Technology and Social Trends

Nine trends society leaders are facing in the early 21st Century
Trend #1
Science and Education Are Taken for Granted
VIOLENT CRIMES ARE ON THE DECLINE

MURDERS WORLDWIDE

2001  2008

VIOLENT CRIME RATE, U.S.

PER 100,000 PEOPLE

EARLY 1990's  2008
The Waning of War

World-wide battle deaths per 100,000 people

- Colonial
- Interstate
- Civil
- Civil (with foreign intervention)

Source: Human Security Report Project, the Uppsala Conflict Data Project, and the Peace Research Institute of Oslo
Measles cases rise
Laboratory confirmed cases of measles in England and Wales

*Provisional data
Source: Health Protection Agency
Average annual reported whooping cough cases per 100,000 population

Source: Centers for Disease Control and Prevention
A Big Whoop: California’s Cough

A month-by-month analysis shows just how fast the state is moving toward a full-blown pertussis outbreak.

Source: California Department of Public Health
Scott Walker cut $250 mn from Wisconsin colleges. Now he’s blowing it on a basketball arena. slate.me/1L6AHmT
Illinois cuts off funding for its public universities

By Nova Safo
March 18, 2016 | 10:22 AM
Trend #2

The Squeeze Is On in Academia
Figure 2-28
Natural sciences and engineering doctoral degrees, by selected country: 2000–08

Thousands

- China
- United States
- Germany
- Russia
- India
- UK
- Japan
- South Korea
Figure 2-19
S&E doctoral degrees earned in U.S. universities, by field: 2000–09

Thousands

- Social/behavioral sciences
- Biological/agricultural sciences
- Engineering
- Physical sciences
- Medical/other life sciences
- Mathematics
- Computer sciences

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009
Recent Progress in the US

Unexpected spending in recent omnibus spending bill

- NIH funding increased by $2 billion, largest increase in 12 years
- FDA receives 5% increase in funding
- NASA receives a 6.6% increase in funding
- NOAA budget increases 4%
- NSF receives a 1.6% increase
- DOD receives a 1.4% increase
Percentage of NIH R01 Principal Investigators Age 36 and Younger and Age 66 and Older (Fiscal Years 1980 to 2010)
How was your spring break?

Good. I got a grant application finished, a book review done, three papers submitted and an exam put together. How about you?

Good. I went skiing in Colorado.
Talk to actual scientists, and . . .

- Top concern is funding
- Younger scientists are checking out
- Glut of scientists
- Older scientists hanging on too long
- Administrative burden is killing productivity
- Careers are too uncertain
- Contracts are unfair, research is serfdom
- Top concern is funding
European Commission reveals details of proposed cuts to science

By Erik Stokstad  |  15 January 2015 2:16 pm  |  1 Comment

A controversial plan to use research funds to pay for economic stimulus became more concrete this week, as European Commission President Jean-Claude Juncker unveiled proposed legislation to implement the shift. The new investment fund would take €2.7 billion over 5.5 years from Horizon 2020, the commission’s main funding stream for research that will invest about €60 billion between 2014 and 2020. Draft legislation, released on 13 January, lays out the framework for the stimulus.

The single largest share of the Horizon 2020 cuts—€350 million—would be directed at the European Institute of Innovation and Technology (EIT) in Budapest. With a staff of about 50, it funds collaborations between universities and industry to work on issues such as climate change adaptation and sustainable energy. The cut would amount to 13% of its budget. Another victim is the basic research portfolio of the European Research Council (ERC), which would lose €221 million, mostly in 2016 and 2017.

The commission has said it believes that the economic stimulus will ultimately generate new funds for research. It also points out that, even with the cuts, Horizon 2020 and the ERC budgets remain substantially higher than during the previous funding period. (Taking funds from research is also less difficult politically than getting it from agriculture, the commission admits.) The European Parliament is expected to approve the legislation relatively quickly, so that the new stimulus fund may begin in June.

Research advocacy organizations lobbied last month to protect Horizon 2020, but their response this week has been muted. “I’m surprised that there isn’t a louder outcry and no clearer opposition from the scientific community,” Hans-Olaf Henkel, a member of the European Parliament, told Science|Business. “What are these ministers for research, presidents of science organisations, and scientists themselves doing? Where is the outcry by all European Nobel laureates?”

