

Empowering Reality, Rationality, Creativity, Empathy

Scientists and Engineers: Facts, Truth, Democracy?

Statistical Mechanics, Demons, and Democracy

Joe Andrade

University of Utah Dept. of Bioengineering

IBE

April 1, 2017

Who am I? Why should you listen to me?

Born 1941; 75 years old
Univ of Utah Faculty 1969-2012
Professor of Bioengineering, Materials Science,
Pharmaceutics; Distinguished Prof.
Dean of Engineering: 1983-87
Chair of Bioengineering
Science without Walls; The Leonardo; The CALL
Emeritus Prof. 2012-present
Ran for Congress, Dist. 2 Utah, 2012; Lost; The RUN
Amateur Novelist: *State Change: A Chemical Fantasy*
(www.statechange.us)
Novel #2: *Deliver Us From Evil* - Pending

The 2017 IBE Annual Conference theme -

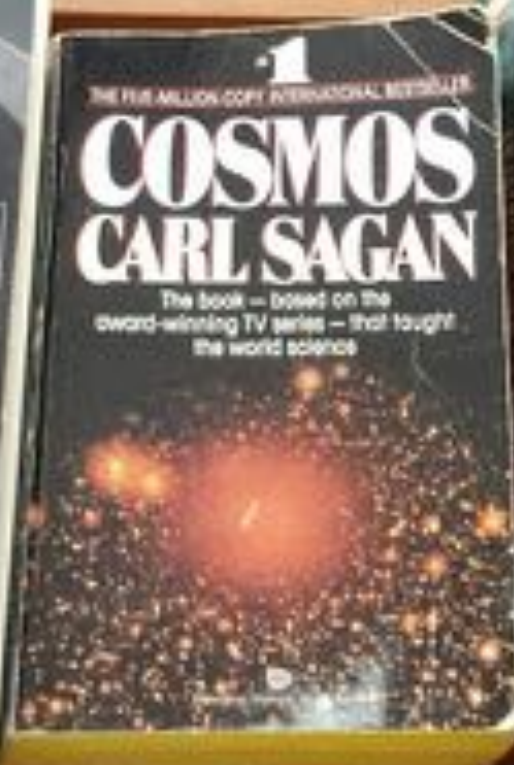
Convergence -

transdisciplinary integration of life sciences, physical sciences and engineering for developing deeper understanding of complex living systems (creating the science of new biology) and for engineering novel solutions to address the grand challenges of our times – to promote a framework of enabling science with network of partners from all fields of life sciences, physical sciences, engineering, etc.

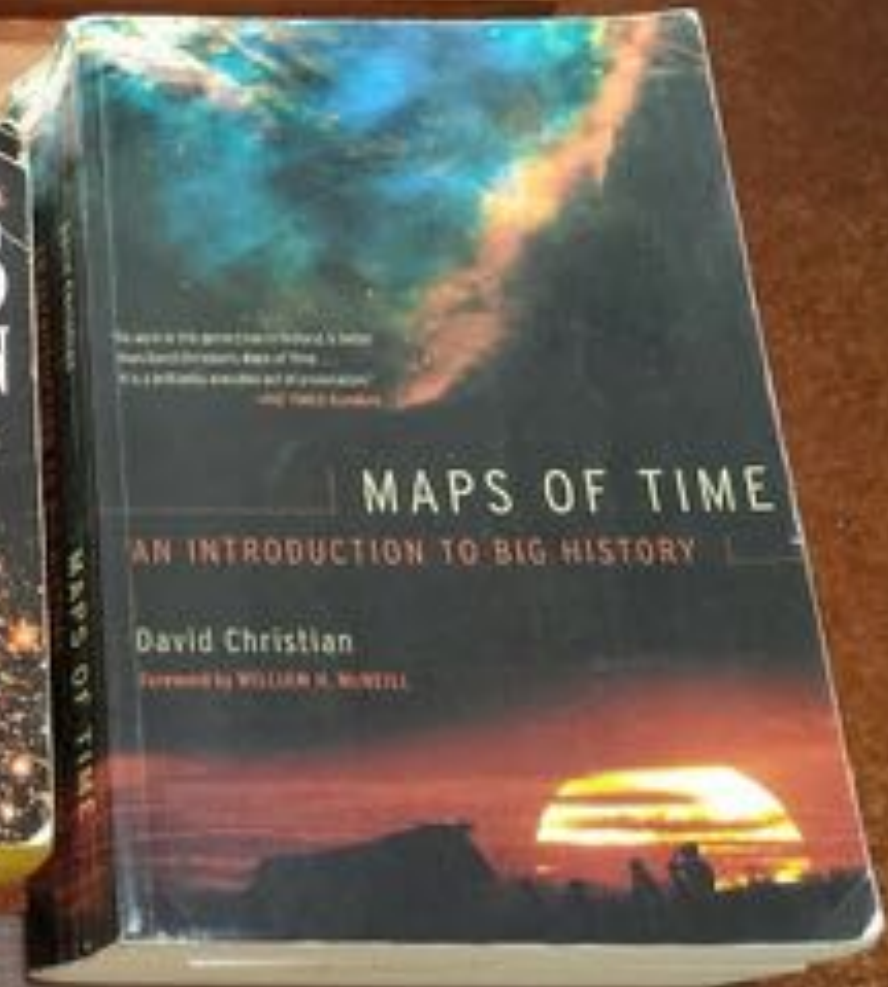
But need also to consider Humanities, Social and Behavioral Sciences - and especially Politics and Government



1998



1993



2005

Hard Rules -- “Soft” Rules

- The Hard Rules -- The Sciences
 - The way the physical and natural World works;
 - The Rules of the Game -- apply everywhere, all the time, to all; no favorites; no supernatural stuff.
- The “Soft” Rules -- The Humanities
 - Societies and Cultures;
 - Philosophies and Religions;
 - Politics and Law.

BUT... soft eventually hardens...

E. O. Wilson:

Consilience: The Unity of Knowledge, 1998

Carl Sagan:

Science as a Candle in the Dark,
(subtitle of *A Demon-Haunted World*)

Cosmos, 1993

The Beginning:

April, 1983: Dr. David Gardner, President,
University of Utah:

“Our nation is at risk...The educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a nation and as a people...

A high level of shared education is essential to a free democratic society and to the fostering of a common culture... citizens must be able to reach some common understandings on complex issues, often on short notice and on the basis of conflicting or incomplete evidence.

America is at risk.”

Twenty years -- a generation later -- the situation is no better.

A Nation At Risk:

THE
IMPERATIVE
FOR EDUCATIONAL
REFORM



The National Commission on Excellence
in Education

U
217
U49
1983

How Ignorance Became a Virtue

CONTINUED FROM PAGE C1

"Americans have reached a point where ignorance, especially of anything related to public policy, is an actual virtue," the scholar Tom Nichols writes in his timely new book, "The Death of Expertise." "To reject the advice of experts is to assert autonomy, a way for Americans to insulate their increasingly fragile egos from ever being told they're wrong about anything. It is a new Declaration of Independence: No longer do we hold these truths to be self-evident, we hold all truths to be self-evident, even the ones that aren't true. All things are knowable and every opinion on any subject is as good as any other."

"The Death of Expertise" turns out to be an unexceptional book about an important subject. The volume is useful in its way, providing an overview of just how we arrived at this distressing state of affairs. But it's more of a flat-footed compendium than an original work, pulling together examples from recent news stories while iterating arguments explored in more depth in books like Al Gore's "The Assault on Reason," Susan Jacoby's "The Age of American Unreason," Robert Hughes's "Culture of Complaint" and, of course, Richard Holbrooke's 1983 classic, "Anti-Intellectualism in American Life." Nichols's source notes are one of the highlights of the volume, pointing the reader to more illuminating books and articles.

