THE SCIENCE OF COMMUNICATING NANOSCIENCE

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- The challenges of communicating nanoscience in societal and political contexts
- A few intuitive assumptions about solutions ... and a preview of the social science that tells us if they will work



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FIRST, FOR LAY AUDIENCES, THE NATURE OF SCIENTIFIC PROBLEMS IS CHANGING



ChemBot, debeloped by iRobot for DARPA/U.S. Army Research Office

- Rapid pace and scientific complexity of Nano-Bio-Info-Cogno (NBIC) revolution
 - Complex science
 - Fast bench-bedside transition
 - ELSI debates without scientific answers

SECND, WE HAVE LOST THE INFRASTRUCTURE FOR CONVEYING COMPLEXITIES TO LAY PUBLICS

Dudo, A. D., Dunwoody, S., & Scheufele, D. A. (2011). The emergence of nano news: Tracking thematic trends and changes in U.S. newspaper coverage of nanotechnology. *Journalism & Mass Communication Quarterly, 88*(1), 55-75.



THIRD, OUR DYSFUNCTIONAL OBSESSION WITH KNOWLEDGE DEFICIT MODELS



Different labels ...

- Knowledge deficit models
- Familiarity hypothesis
- etc.
- ... same assumption
 - If people were only more informed, they would be more supportive of science
 - Effective communication is about explaining the science better or about building excitement for science
- Unfortunately
 - Little empirical support ...

EMBRYONIC STEM CELL RESEARCH: INFORMATION AND ATTITUDES

Ho, S. S., Brossard, D., & Scheufele, D. A. (2008). Effects of value predispositions, mass media use, and knowledge on public attitudes toward embryonic stem cell research. *International Journal of Public Opinion Research*, 20(2), 171-192.





- The challenges of communicating today's science in societal and political contexts
- A few intuitive assumptions about solutions ... and a preview of the social science that tells us if they will work



- The challenges of communicating today's science in societal and political contexts
- A few intuitive assumptions about solutions ... and a preview of the social science that tells us if they will work
 - Assumption 1: Lay audiences (should) think like scientists …

IRONICALLY, EVEN SCIENTISTS DON'T EXCLUSIVELY RELY ON INFORMATION

Corley, E. A., Scheufele, D. A., & Hu, Q. (2009). Of risks and regulations: How leading US nanoscientists form policy stances about nanotechnology. *Journal of Nanoparticle Research*, *11*(7), 1573-1585. doi: 10.1007/s11051-009-9671-5

Predicting views that nano research should be regulated ...

Other disciplines Political/social ideology Economic conservatism^b Social conservatism^c Societal allocation of risk^d Incremental R^2 (in %) Overall perceived risks and benefits Overall risk perception^e Overall benefit perception^f Incremental R^2 (in %)

Disks and Donofits in Application Ar



Slide 10 — © Scheufele 2013

THE TRICKY PART: HUMAN BEINGS USE INFORMATION AS ONE OF MANY HEURISTICS

Scheufele, D. A. (2006). Messages and heuristics: How audiences form attitudes about emerging technologies. In J. Turney (Ed.), Engaging science: Thoughts, deeds, analysis and action (pp. 20-25). London: The Wellcome Trust.



"Low information rationality"

- It does not make sense for most of us to develop an in-depth understanding of complex issues
- As a result, we form attitudes on issues, including S&T, even in the absence of sufficient information
- Shortcuts, heuristics, etc. become powerful replacements or shortcuts for interpreting information

AND OUR RELIANCE ON HEURISTICS IS PARTLY DRIVEN BY MEDIATED REALITIES ...

Nisbet, M. C., Scheufele, D. A., Shanahan, J., Moy, P., Brossard, D., & Lewenstein, B. V. (2002). Knowledge, reservations, or promise? A media effects model for public perceptions of science and technology. *Communication Research*, 29(5), 584-608.



FRAMING ALLOWS AUDIENCES TO CATEGORIZE UNFAMILIAR INFORMATION

Tewksbury, D., & Scheufele, D. A. (2009). News framing theory and research. In J. Bryant & M. B. Oliver (Eds.), Media effects: Advances in theory and research (3rd ed., pp. 17-33). Hillsdale, NJ: Erlbaum.



- All perception is reference dependent, especially for ambiguous stimuli
- Variations in *presentation* therefore reshape how we think about the information
 - GM foods vs. Frankenfood
 - Intelligent design vs. Creationism
 - Nano as the next plastic or the next asbestos
 - etc.