Here are the biggest cuts to Horizon 2020 programs called for by the legislation (in € million):

1. Horizon 2020: €350 million
2. ERC: €221 million
3. EIT: €13% of budget

Staff Writer

Email Erik

Follow @erikatoka
Parliament and scientists both claim win on reversing Horizon 2020 cuts

Éanna Kelly, Science|Business

Following tough negotiations, the European Commission has announced it will cut €500M less from the Horizon 2020 research programme, after additional money is found in the EU budget.

The European Commission will walk back cuts to the Horizon 2020 research programme after a deadlock agreement was reached this morning following all-night negotiations.

Three Horizon 2020 budget lines, the European Research Council (ERC), the Marie Skłodowska-Curie Actions and the ‘widening participation’ programme, have had their budgets ring-fenced.

MEPs, the Commission and member states struck a deal on the vexed issue of how best to finance Jean-Claude Juncker’s new stimulus fund at 8am on Thursday.

On the eighth round of talks, the Commission gave in to MEPs and scientists who said a proposed €2.7 billion trim to the Horizon 2020 research programme was too much. The money was to constitute a major part of the guarantee supplied by the EU to Juncker’s European Fund for Strategic Investments (EFSI).

MEPs secured a €500 million reduction on this figure after the Budget Commissioner Kristalina Georgieva agreed to divert an extra €1 billion from EU accounts into the fund.

“Yes we did it!” Research Commissioner Carlos Moedas declared this morning following news of the end of negotiations.
PARIS—In an effort to modernize the principles and empirical procedures of examining phenomena and advancing humanity’s collective knowledge, the International Council for Science announced Thursday the addition of a “Seek Funding” step to the scientific method. “After making an observation and forming a hypothesis as usual, the new third step of the scientific method will now require researchers to embark upon an exhaustive search for corporate or government financing,” said the group’s president, Gordon McBean, adding that the new stage of the process, which will be implemented across every scientific discipline, also entails compiling and forwarding grant proposals to hundreds of highly competitive funding sources. “Next, scientists simply modify their study’s goals to align with the vision of potential funders and wait for several months to hear back. At this point—should this step be successful, of course—they can move on to the experimental stage, and then to analysis.” McBean confirmed that the council was also developing a new initial step for the scientific process, “Assess Profitability of Research,” which would help determine if systematic investigation is even worth pursuing in the first place.
Trend #3

The Squeeze Is On in Scholarly Publishing
Companies

Tier 1 Companies ($1B+)
- 0.4% Share of companies
- 19% Share of revenue
- 0.0% One-year revenue growth
- $446K Average revenue per employee

Tier 2 ($500M to $999M)
- 1% Share of companies
- 21% Share of revenue
- -0.1% One-year revenue growth
- $173K Average revenue per employee

Tier 3 ($100M to $499M)
- 6% Share of companies
- 31% Share of revenue
- 0.1% One-year revenue growth
- $144K Average revenue per employee

Tier 4 ($25M to $99M)
- 12% Share of companies
- 14% Share of revenue
- 0.4% One-year revenue growth
- $187K Average revenue per employee

Tier 5 ($<25M)
- 81% Share of companies
- 16% Share of revenue
- 1.5% One-year revenue growth
- $180K Average revenue per employee

Revenues

71%

29%
MEDLINE-indexed articles published per year

Graph showing the increase in MEDLINE-indexed articles from 1950 to 2010.
Changes in actual serials expenditures and number of serials purchased and resultant unit costs at ARL universities - a comparison with reported serials price increases* (indexed 1990 = 100)

Change in Average Serial List Price (US$) based on those reported in the Library Journal's Periodical Price Survey

Change in Total Serials Expenditure (US$) - Based on average for ARL libraries reporting 1990-2010

Change in No. of Serials Purchased - Based on average for ARL libraries reporting 1990-2010

Change in Actual Cost per Serial taken (US$) - Based on average for ARL Libraries reporting 1990-2010

*Expenditures not indexed for inflation
Harvard’s “Journals Crisis”
More Papers per Journal

![Bar chart showing the number of papers per journal from 2006 to 2013 with an increase of +15% in 2013.]
DRAWING comparisons to Edward Snowden, a graduate student from Kazakhstan named Alexandra Elbakyan is believed to be hiding out in Russia after illegally leaking millions of documents. While she didn’t reveal state secrets, she took a stand for the public’s right to know by providing free online access to just about every scientific paper ever published, on topics ranging from acoustics to zymology.