Nichols reminds us how a "resistance to intellectual authority" naturally took root in

Follow Michiko Kakutani on Twitter:
[@michikobakutani](https://twitter.com/michikobakutani)

The Death of Expertise: The Campaign Against Established Knowledge and Why It Matters

By Tom Nichols

252 pages. Oxford University Press: \$24.95.

a country, dedicated to the principles of liberty and egalitarianism, and how American culture tends to fuel "romantic notions about the wisdom of the common person or the gumption of the self-educated genius." (Though the country, it should also be remembered, was founded on the Enlightenment principles of reason and an informed citizenry.)

Nichols argues that the "protective swaddling environment of the modern university infantilizes students," and suggests that today's populism has magnified disdain for elites and experts of all sorts, be they in foreign policy, economics, even science.

Trump won the 2016 election, Nichols writes, because "he connected with a particular kind of voter who believes that knowing about things like America's nuclear deterrent is just so much pointy-headed claptrap." Worse, he goes on, some of these voters "not only didn't care that Trump is ignorant or wrong, they likely were unable to recognize his ignorance or errors," thanks to their own lack of knowledge.

While the internet has allowed more people more access to more information than ever before, it has also given them the illusion of knowledge when in fact they are drowning in data and cherry-picking what they choose to read. Given an inexhaustible buffet of facts, rumors, lies, serious analysis, crackpot speculation and outright prop-

NY TIMES

The Scientific and Engineering Community has been largely uninterested and uninvolved in the education and awareness of the general public

The lack of effective science and technology education in the K-12 years over many decades has resulted in:

- an electorate which is largely scientifically, technologically, and numerically/mathematically illiterate,...
- an electorate which can not deal objectively with a wide range of issues, and
- decreasing numbers of students electing to study the sciences.

www.theleonardo.org

slvsef.org



Chemistry demonstrations are a real gas

Alejandro Preciado creates "ghost bubbles" with the help of Amber Bowler, a senior chemistry major at the University of Utah, right, during the American Chemical Society Student Chapter's spring chemistry festival at the Eyring Chemistry Building on the U. campus in Salt Lake City on Saturday. The bubbles were made out of dry ice, water, dish soap and corn syrup. During the free event, children and their families got to see demonstrations that illustrate the role of chemistry in cooking food. Some of the demonstrations included making ice cream with liquid nitrogen, and shooting off rockets.



Working 'with' Legislature , I learned:
It's not about 'Science' - it's Ideology - Belief

<http://www.youtube.com/watch?v=L6ofvMaRpw>



Mike Noel, Kanab, State Legislator,
BA Biology, UC Berkeley
Denialist, Believer

"The issue is NOT Science...the issue is BELIEF. If you choose to Believe in something very strongly and you choose to adopt a position very strongly - no amount of science will change your Belief. It takes a private revelation...to really change....We must understand that rationality is quite rare... We must identify those totally irrational legislators...and get rid of them." Joe Andrade UU Conf 2-2010

For a sustainable future

JOE ANDRADE

Congress



www.2andrade.org





the Run

My One-Year Experiment
in Democracy by Joe Andrade

Awareness and Exposure

“Most of the population is semantically sheltered and isolated - 'protected' from issues, concepts, and problems. I tried to break through the very right, conservative echo chamber in which most Utahns reside. As people hear these words spoken and written - by people and candidates which otherwise seem to be reasonable, informed, educated, and interested - the words will begin to seem less of a threat.”

Engagement Needed

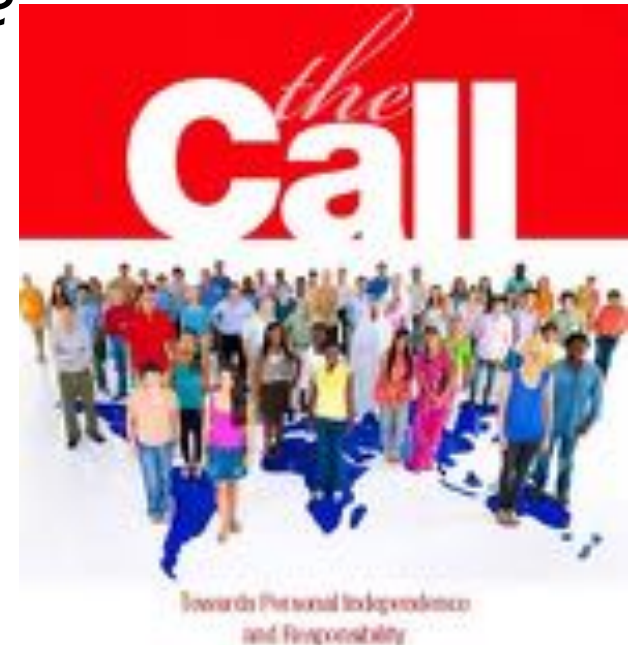
“One of the reasons our nation is in the mess it's in - where ideology rules and critical thinking is almost non-existent - is because the most educated in our society have chosen to be among the least involved. This is especially true in academia. Academic and professional apathy often prevails.”

Assumptions, Fear, and Revelation... impending dystopia...*

“...most people know major changes are coming - they know their historical expectations are in flux. They are afraid of such change. They are afraid of the climate change they hear about and work to deny. They are afraid of impending drought. They are afraid of carbon fees or taxes. They are afraid of higher energy costs. They are afraid.”

* Second Coming, Armageddon, Rapture, ...from parents to youth...young adults...

My discussions with high school kids:



THE HUNGER GAMES



[Home](#) | [About the Books](#) | [About the Author](#) | [Games](#) | [More from Suzanne](#) | [Glossary](#)



The Hunger Games Trilogy



Rodrigo Rodriguez, chapter in *Politics of Panem:*

Collin's message is clear:

quoting Katniss: "...look at the state they left us in, with the wars and the broken planet. Clearly, they didn't care about what would happen to the people who came after them."

Collins seems to believe that the work of building a more equitable world is a project that ultimately falls to the young.

...the goal of the dystopian genre to 'place a mirror before readers, challenging them to examine the world they inhabit and the obstacles it places on the path to social justice'.



Students in Philadelphia waiting for an autograph from Angie Thomas, whose novel, "The Hate U Give," won critical raves. Mack Makela for The New York Times



