

A crisis in science literacy, communication, and evidence-based policy: *At what point does our reluctance to engage the public make us complicit?*

John P. Smol

Canada Research Chair in Environmental Change
Paleoecological Environmental Assessment
and Research Laboratory (PEARL)
Dept. Biology, Queen's University



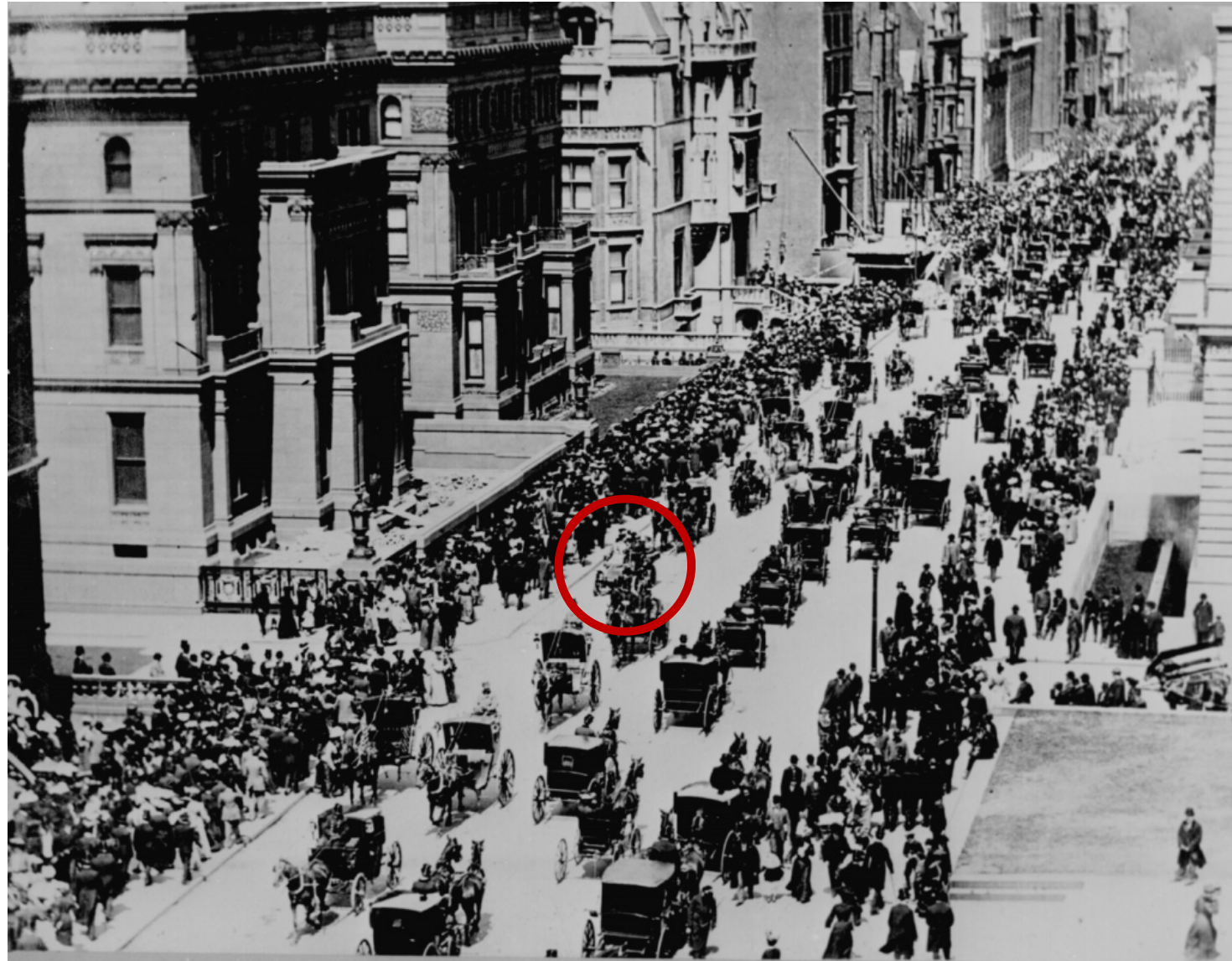
smolj@queensu.ca

At best, science is being under-used by politicians and the public-at-large.

At worst, science is being misinterpreted, misrepresented, and misused.