Her protest against scholarly journals’ paywalls has earned her rock-star status among advocates for open access, and has shined a light on how scientific findings that could inform personal and public policy decisions on matters as consequential as health care, economics and the environment...
Growth in OA Slowing Dramatically

Publication rates of 20 major OA journals, 2012-2014

63.7%
17.0%
-2.5%
Growth Slowing Dramatically
CAGR of article publication for 20 major OA journals, 2011-2014

- CAGR = 5000
- CAGR = 10000
- CAGR = 15000
- CAGR = 20000
- CAGR = 25000
- CAGR = 30000
- CAGR = 35000
- CAGR = 40000
- CAGR = 45000
- CAGR = 50000

1. Total CAGR = 63.7%
2. Total Without PLOS ONE CAGR = 48.7%
3. CAGR = 17.0%
4. CAGR = -2.2%
5. CAGR = 21.2%
6. CAGR = 3.3%
PLOS Feeling the Pinch?

11% decrease in article volume, 10.7% APC increase for ONE in 2015
UK Journal Subscriptions

Full Gold OA in the UK
Trend #4

Academia Under the Microscope
Income of UK HE providers by source 2008/09 to 2013/14

Source: HESA Finance Statistics Record 2013/14
Figure. Expenditures on a child from birth through age 17, total expenses and budgetary component shares, 1960 versus 2013.

1960
- Miscellaneous: 12%
- Child care & education: 2%
- Health care: 4%
- Clothing: 11%
- Transportation: 16%
- Food: 24%
- Housing: 31%

Total = $198,560 (in 2013 dollars)

2013
- Miscellaneous: 8%
- Child care & education: 18%
- Health care: 8%
- Clothing: 6%
- Transportation: 14%
- Food: 16%
- Housing: 30%

Total = $245,340

1 U.S. average for a child in middle-income, husband-wife families.
Thus, although the 20-year increases in net tuition and fees at public and private colleges were most likely not a problem for families in the top 5 percent of income, those increases were a real challenge for families in the middle 20 percent, and were devastating to families in the bottom 20 percent.
“Stop Universities from Hoarding Money”

• Last year, Yale paid about $480 million to private equity fund managers as compensation — about $137 million in annual management fees, and another $343 million in performance fees, also known as carried interest — to manage about $8 billion, one-third of Yale’s endowment.

• In contrast, of the $1 billion the endowment contributed to the university’s operating budget, only $170 million was earmarked for tuition assistance, fellowships and prizes. Private equity fund managers also received more than students at four other endowments I researched: Harvard, the University of Texas, Stanford and Princeton.

Sitting on Piles of Money

Malcolm Gladwell @Gladwell

I was going to donate money to Yale. But maybe it makes more sense to mail a check directly to the hedge fund of my choice.

2:06 PM - 19 Aug 2015

369  434
Rich Schools, Poor Students

“... the highest-endowment colleges and universities, which need government subsidies the least, get the greatest subsidy per student.”

Figure 1: Median Percentage of Federal Pell Grant Participation Versus Average Taxpayer Subsidy by Type of Institution, 2013

As Taxpayer Investment Goes Up, the Percent of the Student Body With Pell Grants Goes Down

- January 2015 – American Institutes for Research
Trend #5

Technology Is Complex and Expensive
Trend #6

The Internet Sucks
Why the Internet Sucks

- It creates bigger companies
- It has undercut the Fourth Estate
- It feeds income and societal inequities
- It’s not where we want it (wi-fi on planes)
- It’s where we don’t want it (tracking locations)
- It’s the location of today’s Cold War
- It’s more expensive to manage, but pays less
- It’s vulnerable
“... digital, even when it claims to have multiple layers [of security], is in a sense one layer. Penetrate that, and you could potentially no longer have another layer you need to penetrate.”
Trend #7

Fragmented Media, Politicized Ideas
User Control of Content Up Significantly – 1995 → 2015

