



UNBELIEVABLE!

SCIENCE COMMUNICATION FOR
A SKEPTICAL WORLD

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Illustration: Mike Nudelman/Business Insider

Do you believe?

Do you believe, brothers and sisters? I sure do.

I believe that chlorine and fluoride in water, and vaccines, are some of the best public health measures we have ever devised.

I believe nuclear power is a good thing. Not only that, it might well be essential if we're to meet the challenges of climate change. And yes, climate change is a thing and we're causing it.

I believe GMOs are essential to help farmers around the world feed themselves, their families, and growing global populations.

I believe pesticides such as glyphosate are right up there in terms of importance in feeding ourselves and protecting the environment too.

Oh, and I believe the theory of evolution is essential to our understanding of life on earth, including things like human behaviour and societies.

Why do I call these beliefs? Well, I'm not a climate scientist, or a geneticist, or a toxicologist. At some point, I have to take it on faith that the established science on these things is true. So maybe my core belief is my belief in science.

But, like everyone, I am not immune to unreason. I still knock on wood. I am uneasy about breaking a mirror... how about you?



Max Planck

belief > facts

“A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die and a new generation grows up that is familiar with it.” – *Max Planck*

Belief can be stronger than facts and last longer.

Before we science-y types get all smug, we should remind ourselves that the community of science is not immune to stubbornly holding on to cherished beliefs.

The people that came up with the idea of plate tectonics and antiseptics were ridiculed in their day. It wasn't until after their deaths that their ideas were widely accepted.

The great German physicist Max Planck observed this. People hold onto their beliefs so strongly that they will often die before they change their minds.

Why do we believe?

- The “Belief Engine” makes us efficient.
- We’re busy, we make snap decisions that form the first foundation bricks for a new belief.
- Then, we go looking for more bricks.
- Unless we have a good reason, we don’t think about taking apart the wall.



Why are we so susceptible to belief? Because it’s efficient.

We make snap decisions on inadequate information or even information designed to manipulate us. We “go with our gut.” These initial decisions form the first building blocks of belief. With these initial blocks in place, we go looking for other blocks to strengthen the wall. Rarely do we look for ideas and information that weaken the wall or remove it altogether.

James Alcock, a psychologist from York University, calls this the “Belief Engine.” I highly recommend his book, “[Belief](#)” to anyone that wants a deep dive into this subject.

Belief is an essential part of our thought process. Think about it: if we had to justify every single thing we do with evidence, we would get nothing done.

It’s much easier to say, “ah, Greenpeace says GMOs are bad. Sounds legit. Greenpeace are the good guys, and GMOs sounds scary, so I’ll shop from the organic aisle. Done! Now I’ve got to get the kids to soccer practice...”



Belief ≠ reality

From the feeds:

- Fluoride causes lower IQ
- Glyphosate causes cancer and kills insects
- Microwave ovens cause cancer
- 5 G causes:
 - Cancer
 - Tinnitus,
 - Hair loss
 - Global warming
 - Hemorrhoids

But “believin’ don’t make it so.”

People believe in a lot of things and get right pissed off when you confront their beliefs.

Case in point: Calgary caved to anti-fluoride activists and took it out of their water supply. Edmonton did not. A few years later, a University of Calgary researcher decided to collect some data on this natural experiment. Turns out Edmonton kids had far fewer cavities than Calgary kids. The researcher was roundly attacked on social media for her trouble. These things don’t seem to go away. In fact they seem to proliferate and mutate. The latest one I saw was that Fluoride causes lower IQ.

A few others you may have seen – they’re common on my social media feeds:

1. Human-caused climate change is a hoax.
2. Glyphosate is causes cancer and kills insects. Never mind that it’s an herbicide rather than an insecticide.
3. I know a person who refused to put a microwave in their new house because microwaves cause cancer. Cellphones, which are microwave transceivers that you hold – RIGHT BESIDE YOUR BRAIN – are okay.
4. Speaking of cellphones, I did a quick Google search of “5G causes...” and I got the following suggestions: cancer, tinnitus, hair loss, global warming, and hemorrhoids. A high price to pay for faster Netflix on your phone...