**1900
Easter Morning
5th Avenue
New York City**

Spot the car?



Source: US National Archives

<https://www.inmotionventures.com/movement-disrupted/>

1913

**Easter Morning
5th Avenue
New York City**

**Spot the horse
and buggy?**



Source: George Grantham Bain Collection

<https://www.inmotionventures.com/movement-disrupted/>

1900



1913



- 1) Science and technology can change our lives very quickly.
- 2) Traffic in New York has always been a mess!

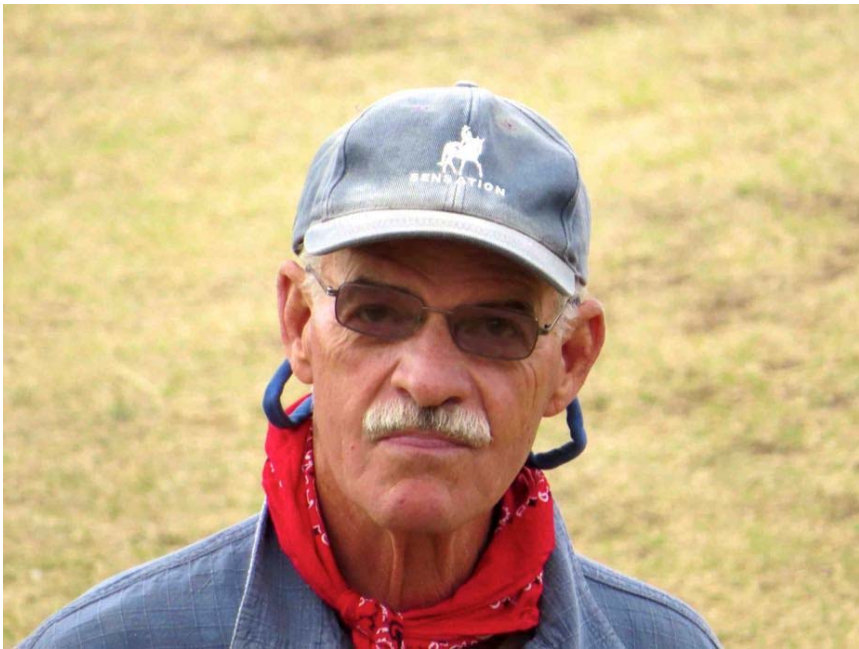
Nearly a third of Canadians don't believe humans, industry 'mostly' cause climate change: poll

'Without B.C.'s carbon tax, emissions would be five to 15 per cent higher than they are right now'

Peter Zimonjic · CBC News · Posted: Apr 04, 2018 5:00 AM ET | Last Updated: April 4



Contrast these poll numbers to the study of Dr. James L. Powell



<http://jamespowell.org/>

Born in Kentucky, holds a PhD from MIT and several honorary degrees, and served as Acting President of Oberlin College, President of Reed College, President of the Franklin Institute of Science Museum in Philadelphia, and President and Director of the Los Angeles County Museum of Natural History. President Reagan, and later President George H. W. Bush, both Republican presidents, appointed him to the National Science Board, where he served for 12 years. He is currently Executive Director of the National Physical Science Consortium.



So over 99% acceptance, based on data, of human-linked global warming in the peer-reviewed scientific literature.

~1,747 : 1

<http://jamespowell.org/>

Compare this 99.94% value in the peer-reviewed scientific literature, which affirms the connection between human activities and climate change with what Canadians believe about the current state of climate science....