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- A few intuitive assumptions about solutions ... and a preview of the social science that tells us if they will work
 - Assumption 2: The same facts means the same thing to different people ...

THE CONCEPT OF MOTIVATED REASONING

Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin, 108*(3), 480-498. doi: 10.1037/0033-2909.108.3.480



- "[M]otivation may affect reasoning through reliance on a biased set of cognitive processes"
- Related findings in the science communication literature
 - Cultural cognition (synthetic biology, climate change etc.)
 - Perceptual filters (nanotechnology, stem cell research etc.)
- The same information means *different* things to different people ...

IT'S PARTLY ABOUT SELECTIVITY ...

(Data from: DMR-0832760, UW Nanoscale Science and Engineering Center on Templated Synthesis and Assembly at the Nanoscale, Social Implications Group, University of Wisconsin-Madison)



U.S. bets on nanotechnology to aid economy - MSNBC

U.S. bets on nanotechnology to all coording meters U.S. start-ups are part of an amibitious effort to create a thriving high meters technology hub in the Midwest.



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Policy Institute

of the U.S. FDA's new draft g

nanosilver in food packagi

would delay products from

the marketplace but wou

Collaborating for profits in nanotechnology - Fox News

Collaborations betweem small companies and venture finance firms in the field of nanotechnology are driving a \$225 billion market.

Nanotechnology start-ups on the rise - CBC

Deals between large companies and finance firms are turning nanotechnology into one of the mos closely watched start-up industries. CBC



Government considering new nanosilver regulations - MSNBC The federal government has recently shown intense interest in the safety of food and food packaging products containing nanomaterials.



Debate over nanosilver regulations continues - Fox News

As nanotechnology advance, it is likely that policy debates over regulating the use of nanosilver in everyday products will continue.



New rules expected on safety of nanosilver products - CBC

The guidelines are the most extensive effort yet to address vexing issues surrounding the rapidly expanding field of nanotechnology.



Nanosilver under study by scientists - MSNBC Researchers look at what effect tiny substances found in products like food msnbc.com packaging and sunscreen may have on the environment.



Nanosilver's effects on health and environment unclear, panel says - Fox News A recent study called for further investigation of the miniscule substances, which are found in products from makeup to food packaging.



Study raises concerns about nanosilver - CBC

Studies suggest that nanosilver may carry health risks similar to asbestos, but scientists say findings are not cause for alarm.

SELECTING INFORMATION ABOUT NANO

(Data from: DMR-0832760, UW Nanoscale Science and Engineering Center on Templated Synthesis and Assembly at the Nanoscale, Social Implications Group, University of Wisconsin-Madison)



... AND PARTLY ABOUT MOTIVATED REASONING

Cacciatore, M. A., Binder, A. R., Scheufele, D. A., & Shaw, B. R. (in press). Public attitudes toward biofuels: Effects of knowledge, political partisanship, and media use. *Politics and the Life Sciences*.





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 - Assumption 3: Traditional ways of communicating science are still working ...

THE PROMISE OF THE NEW INFORMATION COMMONWEALTH



- New communication environments provide
 - essentially unlimited information
 - on a large number of issues
 - can be obtained anywhere
 - with relatively limited effort
 - and opportunities for citizens to connect with others through social media and other 2.0-type tools to make sense of this information
- But what does reality look like?

THE BRAVE NEW WORLD OF COMMUNICATING SCIENCE

"Algorithms as editors"

 Else New Jork Eines
 BUSINESS DAY
 MONDAY, JULY 5, 2010

 At Yahoo, Using Searches to Steer News Coverage

 BY JEREMY W. PETERS

 JULY 5, 2010

Welcome to the era of the algorithm as editor. For as long as hot lead has been used to make metal



 "Forced" selection of news placement or even selection based on one-on-one tailoring

Scheufele	N	What's on your mind?		
AVORITES			SOPT -	
E News Feed			V Top Stories	
👼 Messages	5	Sky at 11PM, Denali Park Most Recent	Most Recent	
Events	2		N5	
ACES AND ADS				

Two concrete examples ...

FIRST, THE PITFALLS OF TAILORED INFORMATION ...

(Ladwig, P., Anderson, A. A., Brossard, D., Scheufele, D. A., & Shaw, B. (2010). Narrowing the nano discourse? *Materials Today, 13*(5), 52-54. doi: 10.1016/s1369-7021(10)70084-5)

Potential of "self-reinforcing informational spirals"



 Learning based on how Google presents results rather than on what individuals are searching?

