in biodiversity, energy, nanotechnology, biomedicine, computational chemistry, physics, biology, geology, and high-performance computing (we currently use the only supercomputer in Ecuador). We are in the process of developing an ecosystem of innovation, driven by projects of critical importance to Ecuador and the Andean region, including a strong connection with the industry. The university is cooperating with several national research institutes in a joint effort to increase the concentration of researchers in the "city of knowledge" that is being built around the university (*2*).

The newly elected president of Ecuador, Lenin Moreno, has reiterated his commitment to the success of Yachay Tech University as an important project for the country (*3*), despite the economic challenges that the country is facing. We hereby express our commitment to continue creating a research-intensive university of the highest academic standards in collaboration with institutions from around the world.

Carlos Castillo-Chavez,* Patricio Ponce, Jürgen Reichardt, Spiros Agathos, Paul Arellano, Andreas Griewank, Ernesto Medina, Hortencia Rodriguez, Edgar J. Patiño
Yachay Tech University, Hacienda San José, Urcuqui, 100650, Ecuador.
*Corresponding author. Email: ccchavez@asu.edu

REFERENCES

1. Universidad Yachay Tech (www.yachaytech.edu.ec/wp-content/uploads/2017/08/Oferta-Academica-EN.pdf).
2. Yachay Tech Partners (www.yachaytech.edu.ec/en/about/partners/).
3. Noticiero El Gobierno Informa Nro. 006 10/07/2017 (www.youtube.com/watch?v=kTG0MBsNodc&feature=youtu.be&t=806) [in Spanish].

10.1126/science.aao5451

TECHNICAL COMMENT ABSTRACTS

Comment on "Active sites for CO_2 hydrogenation to methanol on Cu/ZnO catalysts"

Junji Nakamura, Tadahiro Fujitani, Sebastian Kuld, Stig Helveg, Ib Chorkendorff, Jens Sehested

Kattel *et al*. (Reports, 24 March 2017, p. 1296) report that a zinc on copper surface undergoes oxidation to zinc oxide/copper (ZnO/Cu) during carbon dioxide (CO_2) hydrogenation to methanol and conclude that the Cu-ZnO interface is the active site for methanol synthesis. Similar experiments conducted two decades ago by Fujitani and Nakamura *et al*. demonstrated that Zn is attached to formate rather than being fully oxidized.

Full text: dx.doi.org/10.1126/science.aan8074

Response to Comment on "Active sites for CO_2 hydrogenation to methanol on Cu/ZnO catalysts"

Shyam Kattel, Pedro J. Ramírez, Jingguang G. Chen, José A. Rodriguez, Ping Liu

In their Comment on our recent Report, Nakamura *et al*. argue that our x-ray photoelectron spectroscopy (XPS) analysis was affected by the presence of formate species on the catalyst surface. This argument is not valid because the reactant gases were evacuated at temperatures from 525 to 575 K, conditions under which formate is not stable on the catalyst surface. An analysis of the XPS results obtained after exposing zinc oxide/copper (111) [ZnO/Cu(111)] surfaces to hydrogen (H_2) and mixtures of carbon dioxide (CO_2)/H_2 show an absence of carbon (C) 1s signal, no asymmetries in the oxygen (O) 1s peak, and a Zn:O intensity close to 1:1. Thus, the most active phase of these catalysts contained a ZnO-Cu interface.

Full text: dx.doi.org/10.1126/science.aan8210

NEXTGEN VOICES: SUBMIT NOW

Science for human rights

Add your voice to *Science*! Our new NextGen VOICES survey is now open:

Human rights include civil, political, economic, social, and cultural rights. Briefly describe the human rights most relevant to your field. Then, describe how applications of knowledge in your field (information, methodologies, services, and/or products) support those human rights.

To submit, go to www.sciencemag.org/news/nextgen-voices

Deadline for submissions is 8 September. A selection of the best responses will be published in the 6 October issue of *Science*. Submissions should be 100 words or less. Anonymous submissions will not be considered.

Downloaded from http://science.sciencemag.org/ on August 31, 2017

Published by AAAS

Science

Yachay's promise

Carlos Castillo-Chavez, Patricio Ponce, Jürgen Reichardt, Spiros Agathos, Paul Arellano, Andreas Griewank, Ernesto Medina, Hortencia Rodriguez and Edgar J. Patiño

Science **357** (6354), 881.
DOI: 10.1126/science.aao5451

ARTICLE TOOLS http://science.sciencemag.org/content/357/6354/881.1

RELATED CONTENT http://science.sciencemag.org/content/sci/357/6349/340.full

PERMISSIONS http://www.sciencemag.org/help/reprints-and-permissions

Use of this article is subject to the Terms of Service

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. 2017 © The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works. The title *Science* is a registered trademark of AAAS.

Downloaded from http://science.sciencemag.org/ on August 31, 2017