Evolution of Content Discovery, 1975 – 2015, per Nielsen

- 1965
- 1970
- 1975
- 1980
- 1985
- 1990
- 1995
- 2000
- 2005
- 2010
- 2015

- VCR
- Cable
- AOL
- DBS Satellite
- Yahoo
- Google
- Broadband
- HDTV
- VOD
- Apple TV
- Smartphone
- Roku
- Amazon Prime Instant Video
- Chromecast
- 7th gen game console
- Twitter
- Facebook
- Time-shifted viewing
- Satellite radio
- HD DVD & Blu-Ray
- DVR
- YouTube
- Netflix streaming
- Hulu+
- Smart TV
- Tablet
- Instagram
- Streaming radio
- 8th gen game console
Ideas Have Become Politics

• “Trickle down” economics is 35 years old, completely disproven, yet still persists
• Anti-vaccination worries are bunk, yet the notion persists, even in educated ranks
• Climate change is upon us, yet large swaths of the public believe it is a hoax
• Bad ideas hide behind the “I’m not a scientist” shield, which completes as, “I’m a politician”
Trend #8

“Big Data” = Big Headache
“... he and other NIH leaders are searching for ways to cut costs, and they are urging the databases' overseers to consider charging for use.”
Open Data and Data Publishing

The road ahead needs work
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<td>$35.81</td>
<td>$16 – $49</td>
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</table>
Reanalyses of 13 Null Results Medical Studies

- More patients treated: 69.23%
- Fewer patients: 15.38%
- Longer treatment time: 7.69%
- Additional treatment: 7.69%
PACE Trial Controversy

“I have not given up in my efforts to get the data to demonstrate that this trial did not show that psychotherapy extends the survival of cancer patients, but I am blocked by the unwillingness of authorities to enforce data sharing rules that they espouse.”

- James Coyne, PhD, PLoS Blog
Correlation ≠ Meaning

http://www.tylervigen.com/spurious-correlations

“Companies should remember that while big data is very good at detecting correlations, it does not explain which correlations are meaningful.”

- US Federal Trade Commission
US spending on science, space, and technology correlates with Suicides by hanging, strangulation and suffocation
Trend #8

Publishers Have an Identity Crisis
The Importance of Independence

Funders
- Foundation
- Corporation
- Government
- Institution
- Individual

Authors
- Individual
- Collaborative

How Good Is It?

POSTED BY KENT ANDERSON • FEB 1, 2016 • 19 COMMENTS

FILED UNDER ACADEMIC PUBLISHERS, ACADEMIC PUBLISHING, COWBELL, EDITING, MARKETING, MEDLINE, PEER REVIEW, PRODUCTION, PUBLISHERS, PUBLISHING, PUBMED, SCHOLARLY PUBLISHING

Editor’s Note: If you’re reading this blog, you likely know who Kent Anderson is. What you might not know is that Kent recently hung out his own shingle as an independent publishing consultant, starting Caldera Publishing Solutions. Kent now also has his own blog at the site, and it’s worth checking regularly. I recently realized that one of
Unfunded Mandates

A blogger known as *NeuroDojo* recently wrote:

“*Sometimes, it feels like every proposed reform of scientific publishing involves me doing more work.*”
Reproducibility Means More Screening

A coarse filter lets through more we can’t reproduce

“If you want better, more reproducible papers, you’re going to have fewer of them. Shorter publication lists, fewer journals, and especially fewer lower-tier journals. The number of papers that are generated now cannot be maintained under more reproducible conditions . . .”

- Derek Lowe, *In the Pipeline*
Trend #9

Governance Gets a Jolt
Organizational Behavior 101
Organizational Behavior 101

Retained Earnings as a Percent of Revenues

2010 2011 2012 2013
So I was staring at an invoice for page charges at PLoS Genetics ($2250) and wondered what could they be doing with all that money 1/40
10:09 PM - 14 Mar 2016

After all they don't provide a copy editor, or even proofs for our PDF, and all review and editorial work is done for free by academics 2/40
10:09 PM - 14 Mar 2016
Nor does PLoS, the Public Library of Science, pay for scientific conferences, or give grants to students, or really give any $$$ out 3/40