SECOND, WITH WEB 2.0, TRADITIONAL, MASS-MEDIATED CONTENT IS ON ITS WAY OUT



Instead:

- Online newspaper articles or TV shows not consumed in isolated fashion, but contextualized by reader comments and feedback
- Facebook posts/links with "Like" buttons and comments from other users
- etc.

... AND THIS CONTEXTUALIZATION INFLUENCES HOW WE THINK ABOUT NEW INFORMATION

Anderson, A. A., Brossard, D., Xenos, M., A.; Scheufele, D. A.; Ladwig, P. (forthcoming). Crude comments and concern: Online incivility's effect on risk perceptions of emerging technologies. *Journal of Computer-Mediated Communication*.

THE VANCOUVER SUN Science Blog TEXT SIZE A Risks vs. benefits of nanosilver: U.S. EPA Tools Newsvine a print hearing coming up 0 Digg it reddit C Techno Monday, May 17, 2010 RSS RSS Mixes The U.S. Environmental Protection Agency began a four-day hearing today about the possibility of nanotechnology products releasing toxins into the nearby water supply. The hearing follows the release of a study suggesting potential harmful effects of that water on human health. Silver nanoparticles are used in products like clothing or bandages to kill bacteria and reduce the spread of infectious diseases. Nano silver also has other benefits like water- and dirt-resistance in clothing. SEE DETAILS However, silver nanoparticles can be dangerous to humans since they are so small they are difficult to capture in water treatment systems. Silver is more toxic to aquatic plants and animals than any metal except mercury LATEST ACROSS THE BOARD POSTS Despite the questions surrounding nanotechnology, more than 1,000 consumer products currently contain nanoparticles. Do Cookies vs. jobs the benefits of nanotechnology in clothing outweigh the On prayer, judge got it wrong possible environmental costs A better way to donate? Commenting anonymously 6 comments New Alterra would create jobs Sigh, Thompson not running, JRV Leaders don't see the real cost of Name change is no surprise The benefits we're going to see from using nanotechnology in these Civil War not about slavery kinds of products are pretty obvious. It really scares me to think about Thompson vs. Feingold -- The labels dor work here all of the detergent and water we're wasting if we don't use this new technology!!! posted at 3:24 p NEWS AND OPINION BLOGS » Report abuse 🚺 🚺 \mathcal{C} School Zone Kohler eyes up MPS central office administrator to lead district Orange1 Well I think the risks of this technology are just too high for the fish and atin American film festival starts onight 💷 (ว) other plants and animals in water tainted with silver. I sure hope people think about all of the harm we're doing to the environment by releasing more toxins into the water system. lubbub exiest v etarian lives next doo выв posted at 3:53 p.r » Report abuse 🛅 🚺 All Politics Blog

- Survey/experiment hybrid
 - Keeping messages constant
 - Varying the *nature* of comments
- (In)civility of comments increases likelihood of readers
 - seeing bias in the article
 - perceiving more risks in the technology they read about

IRONICALLY, OUR STUDY BECAME A CASE IN POINT: THE FIRST MEDIA MENTION IN THE SENTINEL ...

Online comments hurt science literacy, study shows

By MARK JOHNSON markiohnson@journalsen

new obstacle to scientific literacy may be emerging, according to a paper in the journal Science by two University of Wisconsin Madison researchers.

The new study reports that not only are just 12% of Americans turning to newspaper and magazine websites for science news, but when they do they may be influenced as much by the comments Readers may be influenced just as much by opinions as story itself

nal Science by two University of Wisconsinon researchers. at the end of the story as they are by the report itself.

In an experiment mentioned in the Science paper and soon to be published elsewhere in greater detail, about 2,000 people were asked to read a balanced news report about nanotechnology followed by a group of invented comments. All saw the same report but some read a group of comments that were uncivil, including name-calling. Others saw more civil comments.

economic uncertainties. /A

"Disturbingly, readers' interpretations of potential risks associated with the technology described in the news article differed significantly depending only on the tone of the manipulated reader

Please see SCIENCE, 7A

Jan. 3, 2013

Health News

Home » Features » Health News

Online comments hurt science understanding, study finds

By Mark Johnson of the Journal Sentinel



A new obstacle to scientific literacy may be emerging, according to a paper in the journal Science by two University of Wisconsin-Madison researchers.