~1,747 : 1

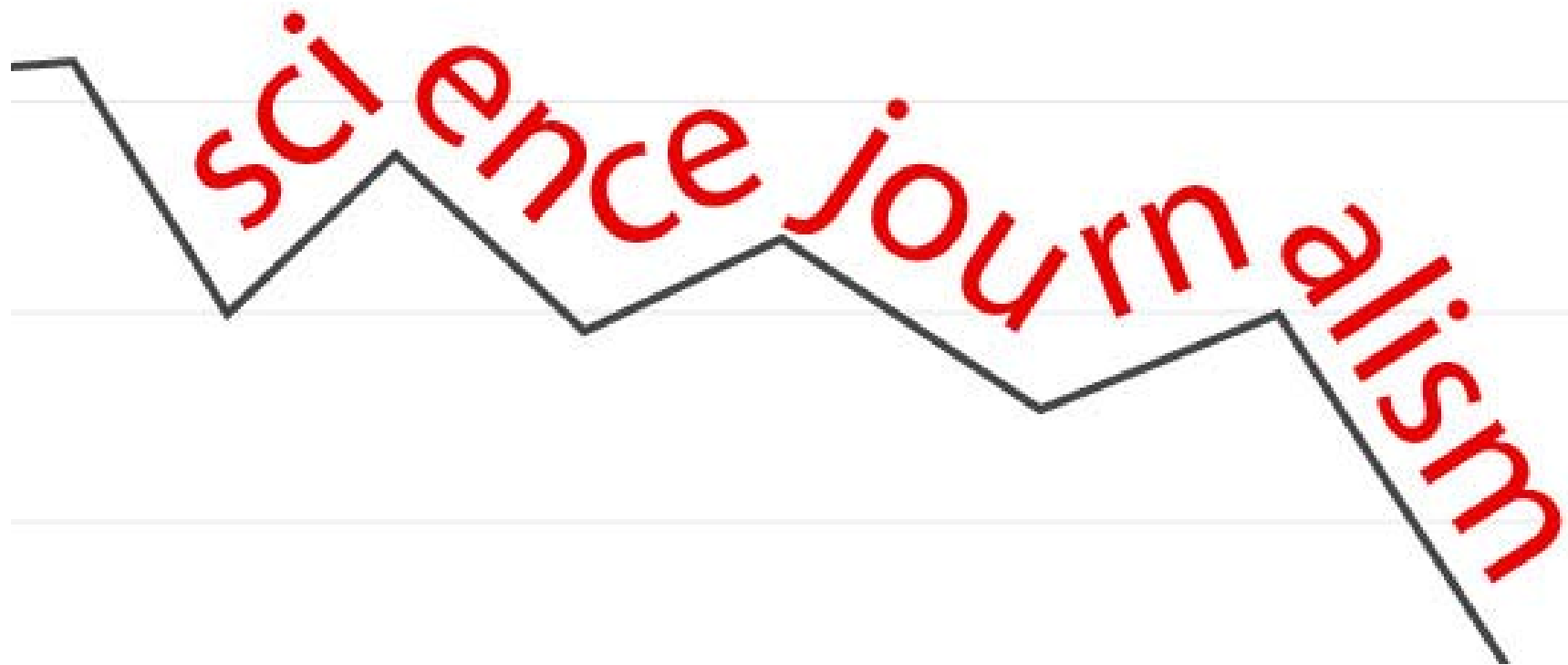
... with the *Abacus Data Poll* that concluded that almost 1/3 of Canadians were not convinced by the overwhelming data.

~1,747 : 1

If 1,748 medical doctors told you your child was seriously ill and needed treatment, would you believe them, or the 1 doctor out of 1,748 who said everything is fine?



<http://healthmeup.com/photogallery-healthy-living/medical-guide-top-10-types-of-doctors-you-should-know/22560/6>



science journalism

<http://www.21stcentech.com/science-journalism-victims-digital-publishing/>

Groundhog Day 2018: Mixed signals and a near escape

N.S.'s Sam, Quebec's Fred predict early spring; Ont.'s Wiarton Willie, Pennsylvania's Punxsutawney Phil don't
CBC News · Posted: Feb 02, 2018 7:00 AM ET | Last Updated: February 2



42% of Canadians get their news through social media

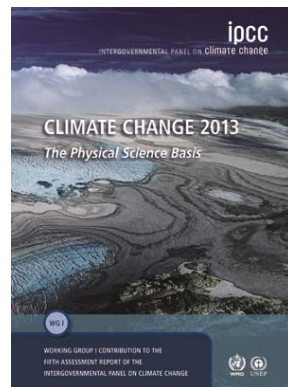
Pew
Research
Center



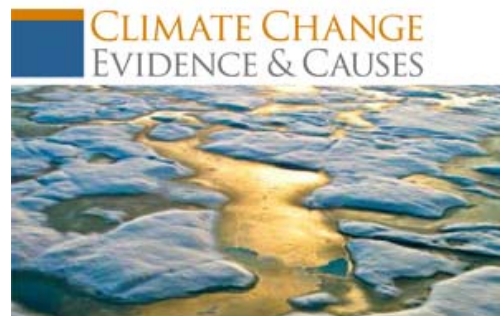
Pew
Research
Center

<http://www.pewglobal.org/2018/01/11/people-in-poorer-countries-just-as-likely-to-use-social-media-for-news-as-those-in-wealthier-countries/>