So where does my $2250 go? It came to me from tax payers via the NIH and my state university, what does @PLOS do with it 4/40?
But here's the kicker for me. In 2013 @PLOS reported $25.8MM in holdings of financial derivatives and closely-held equity interests 24/40

10:26 PM - 14 Mar 2016

Whoa, I need to stop here. Our grant money (i.e. tax payer money) is going to @PLOS so that they can play the market? OA FTW? 27/40

10:31 PM - 14 Mar 2016
If they were serious about being the PUBLIC LoS then they should give back to the scientific community, not horde their profits 33/40

10:38 PM - 14 Mar 2016
Publisher Reserves

- IEEE
- MMS
- AAAS
- AMA
- AHA
- PLOS
- AAOS
- ASCO
- ACC
- ACS

Publisher Reserves amounts:

- $0.00
- $100,000,000.00
- $200,000,000.00
- $300,000,000.00
- $400,000,000.00
- $500,000,000.00
- $600,000,000.00
- $700,000,000.00
- $800,000,000.00
- $900,000,000.00
- $1,000,000,000.00
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Trickle-Down Thinking — Does Anyone Understand Why Universities and Not-for-Profits Have Large Endowments?

Recently, Tyler Cowen on his Marginal Revolution blog asked a very important basic question that’s relevant to this audience: “Why do universities have endowments?”

Scholarly not-for-profits model themselves on their bigger perceived siblings, and the endowment concepts embraced by academia proper have become the de facto standards for behavior in scholarly not-for-profits. Associations and others are either run or heavily influenced by academics, who reflexively look to academic spending, investment, and governance policies for guidance around their own investment funds.

Endowments at academic institutions in the United States can run between two times and seven times the operating budget. Harvard’s is the largest, at ~$32 billion. Around 65 US universities have endowments over $1 billion. For many, the endowment comes in at more than $1 million per student.

These are large sums of money sitting in the bank. These relatively idle funds underscore the importance of Cowen’s basic question: Why?

Surprisingly, there’s no clear answer.
Problems with Governance

It’s always about the expertise

- Board members drawn from field, not by expertise
- Intramural politics always at play at some level
- Lack of comfort with strategy, money, process
- Stakes are high for staff, low for board
- Meetings are sporadic = slow decision-making
- “Mission” often used lazily, not passionately
- Prestige concerns makes everyone cautious
Guest Post: Kent Anderson — How Can Non-profits Improve Their Governance?

POSTED BY SCHOLARLY KITCHEN • FEB 22, 2016 • 11 COMMENTS

Editor’s Note: More from Scholarly Kitchen alumnus Kent Anderson. This post stems from a conversation around finding the right balance between effective business management and focus on mission.

Governance is coming up more frequently as a subject of conversation and concern among executives and managers in non-profit organizations. The topic’s rising prominence coincides with more acute financial stresses and vexing strategic conundrums, both of which traditional governance bodies are finding difficult to handle. Executives are duly concerned.

Unlike with the technologies, social issues, and lifestyles of the modern world, the governance structures of non-profit societies would be readily recognizable to someone from the 1950s. Not only are governance structures similar, but the people populating them would also be recognizable — mostly older academics from the field or discipline the non-profit serves.

The results of governance practices and processes can be examined to some extent, as US non-profits are required to file IRS 990 forms, which are publicly available via state Attorneys General offices as well as from GuideStar, a clearinghouse for non-profit performance data. Examining prominent non-profits with strong publishing programs, you find large investment funds, uneven growth year-to-year, and a traditional blend of revenue sources — meetings, publications, and membership dues.

Perhaps the most striking common feature comes in the form of the large amount of retained earnings in those investment funds (mixed with some gifts and endowments). Organizations that aren’t innovating tend to sit on cash, and these funds can run to several hundred million dollars, with no end in sight.
Ways to Improve Governance

It’s always about the expertise

• More professionals on boards
• More continuity positions
• Eliminate honorary governance positions
• Focus on strategic thinking
• Be more ruthless about expectations of service
• Be attuned to cultural norms and their importance
• Be daring
• Behave as if the world is changing quickly
Wrap

Head Spinning Yet?
Open access
Publisher scapegoating
Funding
Internet
Fragmentation

Fashion
Commerce
Infrastructure
Governance
Culture
Nature
Thank You

Kent R. Anderson @kanderson