Living in the Information Storm

There's too much to process so:

- We ask our friends
- We consult sources we trust
- We rely on "tribal wisdom"
- Entertaining a position helps you understand the other point of view – it doesn't mean you have to accept it.



So, we can't trust our gut. But there is *way* too much information to process and we still have to get the kids to soccer practice. So, what do we do?

We ask our friends, but this can just create a bigger bubble of belief. It's really hard to listen to someone who holds beliefs that are very different from your own, so you're less likely to consult or listen to them.

We also consult sources we trust, but we are prone to choosing ones we agree with. I try to pick from the middle: I'd count the AAAS, Snopes, the Cochrane Library, the Genetic Literacy Project, Environment Canada, and the Mayo Clinic among the many that I trust.

Other people put their trust in sources that I do not consider credible. I'd count outfits like Greenpeace, Friends of the Earth, CBAN (on biotechnology in Canada) and our own Interchurch Uranium Committee in Saskatchewan among these. There are also really "out there" sources like Mercola and of course, Gwyneth Paltrow's Goop.

We believe what our social group, or "tribe" believes. If all your friends and the people you respect and admire believe in the healing power of crystals, it's tough to not at least consider the position. If you believe in physical evidence and the scientific method, it's hard to not just blow it off. But we must at least consider it, if we are to understand other people's motivations.

A colleague of mind shared with me a quote from Aristotle that sums up this concept: "It is the mark of an educated mind to be able to entertain a thought without accepting it."



Photo: Rui Vale Sousa/Shutterstock

“Let me dumb it down for you.”

- Condescending
- Puts audience on the defensive
- Clouds our thinking, interferes with communications strategy

So, how do you get through to people who don't agree with you?

Don't "dumb it down." What a condescending thing to say! Here's the guy that's going to "dumb it down" for you. Don't you want to give him a slap?

"Dumbing it down" implies the person you're talking to isn't smart enough to understand what you're saying.

I don't know about you, but that puts me on the defensive. It's not a good starting point for productive conversation.

It also puts the wrong picture in our heads about our audiences. It clouds our thinking and impairs our ability to communicate effectively

"Dumbing it down" implies that we're talking to fools.

Our audiences are not stupid. In fact, there's something called the Flynn Effect that shows at least some populations are getting smarter (although this may be changing).

But these smart people do some pretty dumb things. Why is that?

Okay, not dumb. But maybe not rational...

- **Intelligence** (*“processing power”*)
- **Knowledge** (*actual facts or you get GIGO*)
- **Need for cognition** (*make the effort to think*)
- **Open mindedness** (*yep, I *might* be wrong*)



I would argue that the “smart/dumb” paradigm is too limiting, and using it limits our thinking. A better way is to think it’s not about being smart, it’s about being rational.

Psychologist Barbara Drescher writes that rationality has four parts:

1. Intelligence – the “being smart” bit
2. Knowledge – reliable information, which is a big challenge today.
3. Need for cognition – that is, making the effort to think.
4. Humility - that is, keeping an open mind and being able to admit we’re wrong.
5. Drescher gives a bit saltier version too. She says:
“...we can be irrational because we are stupid, ignorant, lazy, arrogant, or some combination of those.”



Stay skeptical, my friends

- Yes, people *are* manipulating information to influence our behaviour
- Elections, anyone?
- Marketing and advertising
- Misinformation and propaganda
- Challenge: stay open-minded, but stay skeptical

There's money in misinformation. Whether it's advertising, misinformation, propaganda, people are working hard to get you to change your behaviour or cut them a cheque.

Some of this is pretty benign, as with our current Canadian election campaigns. We expect competing promises and platforms, but we also expect spin as they try to get our votes.

