Seed Magazineabout

SEEDMAGAZINE.COM *September 24, 2009* Subscribe to the magazine » RSS & Email Updates » Follow us on Twitter »

Erasing Dark Energy

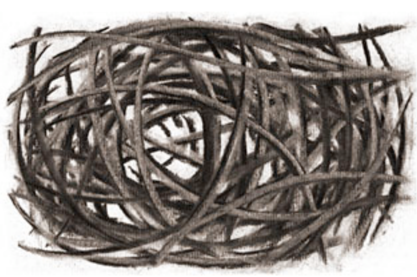
Wide Angle / by Veronique Greenwood / September 24, 2009

Why do we need dark energy to explain the observable universe? Two mathematicians propose an alternate solution that, while beautiful, may raise even **more questions than it answers.**

- ShareThis
- Print

Page 1 of 2

1 2 Next »

 Illustration by Mike Pick

Against all reason, the universe is accelerating its expansion. When two prominent research teams dropped this bombshell in 1998, cosmologists had to revise their models of the universe to include an enormous and deeply mysterious placeholder they called "dark energy." For dark energy to explain the accelerating expansion, it had to constitute more than 70 percent of the universe. It joined another placeholder, "dark matter," constituting 20 percent, in overshadowing the meager 4 percent that make up everything else—things like stars, planets, and people.

That a huge fraction of the universe could be composed of this enigmatic stuff was unnerving, to say the least. But what was most disturbing to cosmologists was that the discovery required adding a term to Einstein's equations of general relativity. These equations were derived from pure mathematics and had already beautifully predicted the expansion of the universe, discovered by Edwin Hubble in 1929. To many, even those who accepted its usefulness in explaining the data, dark energy was an inelegant addition. Over the last decade, some researchers have been working to describe what dark energy might be, but others have gone back to see if the equations of general relativity can be tweaked to avoid having to use such a troublesome piece of math.

Building from the Einstein equations, mathematicians Blake Temple and Joel Smoller have now found a way to explain the observations that led researchers to propose dark energy. If their solution, published in the *Proceedings of the National Academies of Science,* fits the data, it could provide a way out of the unpalatable notion of a dark-energy-dominated universe.

The concept of dark energy—which is simply that a phenomenal amount of energy exists in the vacuum of space—emerged from a discrepancy between how far away supernovae were supposed to be and how bright they appeared. In the 1990s, two teams, one led by cosmologists at the Lawrence Berkeley National Labs (LBNL) and the other by Australia's Mount Stromlo Observatory, were in the midst of a massive survey of Type Ia supernovae. Measuring the brightness of these huge stellar explosions lets scientists deduce how much the universe has expanded since the light began its journey.

The two teams were hoping to observe that the brightness of the supernovae, which grows increasingly dim the farther they are from Earth, would plateau at the farthest edge of the observable universe. This would reflect the theory that the universe's expansion was slowing down due to the gravitational pull of matter. But what they observed was the exact opposite. In fact, the supernovae were receding at a rate that would only be possible in a universe with no matter at all.

After considering and ultimately rejecting alternative explanations for the dimming, both teams came to the same conclusion: The supernovae were dim because they were being pushed away by a wave of universal, accelerating expansion. And that could only happen if a huge amount of energy was counteracting the force of gravity. Thus, dark energy was conceived.

To Temple and Smoller, mathematicians at the University of Michigan and the University of California–Davis, respectively, dark energy seemed an ad hoc addition to cosmology. While performing mathematical research on shockwaves, Temple and Smoller realized that an expanding wave with its epicenter near the Earth could produce the dimming effects the two teams had observed. The two started talking to astrophysicists and other mathematicians to flesh out the idea. What they discovered was as utterly unexpected to them as dark energy was to cosmologists: An accelerating wave of expansion following the Big Bang could push what later became matter out across the universe, spreading galaxies farther apart the more distant they got from the wave's center. If this did happen, it would account for the fact that supernovae were dim—they were in fact shoved far away at the very beginning of the universe. But this would've been an isolated event, not a constant accelerating force. Their explanation of the 1998 observations does away with the need for dark energy.

The theory is attractive because it describes the effect astronomers observed using only general relativity. It also provides a mechanism for a scenario that's been discussed in cosmology for some time, the "bubble of underdensity"—the idea that the Earth might be in an area with a low mass density compared to the rest of the universe, which would account for the distance of the supernovae. And Smoller and Temple say that once they have worked out a further version of their solutions, they should have a testable prediction that they can use to see if the theory fits observations.

Page 1 of 2

1 2 Next »

Tags complexity consensus space truth

Share this Facebook Twitter Stumbleupon Reddit Email + More

Now on SEEDMAGAZINE.COM

- **Books**

  Survival of the Kindest

  In his new book, ***The Age of Empathy*****,** Frans de Waal outlines an alternative to **"Nature, red in tooth and claw."** Can a vision of a more empathic world change the **way we behave toward each other?**

- **Ideas**

  Erasing Dark Energy

  Why do we need dark energy to explain the observable universe? Two mathematicians propose an alternate solution that, while beautiful, may raise even **more questions than it answers.**