Angie Thomas
The Hate U Give

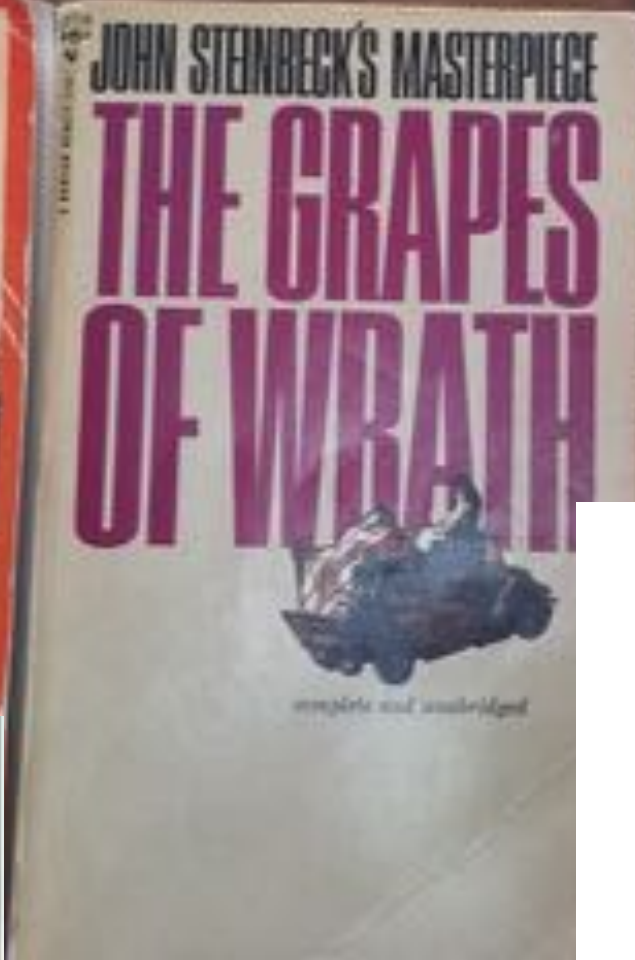
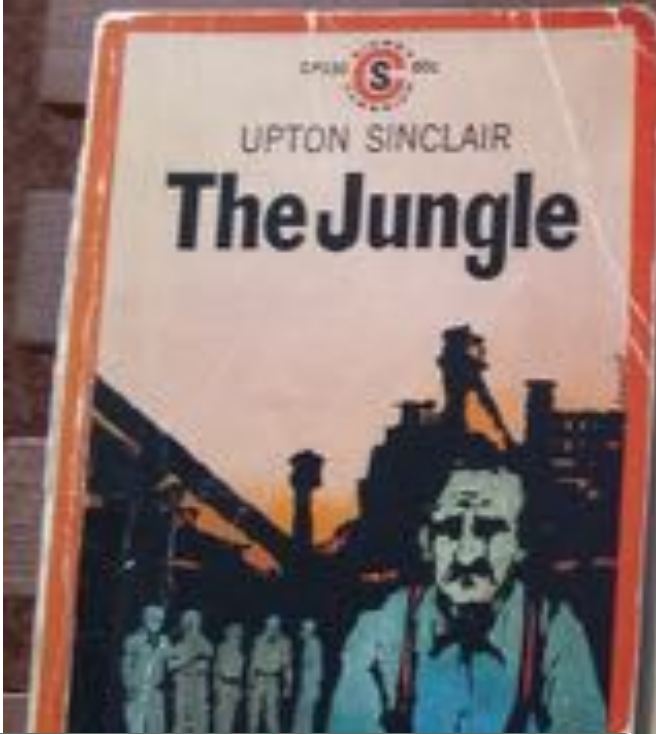
Why Write Fiction?

Reality is so diverse, so complicated, so interesting -
why waste time on fiction? on fantasy?

That was my position for most of my career.
But with age and time (gerontological 'wisdom'?)
I realized fiction, especially novels, can reach
many more people than factual media do:
newspapers, papers, documentaries, texts.

I read and reread some novels that had major
socio-political impacts. I learned you can say
and 'do' in fiction things which might get you arrested
and jailed if said as fact (this was several years
before the President of the United States endorsed
'alternative facts').

And I realized that if you self-publish you don't need to be
constrained by editors, lawyers, agents, or publishers.



So after many years of reading and study about mental constraints, rigidity, ideology, politics, plutocracy, voter and citizen apathy and misinformation, gerrymandering, and outright non-ethical, immoral, and even illegal behavior and actions, I devised a **novel hypothesis and an 'experiment' to hopefully address our impending political catastrophe and resultant dystopia.**

**The first implementation of that hypothesis is
State Change -
(www.statechange.us)**

a 450 page amateur novel in which a set of rigid, obstructionist political ideologues are illegally 'treated' to facilitate their transformation to more rational and reasonable citizens, officials, politicians.

STATE



CHANGE

The most effective, most pragmatic, most realistic solution is to directly change the mindsets of existent afflicted rulers and elected leaders.

Given the urgency of the problems which must be solved, those entrenched mindsets can only be rapidly changed by direct chemical means – by chemically-facilitated revelations and epiphanies.

That is the subject of this book.

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“Perhaps, but remember engineers and physicians – especially surgeons – often tend to be conservative – they like things simple.”

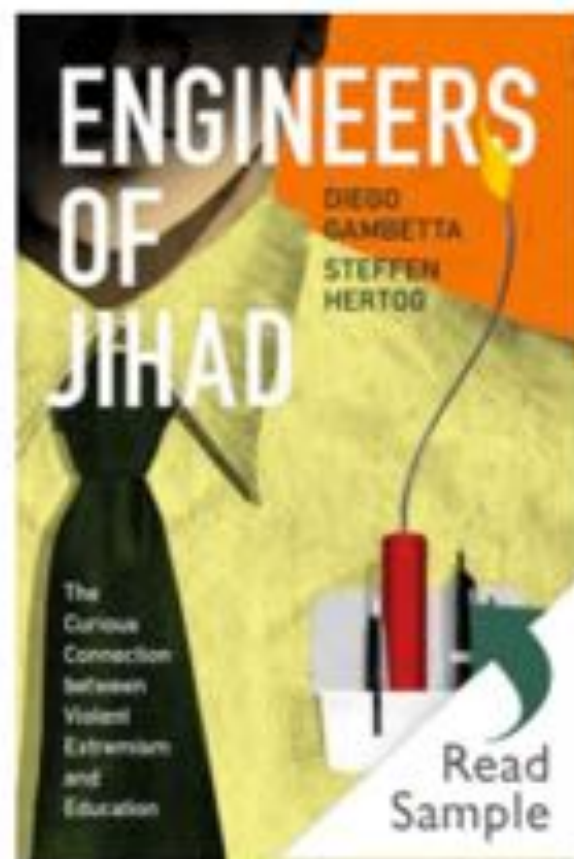
“[Charles Koch] extrapolated his engineering rules and laws directly into the public sector. He assumes that the simplistic ‘rules’ and assumptions applied by his father, by Ayn Rand, by Hayek are as reliable in the social arena as Newton’s Laws and the rules of chemistry are in the physical science arena.”

Charles and David Koch, Paul Ryan, Ted Cruz, and Robert Mercer are *simplists*: smart guys who prefer seductive simplicity to the complexity of social and political (and environmental) reality.

It probably was not Einstein, but it’s been said:
Things should be as simple as possible, but not simpler.

also, Aldous Huxley:

Facts do not cease to exist because they are ignored.



Engineers of Jihad: The Curious Connection between Violent Extremism and Education

by Diego Gambetta

★★★★☆ 1 Review

[See All Formats & Editions >](#)

The violent actions of a few extremists can alter the course of history, yet there persists a yawning gap between the potential impact of these individuals and what we understand about them. In *Engineers of Jihad*, Diego Gambetta and Steffen Hertog uncover two unexpected facts, which they imaginatively leverage to narrow that gap: they find that a...

[See more details below](#)

“Engineers like bombs and circuitry?” Jay asked.

“Yes, in part, but engineers really like ...”

“Rules ... simple, reasonable rules,” Bill interrupted. “Just like adolescents.”

“Yes – the world is confusing and complex – and certain mentalities strive for simplicity, for rules, for order.”

“And some of those people choose engineering.”

“Yes – and that’s why a disproportionate number of active, ‘successful’, jihadists are engineers.”

“And some of them become libertarians, Ayn Rand wannabees – and plutocrats.”

“The book cites some psychology literature about the search for simplism – defined as exaggerated simplicity and oversimplification.”