But we're not being paranoid when we see more subtle and sinister players out there. There really are people out there that work to manipulate our elections, or our attitudes towards renewable energy and natural gas, or whether we should avoid GMOs and eat organic.

As James Alcock puts it, and I quote, "This creates a challenge for us all: to be flexible enough to modify our beliefs appropriately when new and credible information is presented, while at the same time to be steadfast enough to preserve them from manipulation by others."

Ignorance is bliss

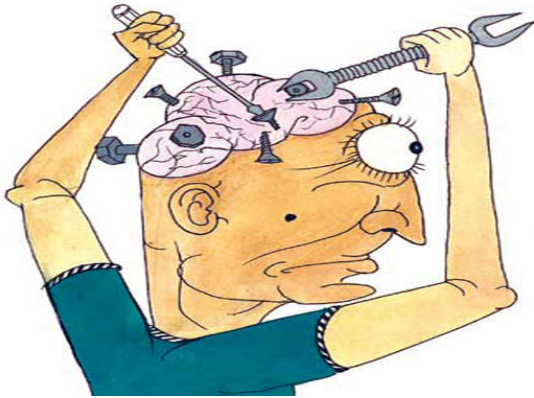
- The Dunning Kruger effect: we don't know enough to know we don't know
- Those that know the least, think they know the most



What are beliefs based upon? Sometimes, not much.

This is something called the Dunning Kruger effect, named after the researchers who first described it in a paper in 1999. Its basic tenet is that you don't know enough to know that you don't know.

It gets worse: those who know the least, think they know the most – whether its GMOs, vaccines, or climate science.



Uncomfortable uncertainty

- Belief is comfortable. Changing belief is not!
- Cognitive dissonance hurts.
- Have compassion for your audience; change is not easy

It's uncomfortable not to know. Belief shields us from uncomfortable uncertainty.

When was the last time you changed your mind on something you really believed in? It's a very unpleasant experience.

Cognitive dissonance is the stress you feel when you're confronted with evidence that conflicts with your beliefs. It lights up the same parts of the brain as physical pain. It actually hurts.

Realize this is what you're asking your audience to do – it's painful to let go of a cherished belief. And eating crow is hard enough without having to swallow a side order of sarcasm and ridicule. Have patience, have compassion, be nice.



Belief = Identity

People don't reject science wholesale; they reject science they see as "a threat to their ideology or worldview, and hence to their identity."

- Katharine Hayhoe, atmospheric scientist

It's important to note that just because someone rejects one bit of science, it doesn't mean they reject it all. Rather, they tend to accept or reject science based on their core beliefs. This is why you can have people accept the safety of GMOs and reject the idea of human-caused climate change, or vice versa.

As Canadian atmospheric scientist Katharine Hayhoe puts it:

"Most people don't reject science wholesale because they actually have a problem with the science... Rather, people selectively reject a specific set of scientific findings: those they perceive to be a threat to their ideology or worldview, and hence to their identity."



Stop fighting

- Direct confrontation doesn't work – it makes matters worse
- Approach obliquely, make suggestions
- Goal: get your audience to "think slow"

So, as science communicators, where do we go from here?

Well, "You're an idiot" is not an effective communications strategy.

Yet there are plentiful examples of science sites pointing out examples of the absurd and making fun of them. If you're trying to reach people outside your bubble, you're wasting your time.

People double down, stop listening.

They will actually harden their positions: something called the backfire effect.

Nobel laureate Daniel Kahneman wrote a book called "Thinking Fast and Slow." The "thinking fast" part I mentioned with the Belief Engine. The "thinking slow" part is taking your time and engaging logical thinking – in other words, "being rational."

Our goal is to get people to question their positions, to get them to stop and think.

You're right. So what?

- The Information Deficit Model, or “eat your peas, they’re good for you” approach
- Facts still matter... but they’re not a silver bullet.

SO WHAT?



WHO CARES?

So, how do we get people to think?

Surely you can just tell them the truth and they’ll come around, right? There’s a name for this approach: the Information Deficit Model.