Peer-reviewed science *versus* basement blogger



≠



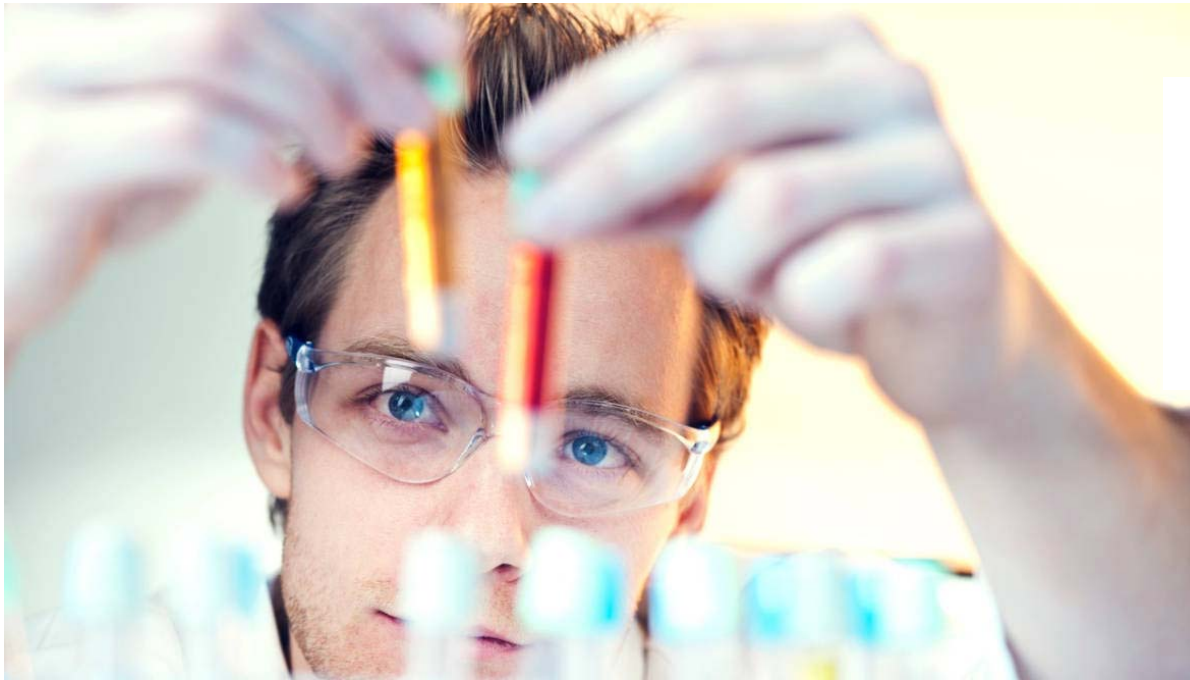
An overview from the Royal Society and the
US National Academy of Sciences

<http://www.stargazersworld.com/2009/03/23/guest-blogger-wanted/>

Almost half of Canadians think science is a "matter of opinion"

Bad news for the country that discovered insulin.

Chris Dart · CBC Life · September 19, 2017



This is ***not*** how scientists decide if a hypothesis is supported!



<http://kryon.com/inspiritmag/scrapbooks/sb-indy-01.html>

Queen's Alumni Review article on
environmental work at Queen's resulted in
some “interesting letters”

Myth #1 that is entrenched:

In order to get promoted and
advance in their career, scientists
have no choice but to “toe the line”
and “follow the herd”.



Apparently this is how scientists make a name for themselves and get ahead.



**“Science advances one
funeral at a time”.**

Max Planck (1858 – 1947)

Myth #2 that is entrenched:

Scientists are just looking for more grant money.