“Sounds like libertarianism, tea party patriots, and some engineers I know,” Bill said.

“And jihadists.”

APRIL 3, 1950

TIME

**Is
Truth
Dead?**

© 1950 TIME INC.

English has one word, TRUTH,

with Two Definitions:

1. In accordance with fact or reality - the real world;
2. A firmly held opinion or conviction - as in the spiritual world.

TRUTH is What Is *or* What / Believe

Russian has two different words for TRUTH:

ИСТИНА, пожалуйста

Real, Unshakeable, Factual Truth

Правда, пожалуйста

Surface, Subjective, Superficial Truth

https://www.nytimes.com/2016/12/15/opinion/to-understand-trump-learn-russian.html?_r=0 :

“You can fiddle with the pravda all you want, but you can’t change the istina.”

Charles Blow: NYT 1-26-2017: <https://nyti.ms/2kvMlzt>

on liars, lying, fake news, truth, science

“Donald Trump is a proven liar. He lies often and effortlessly. He lies about the profound and the trivial. He lies to avoid guilt and invite glory. He lies when his pride is injured and when his pomposity is challenged.

Indeed, one of the greatest threats Trump poses is that he corrupts and corrodes the absoluteness of truth, facts and science.

It is no coincidence that the rise of Trump is concurrent with the rise of “fake news.” It is no coincidence that his rise comes during an age of severely damaged faith in institutions.”

WHAT'S "FAKE NEWS"? 60 MINUTES PRODUCERS INVESTIGATE

Stewart's Conf. Panel:
News and Democracy

What surprised 60 Minutes producers who reported on "stories that are provably false" -- and why arguing about it "is like going down the rabbit hole"

<http://www.cbsnews.com/news/whats-fake-news-60-minutes-producers-investigate/>

2017
MAR 26

COMMENTS
 **73**

FACEBOOK


TWITTER


STUMBLE


What does the phrase "fake news" mean? It depends who you ask. The term has become so loaded that when a team of 60 Minutes producers began to **investigate fake news**, the producers first had to agree on a definition.

"We weren't interested in doing a story about the 'fake news' that is invoked by politicians against the media for stories that they don't like or for comments that they don't like," explains producer Michael Radutzky in the 60 Minutes Overtime video above. "We're using the term 'fake news' to describe stories that are provably false, have enormous traction in the culture, and are consumed by millions of people."

FRIDAY, DEC 23, 2016 12:05 PM MST

Dystopian Donald: Will Trump make “1984” look like a nursery tale?

Can you doubt that we're in a dystopian age, even if we're still four weeks from Trump entering the Oval Office?

TOM ENGELHARDT, TOMDISPATCH.COM

[SKIP TO COMMENTS](#)

TOPICS: DONALD TRUMP, DYSTOPIA, ELECTIONS, INAUGURATION, TOMDISPATCH.COM, POLITICS NEWS, ELECTIONS NEWS, SOCIAL NEWS, NEWS



The Trump era's top-selling dystopian novels

By Brian Wheeler

BBC News, Washington DC

29 January 2017 | Magazine



Donald Trump has sparked a sales bonanza for publishers of dystopian fiction - as well as his own books on business success. Here are the titles currently enjoying a boost on the back of his arrival in the White House.

SCIENCE

In Age of Trump, Scientists Show Signs of a Political Pulse

By AMY HARMON and HENRY FOUNTAIN FEB. 6, 2017

Michael Eisen, an evolutionary biologist, is among the elite of American scientists, with a tenured position at the University of California, Berkeley, and generous funding from the Howard Hughes Medical Institute for his research on fruit flies.

But late last month, dismayed over the Trump administration's apparent disdain for evidence on climate change and other issues, Dr. Eisen registered the Twitter handle @SenatorPhD and declared his intention to run in the 2018 election for a seat in the United States Senate from California. His campaign slogan: "Liberty, Equality, Reality."



THE GLOBAL ENERGY CHALLENGE:

A MORAL IMPERATIVE FOR THE UNIVERSITY

DR. DANIEL G. NOCERA

PATTERSON ROCKWOOD PROFESSOR OF ENERGY
HARVARD UNIVERSITY

MARCH 30 | 6 PM | ASB 220

ALINE W. SPASSI BOLDY BUILDING



50



Dr. Daniel G. Nocera
Patterson Rockwood
Professor of Energy,
Harvard University

The Global Energy Challenge: A Moral Imperative for the University

Climate change is an existential threat to society as we continue to meet energy demand with carbon-based fuels. A growing population, increasing global living standards, expanding access to education, and improving health outcomes are all inextricably linked to a need for greatly increasing access to affordable, reliable energy. Meeting this need with the expanded use of fossil fuels is inconsistent with a low-risk climate pathway, yet those fuels often remain the most affordable and widely available, despite continued declines in the costs for zero-carbon energy technologies. [Read more...](#)

Event Details

**Thursday,
March 30**

6:00 P.M.

ASB 220
259 S 1400 E
SLC, UT 84112
Free to the public

[Click here for a map](#)

Budget cuts to National Institutes of Health

■ BY JOSHUA L. ANDERSEN

The world is on the verge of a new golden age in biomedical research and disease treatment. Groundbreaking

myview

medical discoveries are revolutionizing medicine and ushering in an era of sharpened, personalized tools for treating human disease.

Historically, the U.S. has been the unquestionable leader in this charge, primarily due to an unparalleled system of public research funding administered by the National Institutes of Health. However, on March 16, the Trump administration released a budget proposal that contained unprecedented, crippling cuts to the NIH, the crown jewel of U.S. biomedical research. Under the Trump plan, the NIH budget would be cut by \$5.8 billion, a budget decrease of nearly 10 percent. Within the scientific community, such a cut in an already historically difficult funding climate is hard to fathom.

Let's put the proposed budget cuts in perspective. The last significant increase in the NIH budget occurred nearly 20 years ago in the late 1990s and received strong bipartisan support. As a result, NIH grant funding rates hovered around 30 percent — meaning nearly a third of submitted grants were funded. Innovative and bold ideas found fertile ground, and we saw a boom in biomedical research, which paid significant economic

dividends and led to many of today's innovative therapies.

However, in the ensuing years, the NIH budget essentially remained flat, failing to keep up with inflation and the pace of discovery. By the mid-2000s, funding rates began to plummet sharply and have now sunk to historic, all-time lows — below 10 percent for many NIH divisions. Morale within the scientific community, despite exciting advances on the horizon, has probably never been lower.

The negative ripple effect of low NIH funding is massive. It creates an environment in which innovative high-risk, high-reward ideas are shelved for less ambitious projects. Early-career scientists, unable to obtain funding, either leave the U.S. to pursue research elsewhere, or leave science altogether. This "brain drain" of young U.S. scientists has been recognized by the NIH, but budget constraints prevent a significant remedy to the problem.

Even researchers with long track records of innovation are stymied by the need to constantly write grants just to scrape by. Ultimately, the cumulative effect of the current funding crisis is a drying up of the pipeline of ideas — potential cures are left on the table, an impact that will be felt in coming years. Meanwhile, emerging research powers like China and India recognize this opportunity to get ahead and are spending record percentages of their GDP on biomedical research. To say this is an unfortunate time for an NIH

budget cut is an understatement.

Support of the NIH should not be a partisan issue. Even before the Trump budget proposal, politicians on both sides of the aisle recognized the current NIH funding crisis as one of fundamental importance to society. Newt Gingrich, a staunch conservative and Trump supporter, published a Fox News article in 2015 pleading for a doubling of the NIH budget. Gingrich made an excellent point — that we spend nearly \$80 billion through Medicare in treating chronic kidney disease, yet the NIH is only able to devote roughly 0.8 percent of that amount toward developing a cure.