But when your up against belief, this doesn’t work very well.

Yeah, you may be right, but so what? Who cares? Do facts matter?

We're just talkin' here.

- People will accept information contrary to their beliefs *if* it's neutral and easy to understand.
- Caveat: don't assume you know how simple it needs to be. Do your research.
- Aim for neutrality and simplicity.
- Don't expect miracles: some change, but not wholesale change.



Don't despair. It turns out that knowledge **does** have the power to change beliefs – if it's presented correctly, and you don't expect miracles.

Jon McPhetres, a University of Regina social psychologist, did a study on GMO attitudes.

He found people will change their attitudes if presented with information on GMOs that is neutral and easy-to-understand. But he found such materials hard to come by when they went looking for them on the interwebs.

He also observed they had to start at a more basic level than they had anticipated. The researchers had to explain what DNA is and how it works, for example. People told McPhetres, and I quote, "I've had people say they try not to eat things that contain DNA because they're afraid it's going to contaminate their genes."

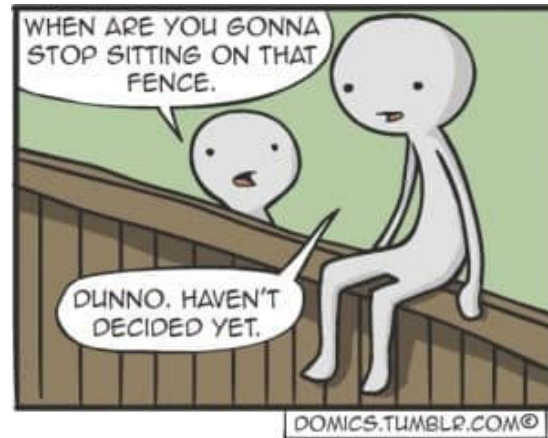
So, lessons learned: aim for neutrality and simplicity, and don't assume you know what your audience knows before you start planning your communications. Find out what makes them comfortable, and what makes them afraid. Do your research.

So, the Information Deficit Model works after all? Well, to a point.

McPhetres found that people became more willing to accept GMOs after getting the information, but not **totally** willing. [For example](#), 46 per cent of the control group were willing to eat GMOs. McPhetres' information strategy bumped this up to 68 per cent. A significant achievement, but not a silver bullet.

The movable middle

- Focus your attention on those willing to listen
- Nudge them off the fence



So who are we talking to, anyway?

There's a saying in public discourse that 20 per cent of people will hate what you're saying, 20 per cent will love you, and 60 per cent are in the "moveable middle."

The most vociferous voices of opposition are unlikely to change their minds. Nor are the most ardent supporters. But the moveable middle, if they're paying attention at all, are sitting on the fence.

Our job as communicators is, when they are ready to get off the fence, they're getting off on the side of the true and not the side of the woo.



Talk for the third ear

- Speak to be overheard
- Directed elsewhere, so non-threatening

There's a few ways to do this. Here's one.

Talk for the third ear. Basically this means talking as if we don't know anyone is listening, but we do and they are. We do this with kids.

People will listen to opposing views if they are not directed at them. It's non-threatening; it's a topic that interests them, and they will compare it to their own views if for no other reason to try to shoot it down later.

Take an interest

- Listen attentively, consider respectfully, ask questions
- Tell them you sort of understand, but ask for clarification
- Show them that you take them seriously, but see some inconsistencies you find puzzling
- Objective: get them to see these same inconsistencies



Practice active listening. Don't be that guy that looks like he's listening but is actually just waiting for you to finish so he can talk.

Listen attentively, process, ask strategically.

Ask for clarification. "Well, if that's true, why..."

Your objective is to show them you are taking their position seriously but see some inconsistencies that you find puzzling.

Your goal is not to change their position, but to get them to doubt it, and in doubting it, engage their logical decision-making process.