Some silver linings in the Abacus Data Poll

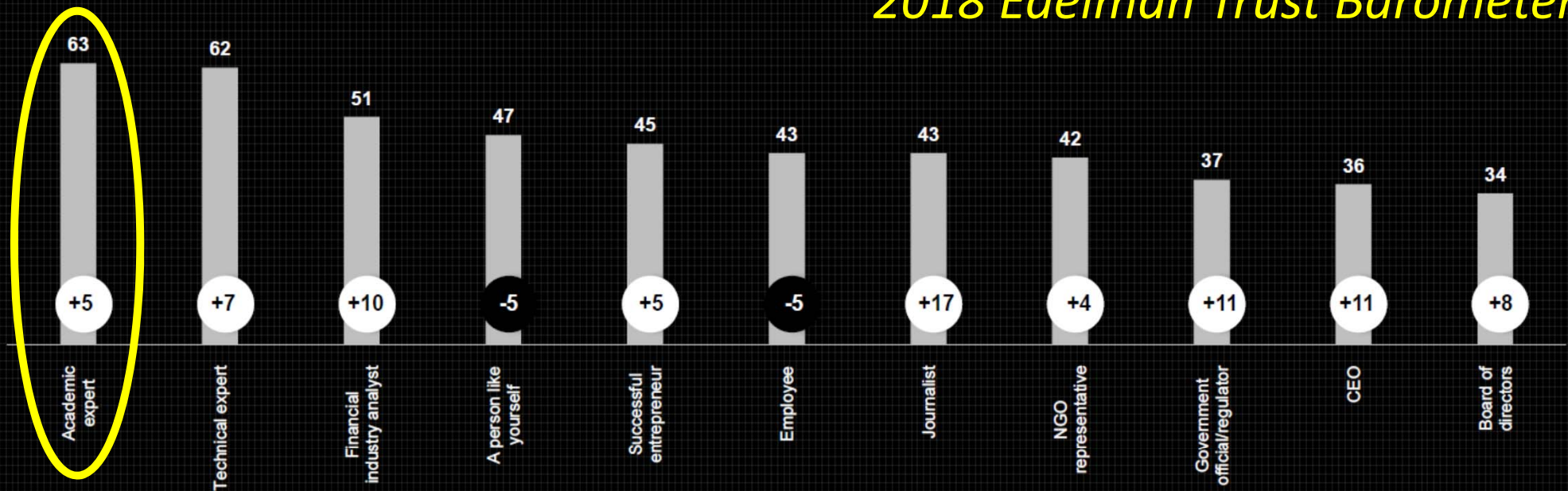
33% of Canadians consider themselves “science illiterate”, but that **82% *want to know more about science.***

Canadians Returning to Figures of Authority for Truth

Per cent who rate each spokesperson as very/extremely credible, and change from 2017 to 2018, in Canada

— 0 + Y-to-Y Change

2018 Edelman Trust Barometer



Source: 2018 Edelman Trust Barometer. CRE_PPL. Below is a list of people. In general, when forming an opinion of a company, if you heard information about a company from each person, how credible would the information be—extremely credible, very credible, somewhat credible, or not credible at all? (Top 2 Box, Very/Extremely Credible), question asked of half of the sample. General population, Canada.



Science was under attack in this country.