Similar financial discrepancies exist for many of the most debilitating human diseases. Imagine the long-term cost savings and reduction in human suffering if we could flip that paradigm and focus more resources on developing preventive interventions and cures.

We are on the verge of historic advances in biomedical research, and the powerful role of the NIH in pushing this effort forward cannot, realistically, be filled by any other entity — not private enterprise nor philanthropic groups. I plead with politicians and all Utahns to recognize that cutting the lifeblood of biomedical innovation will have far-reaching negative impacts on human health and the U.S. economy. Joshua L. Andersen is an assistant professor of biochemistry at Brigham Young University. His views do not necessarily reflect those of BYU.

Deseret News



How Woody Guthrie can help us fight for science

After the election of Donald Trump, Jacqueline M. Vадjumeц offers a message of resistance and hope from deep within the US Bible Belt.

Oklahoma

When I moved from Massachusetts almost a decade ago to teach at Oklahoma State University, many colleagues were afraid for my career. I took on the human dimensions of global environmental change, and Oklahoma has a long and complex history with science, including climate change.

Oklahoma was the first state to ratify anti-Darwin legislation in 1923 and today is home to key scripture in the war on climate change, including Republican Senator James Inhofe and Scott Pruitt, the state attorney general, who earlier this month was nominated to run the US Environmental Protection Agency. These politicized debates trickle down, and both evolution and human-induced climate change remain contested topics, especially in schools.

However, Oklahoma is also the home of protest singer Woody Guthrie, a visible example of resistance in the 1930s class and culture wars between rural and urban values. If Woody could see his voice to speak up, so can scientists.

In truth, my career is flat, and my colleagues are supportive. I not only manage, but also thrive. And I can, then so can other scientists who find themselves concerned about the tidal wave of climate scepticism that comes with last month's election of Donald Trump and his associates. The election might have powerful effects on science policy and funding. But I want to stress the power and promise of human agency.

In my case, adjustments are minor, but might seem substantial elsewhere. I realize that in my day-to-day actions in the classroom and in my research with family farmers and ranchers, I probably hold a minority viewpoint on human-induced climate change. In the classroom, I am sensitive to the fact that many of my students have family ties to the oil and gas industry. I regularly see them struggle with the local contradictions. I try to create a place of mutual respect to embrace this struggle on their own terms, while also trying to focus on our role as global citizens facing global challenges. It is not always an easy balancing act; these experiences have taught me that most students care about global environmental change, but often have little previous exposure to such issues — in part because of the decisions of local politicians and school boards. In our debriefing at the end of the semester, students often express frustration that they weren't exposed to many of the issues surrounding climate change at a younger age.

I also learned that actively listening to (instead of talking at) farmers and ranchers who care about sustaining their land and livelihoods is a good way to open dialogue. We can then find common ground on pressing environmental issues, such as the depletion of the Ogallala Aquifer, encroachment of invasive and nuisance woody-plant species on pasture lands, and the compounding impacts of long-term cyclical

drought. People in Oklahoma care about the long-term sustainability of their natural resources, but they often use language that is different from that of climate scientists and elected officials.

We should remember the power of the small. In *Diagrams of the Mind* (Ole UPenn Press, 1985), James C. Scott illustrates the power of "everyday forms of resistance." It is through these small acts (both intentional and unintentional) that power can be contested, destabilized and renegotiated. There may be increased climate scepticism, but there will also be more scientists, teachers and citizens banding together to respond.

Despite official policies that limit climate change education, a recent survey of 115 science teachers in Oklahoma showed that more than 80% teach climate change in state schools, either formally or informally (C. M. Colton and T. A. Fey *J Educ Policy* 30, 773–795, 2015). Faced

with few locally available teaching resources, most teachers write their own lesson plans. They also take advantage of "teach the controversy" campaigns — intended by some to undermine the scientific consensus — to introduce students to locally controversial topics such as human-induced climate change, which otherwise might be seen as off limits. Consequently, more than two-thirds of these teachers say that they experience no pushback from students, parents or administrators (C. M. Colton and J. M. Vадjumeц *Geosoc Res* 235–248, 2015).

In resisting the mood of anti-science, researchers need to reach out to a diverse public in more accessible ways. We also need to accept different ways of knowing or even talking about climate change: ways that open doors to start a conversation; ways that are more context specific, culturally sensitive and nuanced than science in general might be comfortable with.

For example, state politics in Oklahoma are shaped in part by continuous interactions with Oklahoma's 39 Tribal Nations. These Native Americans, in conjunction with researchers and media artists, are speaking up to provide their own unique perspectives on climate change (see go.nature.com/2gk4t0). Such projects show that indigenous people care deeply about climate change issues, but that when it comes to adaptation and mitigation, they would like their traditional knowledge to be valued along with that produced by Western science.

When there is climate war, there is also climate resistance, in large and small ways. I urge scientists not to lose heart, but to develop tools and projects that are useful to citizens, as well as to our peers and funding agencies. In practicing such open-minded science, we might find that we have more allies than are visible at first glance. ■

Jacqueline M. Vадjumeц is an associate professor in the Department of Geography at Oklahoma State University in Stillwater. e-mail: jacqueline.vadjumeц@okstate.edu

WHERE THERE IS
CLIMATE WAR,
THERE IS ALSO
CLIMATE
RESISTANCE,
IN LARGE AND
SMALL WAYS.

Major Science/IBE Societies: Twitter handles and membership

Amer. Chem. Soc.	@AmerChemSociety	160,000
AAAS	@AAAS	120,000
Union Concerned Scientists	@UCSUSA	100,000
NSTA	@NSTA	50,000
Amer Physical Soc.	@APSPPhysics	50,000
IBE	???	200
BMES	@BMESociety	7,000
Soc. for Biomaterials	@SFBiomaterials	1,000
IEEE	@IEEEorg	400,000

Internet in a Minute!

Over 2 Million Google searches
over 300,000 Tweets
about 3 Million YouTube views
over 20 Million WhatsApp messages

If you Facebook, Tweet, post, blog, comment, like, follow -
then

‘You are a publisher!’ says Adam Sharp.

‘You are part of ‘the media’’



Bagley Cartoon: The Strongman

By **PAT BAGLEY** | The Salt Lake Tribune | [contact](#)

First Published Dec 06 2016 05:54PM - Last Updated Dec 06 2016 05:56 pm



Twitter Followers

@NeilTyson	7 Million (M)
@ProfBrianCox	2.5 M
@RichardDawkins	2 M
@LKraus1	300K
@MichaelEMann	50K
@danlevition	20K
@PaulREhrlich	10K
@JoeAndrade2012	<100!



TWEETS
5,279

FOLLOWING
51

FOLLOWERS
7.09M

LIKES
2

LISTS
9

Follow

Neil deGrasse Tyson

@neiltyson

Astrophysicist

New York City

haydenplanetarium.org/tyson/

Joined January 2009

Tweets Tweets & replies Media



Neil deGrasse Tyson @neiltyson · Mar 24

JUST POSTED: [@StarTalkRadio](#) "Science & Technology in the Military" with Ash Carter. On [@iTunes](#) &



Science and Technology in the Military, with Ash Ca...
Neil Tyson talks science, technology and defense with Ash Carter. Ft. Leighann Lord, Michael Horowitz, P.W.