The new study reports that not only are just 12% of Americans turning to newspaper and magazine websites for science news, but when they do they may be influenced as much by the comments at the end of the story as they are by the report itself.

JUST A FEW OF THE COMMENTS THAT FOLLOWED THE SENTINEL STORY ...

Leonard J Krabbs - Jan 07 at 1:15 PM - Report Abuse

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I think I speak for all of us when I say that the real issue we have with scientific research as revealed by the media is its insincerity of intent. The endless reporting of 'results,' 'facts' and 'statistics' is a weak and transparently malevolent attempt to distract the public from the consensus reality(delusion) imposed upon us by our Reptilian overlords. Their control of the banking, prison, clothing and video game industries is a secret that they will do anything to preserve, and mesmerizing our attention with white-coated men who uselessly play with pretty liquids in test tubes is one of their many tactics.



stanton12 - Jan 04 at 4:26 PM - Report Abuse

I think you can take all these studies by pointy headed scientists, 99% of whom are socialists and communists, and stick them where the sun don't shine. Just listen to Rush and Hannity, and you will learn why you shouldn't trust "science." It is all designed to let the government control every aspect of our lives.



bagman00 - Jan 03 at 8:44 PM - Report Abuse

Let's see: The global warming ruse was base on fraud not science. Fair media reporting, xnay to that one. Lack of real science being taught in the schools rather than students being steered towards an opinionated solution. University of Wisconsin Professors bewildered by science opinion being questioned rather than being accepted as told. Progressives trying to control information and getting called out when they are misinforming have their feelings hurt.



itismuddyhere - Jan 03 at 8:40 PM - Report Abuse

This is absolutely outrageous! How could the Dems invent a study like this with a straight face?? Anyone who aspires to this conclusion hates God and our Country.

THE BRAVE NEW WORLD OF COMMUNICATING SCIENCE



Why We're Shutting Comments PopularScience.com will no lor

Starting today, PC	Spularee
Here's why.	Posted 09.24.2013 at 8:15 am
By Suzanne Cal	с 🚳 👥 🕇 🔛 1.7К



Wellcome Images vents can be had for science.

Comment Ban Sets Off Debate

BY PAM BELLUCK OCTOBER 1, 2013

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The New Hork Times

GADGETS CARS SCI

W VIDEOS III COLUMNS 🗢

Care to comment on a Popular Science article - say, " These Magnetic Nanobots Could Carry Drugs Into Your Brain" or " FYI: Do Animals Have Orgasms?"

That's not possible - not anymore. Last week, the magazine, known for a chatty, pop-culture approach to serious science, announced that it was shutting off online comments. "Comments," an editor wrote in an online post, "can be bad for science."

The magazine said that vicious, insulting or ignorant comments can pollute otherwise intelligent online discussions and undermine public understanding and appreciation of science itself. "Trolls and spambots," it said, sometimes hijacked the conversation, particularly on divisive issues like climate change and evolution.

For example: "BUNK," one commenter said of an article posted in August about scientists finding fossil evidence that mammals weren't the first creatures with fur. "What this actually shows is that evolution is still nonsense and doesn't work." Even on sitos mi

SCIENCE TIMES

"Unless a comment stream is actively moderated, it inevitably is ruined by bullies, hotheads and trolls," James Fallows wrote, explaining why he does not allow comments on his columns on The Atlantic's Web

TUESDAY, OCTOBER 1, 2013

But others called Popular Science's move too extreme, disagreeing that public support for science could be imperiled by unbridled comments. Some people said that comments, when kept under control, could benefit science, fostering debate and displaying what Will Oremus, on Slate, called the "spirit of free inquiry that has always driven scientific discovery."

"I have to say I don't think comments are bad for science," Fred Guterl, executive editor of Scientific

"Commenters shape public opinion; public opinion shapes public policy." Suzanne LaBarre Online content director at Popular Science,

FINALLY, FIVE SUREFIRE STRATEGIES FOR COMMUNICATION FAILURE

- Arthur M. Sackler The Science of Science Communication
- Be reactive rather than proactive, i.e., only start going public after a crisis hits
- Address only issues and ignore values, emotions, etc. that people bring to the table
- Assume that scientific facts will triumph over everything else (including how they're initially framed in public discourse)
- Assume that new and social media don't matter as much as traditional media
- Assume that public communication is an art rather than a science, i.e., rely on intuition rather than communication experts

THANK YOU

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