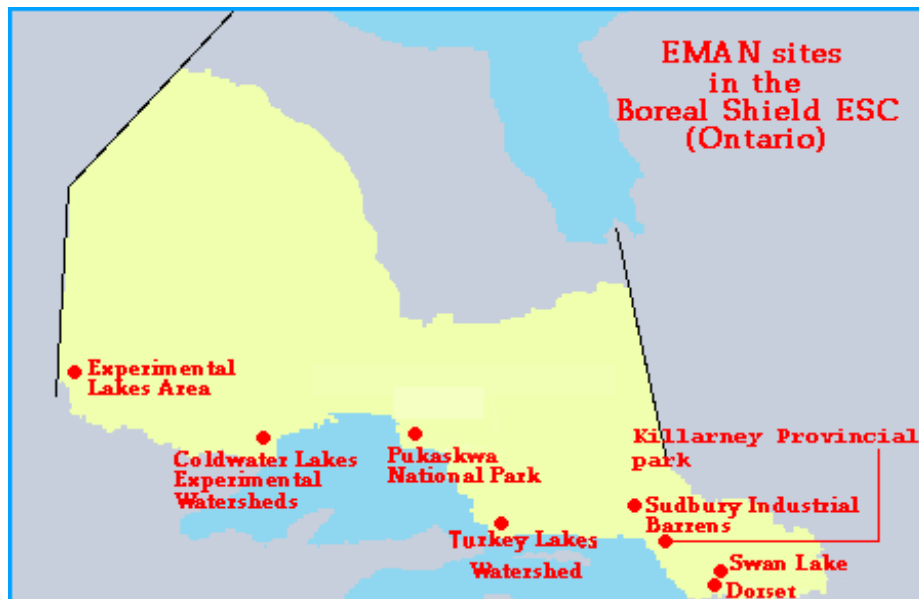


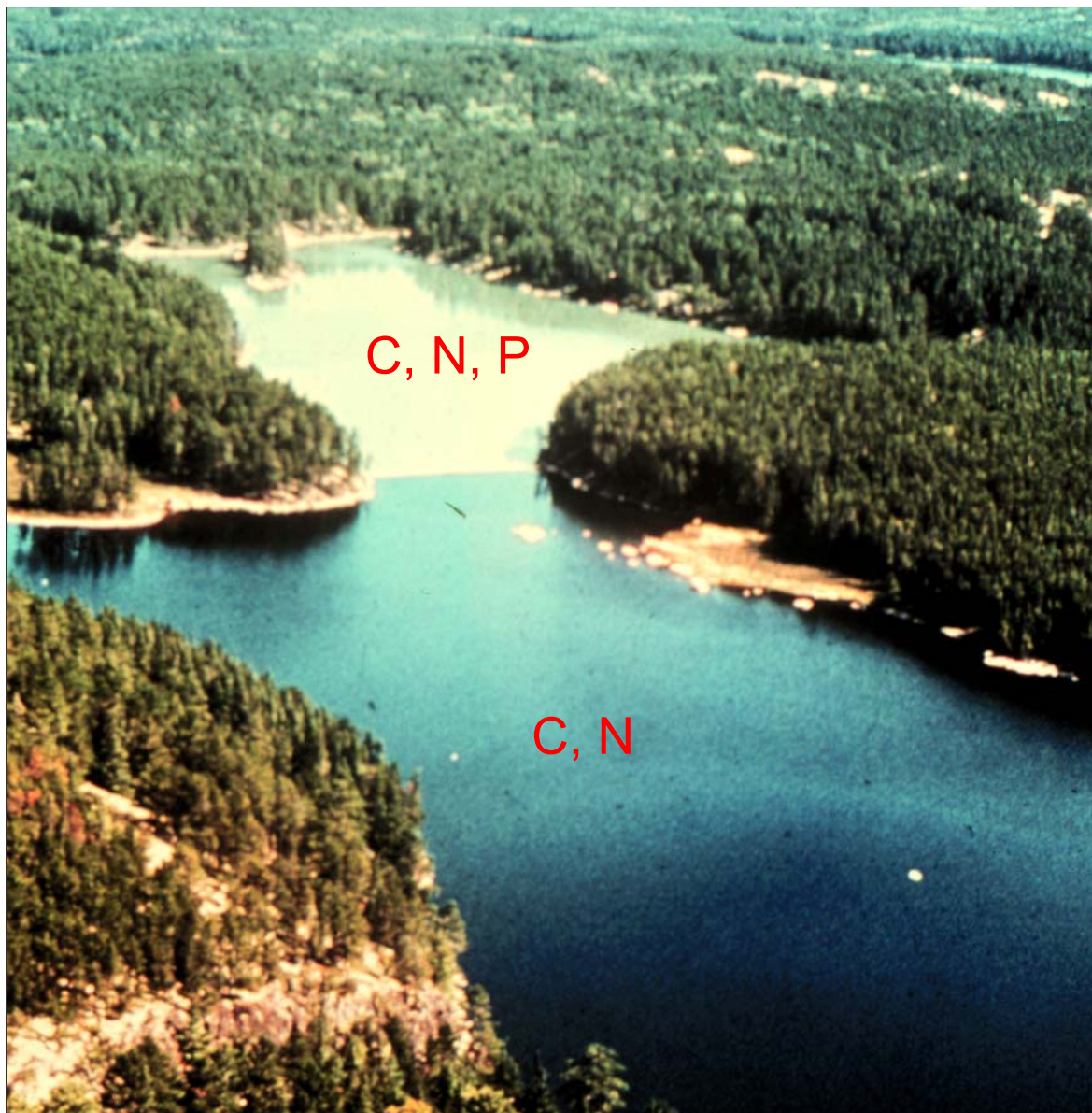
<http://rabble.ca/blogs/bloggers/miningwatch/2012/07/death-evidence-rally-how-budget-cuts-effect-mining-issues>

Large cuts to environmental departments greatly decreased our ability to identify and deal with complex environmental issues.