1. **Neil deGrasse Tyson** @neiltyson
(<https://twitter.com/neiltyson>) **We all want to Make America Great Again. But that won't happen until we first Make America Smart Again.**

2. **Neil deGrasse Tyson** @neiltyson
(<https://twitter.com/neiltyson>) **The very best way to support and feed your delusions: Surround yourself with people whose world views match yours exactly.**



3. **Neil deGrasse Tyson** @neiltyson
(<https://twitter.com/neiltyson>) **We can all imagine a land that provides no support for Art. But is that a place you'd want to Live? To Visit? To Play?**



4. **Neil deGrasse Tyson** @neiltyson
(<https://twitter.com/neiltyson>) **The fastest way to melt glaciers & flood the World's coastal cities: Ignore scientists and do nothing to stem the rise of CO2**



5. **Neil deGrasse Tyson** @neiltyson
(<https://twitter.com/neiltyson>) **The fastest way to thwart Earth's life-support systems for us all: Turn EPA into EDA — the Environmental Destruction Agency.**



6. **Neil deGrasse Tyson** @neiltyson
(<https://twitter.com/neiltyson>) **The fastest way to Make America Stupid: Cut funds to programs that support education.**



7. **Neil deGrasse Tyson** @neiltyson
(<https://twitter.com/neiltyson>) **The fastest way to Make America Sick Again: Cut funding to the National Institutes of Health**



Tweet: 140 characters,
better less - like a nano-abstract.

Letter to Editor - about 200 words.
Short abstract - often 200 words.

We know how to write - briefly,
succinctly, clearly.

So do it.

Other Tweeters and their Followers:

@HillaryClinton	17 M
@MichelleObama	7 M
@BarackObama	86 M
@realDonaldTrump	27 M
@POTUS	16 M
@FLOTUS	7 M
@TheEllenShow	66 M
@ladygaga	66 M
@Oprah	36 M
@LeoDiCaprio	17 M
@StephenatHome	13 M
@KatyPerry	100 M!



TWEETS 34.7K FOLLOWING 43 FOLLOWERS 27.1M LIKES 47

[Follow](#)

Donald J. Trump

@realDonaldTrump

45th President of the United States of America

Washington, DC

Joined March 2009

[Tweet to Donald J. Trump](#)

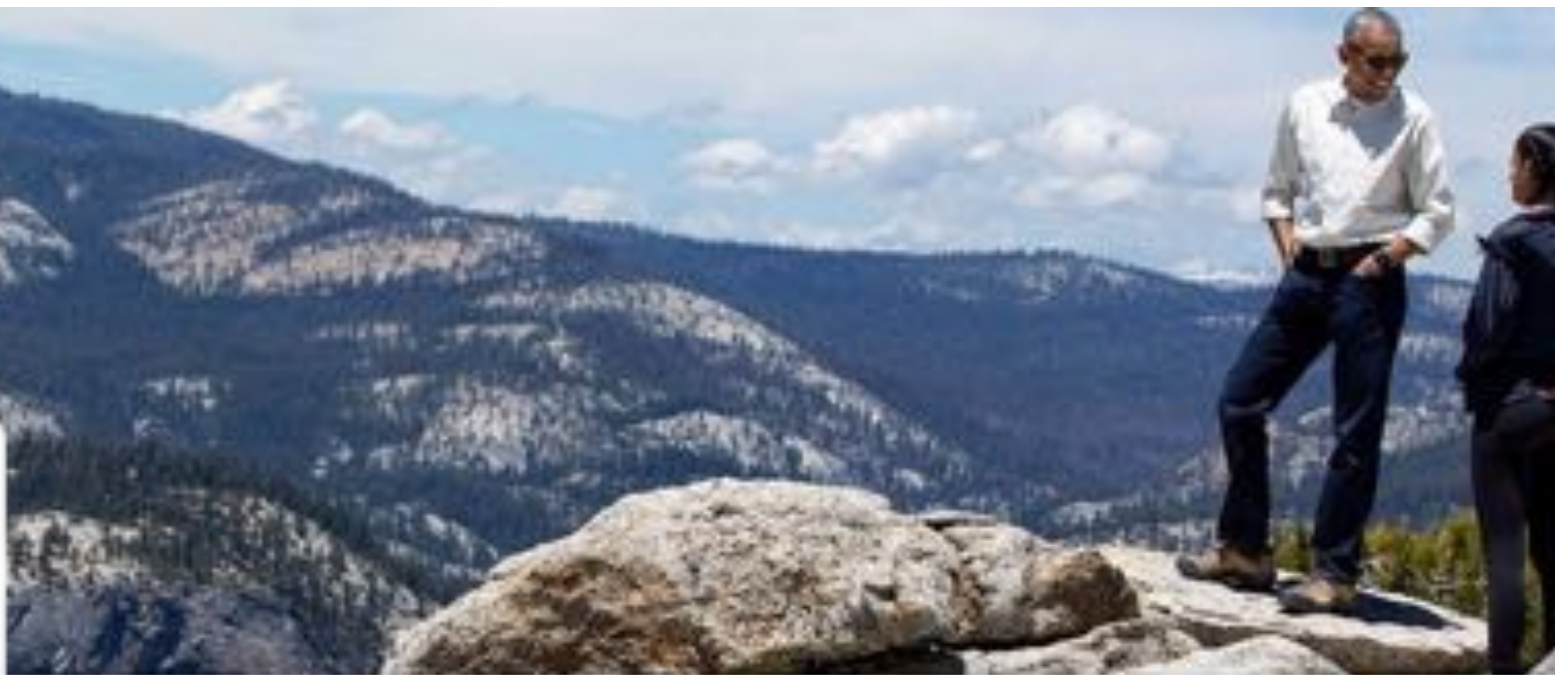
Tweets Tweets & replies Media



Donald J. Trump @realDonaldTrump · 17h

General Kelly is doing a great job at the border. Numbers are way down. Many are not even trying to come in anymore.

22K 16K 79K



TWEETS
15.4K

FOLLOWING
631K

FOLLOWERS
86.3M

LIKES
10

LISTS
3

Following

Barack Obama

@BarackObama

Dad, husband, President, citizen.

Washington, DC

obama.org

Joined March 2007

Born on August 4, 1961

Tweet to Barack Obama

Tweets

Tweets & replies

Media



Barack Obama @BarackObama · Mar 23

My heart goes out to the victims and their families in London. No act of terror can shake the strength and resilience of our British ally.

13K

143K

787K



TWEETS 1,674 FOLLOWING 36 FOLLOWERS 77 LIKES 1 LISTS 3 MOMENTS 0

Edit profile

Joe Andrade

@JoeAndrade2012

Working towards a sustainable future

Salt Lake City, UT

statechange.us

Joined February 2012

Photos and videos

Tweets Tweets & replies Media



Joe Andrade @JoeAndrade2012 · 18h

How @NewsHour can @SenJohnBarrasso with degrees from Georgetown – and an MD degree – be so dogmatic," Bill asked: statechange.us.



SCIENTIFIC COMMUNITY

From a tweet, a March for Science is born

Plans for 22 April demonstrations spread to more than 100 cities around the world

By **Lindzi Wessel**

It was a tweet that brought them together. “Hell hath no fury like a scientist silenced,” Caroline Weinberg, a public health educator and science writer in New York City, tweeted late last month. As a result of worries about the impact that President Donald Trump’s administration might have on scientists,

The marches will be not just for scientists, but for “anyone who believes in empirical science,” the organizers emphasize on the March for Science web page. The demonstrations are meant to be a celebration of science, they say, as well as “a call to support and safeguard the scientific community.”