- **Ideas**

  Richard Dawkins Seeks Converts

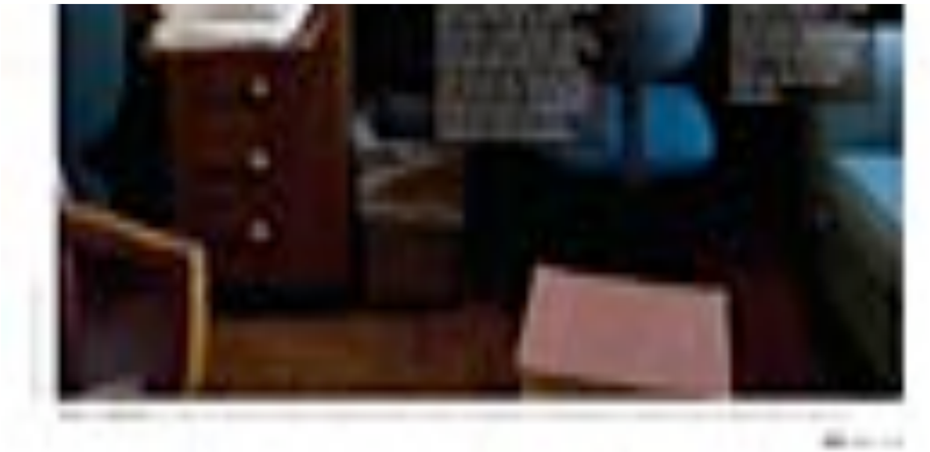
In his new book, Richard Dawkins sets out to convince the unconvinced that **evolution is true. Will he succeed?**


THE
LAST
EXPERIMENT


BAD
MEMORIES

THE EXTINCTION OSCILLATOR

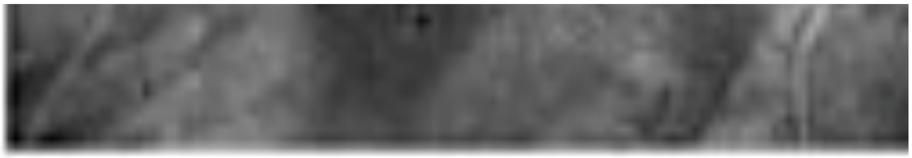
Ocean Fertilization




THE LAST EXPERIMENT

The

Political
Scientist




EGO
DREAD


Subscrib


See it again
e to Seed
Subscribe Now

The Current Issue *The Last Experiment*

Subscribe to Seed

- Tags
- research
- policy
- theory
- technology
- innovation
- politics
- creativity
- climate
- genetics
- decision making
- space
- energy
- neuroscience
- truth
- development
- governance
- ecology
- leadership
- cooperation
- scale
- data
- funding
- systems
- public perception
- cognition
- law
- dna
- disease
- information
- biotechnology
- food
- complexity
- design
- medicine
- happiness

- growth
- ethics
- limits
- visualization
- networks
- education
- bias
- scarcity
- economics
- competition
- media
- water
- democracy
- literacy
- music
- consensus
- carbon
- geography
- environment
- math
- engineering
- identity
- religion
- diplomacy
- pandemics
- enhancement
- time
- crime
- intelligence
- proof
- structure
- contagion
- life
- collapse
- multilateralism
- social science
- sciart
- efficiency
- globalization
- robotics
- community
- borders

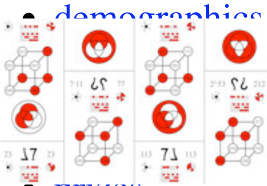
- Home
- World
  - Politics
  - Development
  - Environment
- Ideas
  - Findings
  - Theory
- Innovation
  - Technology
  - Design

- selection
- fabrication
- synthetic biology
- resilience
- conflict
- irrationality
- cities
- pace
- n
- virus
- security
- gdp
- capitalism
- risk
- demographics
- prizes
- gpd
- geometry

- Business
- Culture
  - Books
  - Arts
  - Events
- Subscribe
  - The Current Issue

The Seed Salon

Video: conversations with leading scientists and thinkers on fundamental issues and ideas at the edge of



Are We Beyond the Two Cultures?

Video: Seed revisits the questions C.P. Snow raised about science and the humanities 50 years by asking

Saved by Science

Audio slideshow: Justine Cooper's large-format photographs of the collections behind the walls of the A

The Universe in 2009

In 2009, we are celebrating curiosity and creativity with a dynamic look at the very best ideas that give u

Revolutionary Minds
The Interpreters

In this installment of Revolutionary Minds, five people who use the new tools of science to educate, illu

The Seed Design Series

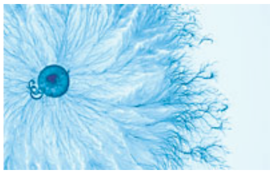
Leading scientists, designers, and architects on ideas like the personal genome, brain visualization, gener

The Seed State of Science

Seed examines the radical changes within science itself by assessing the evolving role of scientists and th

A Place for Science

On the trail of the haunts, homes, and posts of knowledge, from the laboratory to the field.



Portfolio

Witness the science. Stunning photographic portfolios from the pages of Seed magazine.

Studio
Search find it

- Home
- World
  - Politics
  - Development
  - Environment
- Ideas
  - Findings
  - Theory
- Innovation
  - Technology
  - Design
  - Business
- Culture
  - Books
  - Arts
  - Events
- Monthly Archives
- All Tags

Subscribe to Seed | About SEEDMAGAZINE.COM | Advertise with SEEDMAGAZINE.COM | Privacy Policy | Terms & Conditions | Contact Us

SEEDMAGAZINE.COM by Seed Media Group. ©2005-2009 Seed Media Group LLC. All Rights Reserved.

Sites by Seed Media Group: Seed Media Group | ScienceBlogs | Research Blogging | SEEDMAGAZINE.COM