The Experimental Lakes Area (ELA)





ELA
Lake 226



Why do we get
algal blooms?

Acidification



Over 8 years (1976-1983), Lake 223 was gradually acidified lake from pH 6.8 to 5.0



Lake trout – 1979 (pH = 5.4)



Lake trout – 1982 (pH = 5.1)

What was the financial cost of ELA?



~ 2 million dollars a year, or about
5 cents per person in Canada a year

Cost of one F-35 jet?



\$85 million per jet
(or over 44 years of running ELA)

Cost of government spending on
“celebrating” War of 1812?
Over \$28 million.
(or over 14 years of running ELA)



<http://www.cbc.ca/news/politics/conservatives-draw-fire-for-war-of-1812-spending-1.1265851>

What did ELA research tell us?

Why we get algal blooms and what we can do about it.

Why is acid rain a problem and what can we do about it?

How do contaminants like mercury affect ecosystems?

How does water flow regulation affect ecosystems?

What are the effects of aquaculture?

Since monitoring has been ongoing since the 1960s, the data set is incredibly important for Canadians and the rest of the world.

Many other issues.....



Science Under Attack

Second tactic:

Don't let your scientists give bad news.

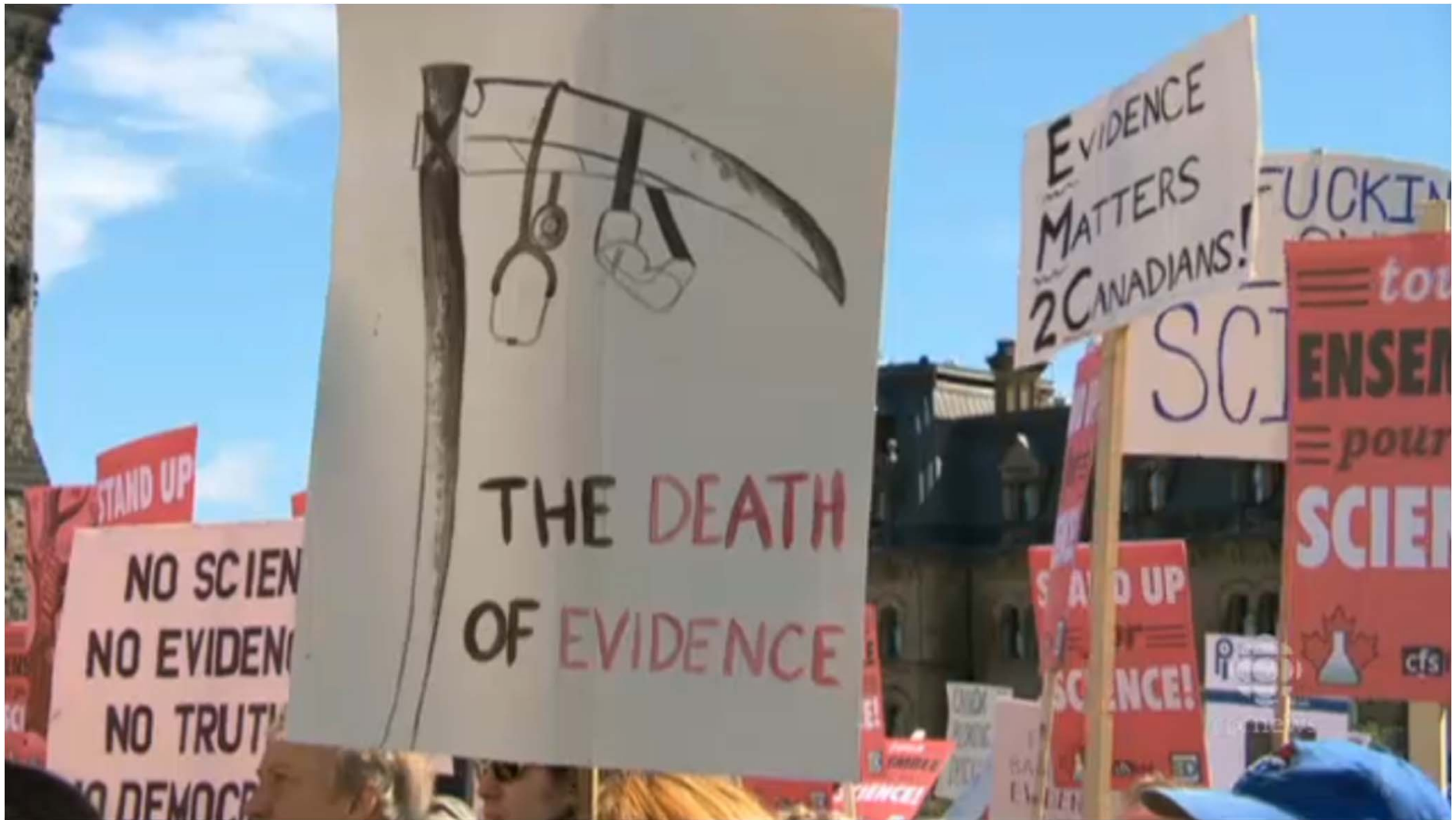


<http://desmog.ca/2013/02/11/federal-government-muzzles-dfo-scientists-new-policy>

When the public hears less and less about government science and the important findings they make, then it is easier to cut.



<http://www.dailygalaxy.com/photos/uncategorized/2008/08/26/sleeplearning.jpg>