But although the march has garnered the endorsement of many prominent sci-

general scientific society. AAAS has not yet decided whether to endorse or participate in the march.

The debate over the march’s wisdom is just part of the whirlwind that has engulfed its amateur organizers, who have yet to meet in person. “I’ve lost so much weight from forgetting to eat,” Aquino says. In just weeks, the organizers have created a web page, written a mission statement, and es-

MARCH FOR SCIENCE

EARTH DAY

APRIL 22, 2017



TWEETS
1,693

FOLLOWING
382

FOLLOWERS
341K

LIKES
1,861

LISTS
4

 Follow

March for Science

@ScienceMarchDC

The March for Science champions robustly funded and publicly communicated science as a pillar of human freedom and prosperity. March with us on April 22, 2017.

 Washington, DC

 bit.ly/2miCSZA

 Joined January 2017

 Tweet to March for Science

Tweets

Tweets & replies

Media

 Pinned Tweet



March for Science @ScienceMarchDC · Mar 9

Here's what the #ScienceMarch is. We are political. We value diversity. We won't put up with harassment. Read more:



RCH FOR SCIEP

Statement on IDEA

It is time for scientists, science enthusiasts, and concerned citizens to come together to make ourselves heard.

marchforscience.com

By Gabrielle Kardon

Step out of the lab and engage

Last month I found myself sitting on a leather couch, my black dress smoothed over my knees, in a hushed wood-paneled room in Washington, D.C. The silence was broken by a group of lobbyists for the aerospace industry bantering about labor costs. I panicked for a moment. “Why am I here waiting in the anteroom of this senator’s office?” I asked myself. I had a mission—advocating for science funding—but I felt out of my element. Normally, I would be sitting in jeans and a T-shirt peering down a microscope at sections of muscle tissue. But I reminded myself that scientists have an important role to play in public policy.

My path to active policy engagement began when a graduate student and I stumbled into studying a common but relatively unstudied birth defect. Congenital diaphragmatic hernia (CDH), in which the diaphragm muscle does not develop properly, ultimately kills 50% of afflicted infants. After the excitement of publishing our research, I realized that I knew little about how this birth defect actually affects people’s lives. So I reached out to Cherubs, a community of CDH patients and parents, which enthusiastically embraced my



many people I employ and the effects of a flatlined NIH budget on the lab’s personnel and productivity, and I realized that few nonscientists understand the practical realities of conducting scientific research.

Did my visits to Congress make any difference? I know that Sessions’s office made yearly inquiries into NIH funding for birth defects when he was a senator and that Representative Stewart now knows that a developmental biology lab is like a small business, but I’m not sure how much further the impact extends. A

fect actually affects people's lives. So I reached out to Cherubs, a community of CDH patients and parents, which enthusiastically embraced my lab and me. In 2015, when I heard the group was lobbying Congress for increased research funding, I decided to join the effort. I was curious whether our concerns would resonate with our elected officials.

We visited more than a dozen members of Congress. The highlight was a discussion with then-Senator Jeff Sessions (R-AL), whose grandson is a CDH survivor. Fifteen CDH patients and parents crowded around a table in his conference room and took turns narrating their health care struggles. The senator (who is now the attorney general) then singled me out as the only scientist in the room and asked about the latest discoveries in CDH research. We chatted for a few minutes about the complicated genetics underlying CDH, and I saw how his personal connection with CDH sparked a sincere interest in the underlying science.

Then, last month, emboldened by this first visit and motivated by recent political events, I decided to speak with my senators and representative when I was in Washington, D.C., for a science meeting. My most memorable visit was with Representative Chris Stewart (R-UT). Again, a key to the success of this conversation was finding common interests. What resonated with him was hearing about the economics of running a lab that relies on funding from the National Institutes of Health (NIH). He was clearly interested in how



“A key to the success of this conversation was finding common interests.”

representative Stewart now knows that a developmental biology lab is like a small business, but I'm not sure how much further the impact extends. A better question may be, “Will I visit Congress again?” I can answer that with an unqualified “yes!” It is critical that we scientists engage, communicate our science, and make it accessible to the larger community. Most members of the public have

never met a scientist and may not know how science works, but we can each do our small part to change that. As I sit here writing this piece, I chide myself for not spending this time on the undone work that is piling up—experiments, manuscripts, grants, and lectures. But I've decided that replacing just one coffee hour a month with an outreach activity is a reasonable goal.

My advice is to find some way to tell your own science story that will resonate with your listeners. You could take a few hours during your next trip to Washington, D.C., to visit your senators and representatives. Attend town meetings and speak up. Volunteer in classrooms at your local schools. Participate in the March for Science. Step out of the lab, step in from the field, and engage. ■

Gabrielle Kardon is an associate professor and a National Science Foundation–sponsored STEM Ambassador (stemap.org) at the University of Utah in Salt Lake City. Send your career story to SciCareerEditor@aaas.org.

“... replacing just one coffee hour a month with an outreach activity is a reasonable goal.”

Gabrielle Kardon

In the case of Tweeting, direct your Tweet to one or 2 who need the input, the education. It may only be a ‘nano’ effect, but they add up. Be a Maxwell’s Demon via social media. Increase the Pressure!



Koch-Funded Group Tries to Persuade 200,000 Science Teachers That Climate Change Is Debatable

The [Heartland Institute](#) is trying to nurture the next generation of [climate change deniers](#).

The conservative and libertarian think tank has sent out 25,000 copies of the organization's [book](#), *Why Scientists Disagree About Global Warming*, and an accompanying 10-minute DVD to 25,000 science teachers this month, according to a [Frontline](#) report. The book argues that [climate change](#) is not settled science.



The Heartland Institute says it will send the book "Why Scientists Disagree About Global Warming" to every public school science teacher in the nation. (Brenna Verre, FRONTLINE)

Twenty-five thousand science teachers opened their mailboxes this month and found a package from the Heartland Institute, a libertarian think tank that rejects the scientific consensus on climate change.

**"WHEN THE VOICES OF
SCIENTISTS ARE NOT
HEARD, THERE IS A PRICE
TO PAY."**

Janet Napolitano, President, University of California

@314Action

www.314action.org



Joe-

I hope you saw Dr. Michael Mann's message. Yesterday, he was the only witness who defended the scientific consensus on climate change before the House Science Committee.

After Dr. Mann cited a peer-reviewed article in Science magazine, Chairman Lamar Smith responded, "that is not known as an objective writer or magazine." This is the same climate denier Congressman who has written articles in the alt-right *Breitbart* and praised President Trump as a source of "unvarnished truth."

[At yesterday's climate change hearing, Dr. Michael Mann was the lone voice for science, facing down hostile questions from fossil fuel industry-funded members of Congress. Please chip in \\$5 or more before tomorrow's quarterly deadline to](#)



LIBERTY EQUALITY REALITY

TWEETS 303 FOLLOWING 24 FOLLOWERS 6,703 LIKES 5

Follow

Michael Eisen

@SenatorPhD

Scientist, Advocate for Public, Defender of Freedom, Human Rights & Planet Earth; Believer in Data & Rationality; Candidate for US Senate from CA; Also @mbeisen

Berkeley, CA

michaieleisen.org

Joined January 2017

Tweet to Michael Eisen

10 Photos and videos



Tweets Tweets & replies Media

Pinned Tweet



Michael Eisen @SenatorPhD · Mar 2

i want to live in a free, just, equitable and safe society on a healthy planet - science is part of, not separate from, those aspirations

Retweets 91 Likes 224



Michael Eisen @SenatorPhD · Mar 27

the @Raiders once again throw the City of Oakland and fans who love them under the bus - Oakland deserves a team that wants to be here

Retweets 3 Likes 3



Michael Eisen @SenatorPhD · Mar 27

too bad @GovMikeHuckabee can't extrapolate from #NEA helping him to other government programs helping other people

Who to follow · Refresh · View all



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Follow



Utah House Democrats ...

Follow



Todd Weller @gopTODD

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Find trends

Trends · Change

#Valerian

Watch the new trailer for #Valerian - in theaters July 21

Promoted by Valerian Movie

#TorreyGreen

#wednesdaywisdom

83.3K Tweets

#ThingsAnnoyingCoworkersDo

1.2M Tweets



5:20

+ Queue

Download

Embed

POLITICS

Message To 'Resistors' From Occupy Co-Creator: Stop Protesting. Run For Office

March 28, 2017 - 5:01 AM ET

Heard on Morning Edition



ERIC WESTERVELT



Micah White, co-creator of the Occupy Wall Street movement, now lives in Nehalem, Ore., where he's active in local politics.

"There are no big businesses here. These are all my neighbors. You can't block traffic," he says.

Trav Williams

WORKPLACE DIVERSITY

**'WE ARE NOT SEEING
A MAJOR INCREASE
IN FEMALE
LEADERSHIP ...**

**AND I THINK
THAT'S A SHAME.'**

Sheryl Sandberg speaks in 2015, months after her husband died. His death has affected her views on parenthood.

Jessica Guynn
@jguynn
USA TODAY

Sheryl Sandberg's bestseller *Lean In: Women, Work, and the Will to Lead* launched a national conversation on gender in the workplace and an online community of millions of working women ready to bulldoze the barriers they face, from being paid less and promoted less frequently to carrying an uneven split of the housework and child care.

4 years after the debut of her hit book 'Lean In,' Sheryl Sandberg pushes for more progress

Donald Trump has made the drive for workplace equality as urgent as ever. Topping her agenda: equal pay, a hike in the federal minimum wage, paid family leave and maternity leave. The interview has been condensed and edited.

Q: It has been four years since the publication of *Lean In*. Are we better off or worse off four years later?

A: In terms of women in leadership roles, we are not better off. We are stuck at less than 6% of the Fortune 500 CEO jobs and their equivalent in almost every

and what will be the single-biggest factor in propelling that progress?

A: My goal is very clear, and I wrote about it in *Lean In*, which is that women run half our companies and countries and men run half our homes. As much as I wish that could happen in four years, I don't think that's a likely time period. But I think it can happen sooner than we think. Part of it is having that aspiration and that goal. I think we too often suffer from the tyranny of low expectations.

Q: What have you learned

SEE PHOTO BY LAURA CAVALLO/GETTY IMAGES FOR AVIS

What can WE do? Don't be apathetic or passive - Be Informed:

Local Paper, TV, Radio

State Paper - Governor, Legislature

NY Times - Science Times

Washington Post, LA Times

Wall St Journal and USA Today

New Scientist

The Economist

SCIENCE

NATURE

Don't give up on health care reform



Editor's note: In addition to the following by Sen. Mike Lee, see two additional perspectives on health care reform, from Deseret News columnists Dan Liljenquist and Natalie Gochnour, on the facing page.

WHEN I WAS first elected to the Senate in 2010, I ran on a promise to repeal Obamacare.

When I ran for re-election last year, I again ran on a promise to repeal Obamacare.

For more than six years, I've made finding a way to make health care more affordable for Utahns my top priority as a United States senator.

Unfortunately, the American Health Care Act, which the House of Representatives rejected last week, would have failed to reduce health care premiums for Utahns.

That is why I urged my House colleagues to vote against it.

But that is also why I am more committed than ever to finding legislation that can pass both the House and Senate and reduce health care costs.

The heart of the problem is the Washington-created, one-size fits all

regulations that treat Utah's unique population the same as that of Florida or Massachusetts.

Each of our 50 states has different populations with different health care needs. There is no reason we should all be forced to buy the same "essential health benefits" package when we shop for health insurance. What is essential to one family or individual may not be essential to another. That is a decision for our diverse states, communities and families to make, not bureaucrats and politicians in Washington.

As Americans, we should also be free to pay for the amount of health care we want, when we want it. If your family wants a high-deductible health care plan that would only cover big emergencies, you should be able to buy that plan. And if you want a more expensive plan that covers every trip you make to the doctor, you should be free to purchase that plan too.

If we could repeal these and other Obamacare regulations, we could significantly drive down the health care insurance premiums Utahns are forced to pay every month. According to actuarial experts at the Milliman consulting firm, Americans are paying between 44.5 percent and 68 percent more in premiums due to Obamacare's federal insurance regulations.

The worst thing Congress could do is abandon health care reform entirely. We've come too far and we were too close to a deal last week to give up

now. Especially after we devoted just 17 legislative days to debating the Republican Obamacare repeal and replace plan. In 1996, welfare reform took 56 days. In 1986, tax reform took 323 days. And it took President Obama 187 days to pass Obamacare. An issue as complex as health care clearly deserves more than 17 days of hasty discussion.

If we want to get this policy right — and we owe it to the country to try — then it would be a dereliction of duty to give up on health care reform after just over two weeks of trying.

Americans, including many Utahns, are suffering every day under the dysfunction of our federal health care system, and it would be cold-hearted to turn our backs on this issue.

In just the past year the number of health insurance plans being offered in Utah has dropped from four to three. Twenty out of 29 counties only have one health insurance provider. Premiums have risen by 30 percent. I've talked to countless Utahns who've been forced — literally forced — to pay more in health insurance premiums each month than they pay for the monthly mortgage payment that puts a roof over their heads.

These people are why I am still fighting to fix your health care. They need help now. And they deserve more than a two-and-a-half-week effort.

Mike Lee is the junior U.S. senator from Utah.

Deseret
News
3-30-2017

What Else?

Do you have teen age kids? Time for quality time!

What are they reading?

What are their concerns, interests?

Get them fact-checking

Teach them to separate fantasy from reality, to diagnose ignorance, to call out lies.

Follow your Congressperson, contact her regularly.

Ditto for Governor, local legislators

Correct local officials, reporters, politicians.

Don't tolerate lies, BS, or hypocrisy - call it out.

How about 15 minutes/day - every day?!

Today at 3:23 PM

LS

Senator Mike Lee <mike_lee@lee.senate.gov>

To: Joseph Andrade <joe.andrade@utah.edu>

Reply-To: mike_lee@lee.senate.gov

The Laudable Pursuit: Fighting to Fix Your Health Care



March 31, 2017

"To elevate the condition of men--to lift artificial weights from all shoulders, to clear the paths of laudable pursuit for all, to afford all an unfettered start and a fair chance, in the race of life." --Abraham Lincoln

Chairman's Note: Fighting to Fix Your Health Care

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KNOW what you are talking about:



And insist others know what they are talking about



www.statechange.us
joe.andrade@utah.edu
@JoeAndrade2012

Thanks
Discussion?

“Perhaps the sentiments contained [herein] ... are not yet sufficiently fashionable to procure them general favor; a long habit of not thinking a thing wrong, gives it a superficial appearance of being right, and raises at first a formidable outcry in defence of custom.

But the tumult soon subsides. Time makes more converts than reason.”

Thomas Paine

“Too much sanity may be madness – and the maddest of all – to see life as it is, and not as it ought to be.”

Don Quixote via Cervantes