<http://www.cbc.ca/news/technology/canadian-cities-march-for-science-1.4078358>



<https://twitter.com/dailymirror/status/796467942435262464>

Canada has seen positive changes over last 2 years, but history teaches us that we are vulnerable.

Top 4 Excuses Scientists Often Use to Avoid Engagement

- 1) I don't have time!
- 2) What will my peers think?
- 3) What I do is "too complicated."
- 4) It might get "unpleasant".

The Growing Threat of Self-Censorship?



[http://bigthink.com/ideafeed/do-you-self-censor-on-facebook-youre-not-alone?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+bigthink%2Fmain+\(Big+Think+Main\)](http://bigthink.com/ideafeed/do-you-self-censor-on-facebook-youre-not-alone?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+bigthink%2Fmain+(Big+Think+Main))



Donald J. Trump ✓

@realDonaldTrump

Following

The concept of global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive.

RETWEETS

104,728

LIKES

67,204



7:15 PM - 6 Nov 2012



12K

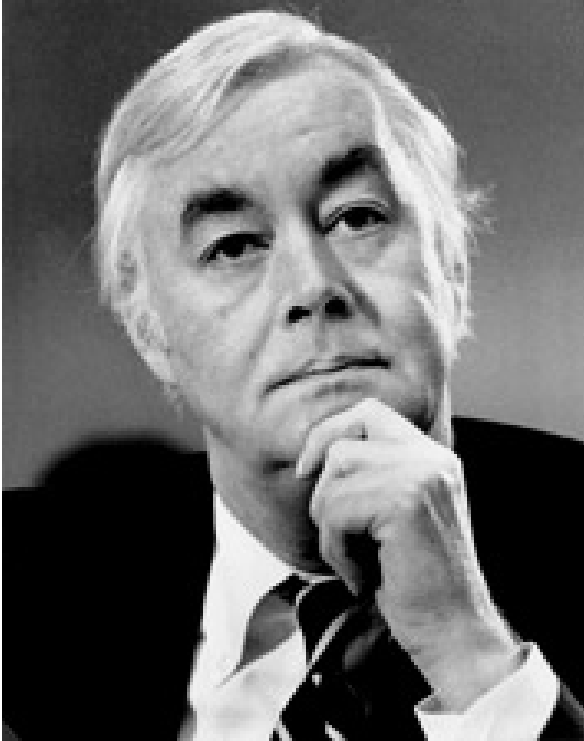


105K



67K





“Everyone is entitled to his own opinion, but not to his own facts.”

Daniel Patrick Moynihan (1927-2003)

Politician, sociologist, diplomat

A portrait in letters of an American visionary

(edited by Steven R. Weisman, 2010)



The stakes are too high not to engage.

We need to rebuild the public trust in science.

And, yes, sometimes you have to “throw stones at giants”.