Rx for info ills

1. Provide detailed, concise explanations.
2. Explain, using alternate accounts.
3. Repeat corrections.
4. Don't repeat the misinformation without the right context. Concentrate on *why* it's wrong.
5. Correct immediately. Unanswered falsehoods quickly grow roots.



*"10 Ways to Combat Misinformation" by
Terry Flynn and Tim Li*

Misinformation, both incidental and deliberate, has been a bugbear of science communications for a long, long time.

It kind of bubbled under the surface, even when outrageous events like Wakefield's vaccine-autism paper and Seralini's GMO-cancer rat paper and subsequent blatant media manipulation.

In 2016, a lot more people started to take notice. And of course in the political arena south of the border it has become rampant. Blatant lies and conspiracy theories are passed off as truth and believed as true! What the heck is going on?

So, scientists are doing what they always do: research the heck out of it. I should hasten to add they had been doing this before, but current events have sure given their work a higher profile. Bottom line, we communicators have some research-backed tactics to draw from.

Here are [10 Ways to Combat Misinformation](#) from Terry Flynn and Tim Li at McMaster University, published through the Institute for Public Relations.

1. Provide detailed, but concise explanations. Keep it tight.
2. Explain, using alternate accounts. That is, knock out the falsehood, backfill the gap with solid info.
3. Repeat corrections. Repetition builds belief. The more familiar information is, the more likely it is to be taken as true.
4. Don't repeat the misinformation without the right context. Concentrate on why it's wrong.
5. Correct immediately. The longer a falsehood is out there, the stronger it gets.

In the Information Age, this means you need someone monitoring your feeds with the authority to respond right now.



Seralini and one of his infamous rats

Rx for info ills

6. Use visuals.
7. Inoculate against misinformation.
8. Choose your public face wisely.
9. Encourage and support analytical thinking.
10. Affirm the audience's sense of self.

*"10 Ways to Combat Misinformation" by
Terry Flynn and Tim Li*

Use visuals. Images evoke emotion – which the purveyors of misinformation well know. Graphs transform thick statistics into an easily understood form. Pictures carry not only information but emotion and feeling – the one we're going for is trust.

Inoculate against misinformation. Get the good stuff out there early and often. Make sure it becomes the first bricks of that foundation of belief.

Choose your public face wisely. Experts are good, depending on how they come across. Or someone that your target audience can identify with. Ask: would I like and trust this person?

Encourage and support analytical thinking. Ask people: what is misinformation? Why is it out there? What's the harm? What can I, as a parent/brother/friend do about it?

Affirm the audience's sense of self. Emphasize the positive values and traits they hold, things that are good and admirable. You must present a worldview consistent their moral foundation that is core to their identity and sense of self-worth, or they'll stop listening to you.

Change from within

- Plant a seed of doubt
- Find a wedge issue
- Suggest a counter explanation
- Don't focus on the false
- Allow them to save face

From "Belief" by James Alcock



Old joke: how many psychologists does it take to change a light bulb? Answer: Just one, but the lightbulb really has to want to change. Here's a few ideas from James Alcock on how to fan that desire in your audience.

Plant a seed of doubt. Such as with the third ear method, asking sincere questions, etc.

Find a wedge issue. For example, if capital punishment... what if an innocent guy gets killed? Use a specific example.

Counter explanations – have them play the devil's advocate – why do they think the other side believes as they do?

Don't focus on the false. Example: rather than push against anti-vax stance, stress the dangers of communicable disease, such as old folks and young babies dying of flu, babies with whooping cough, personal experiences. There are still polio survivors out there; I had a cousin permanently crippled.

Allow them to save face. For example, "I can understand why you would believe that, considering. I mean, anyone would." People don't like to admit they're wrong or that they're backing down from their beliefs.

Packaging, platform, personality

- Use the media platforms your audience prefers.
- Use language familiar to your audience.
- Use messengers your audiences find credible and can relate to.



So, what does this look like when you roll it out in a communications campaign? Let's look at a COVID-19 example.

Canadian youth, and youth in general, haven't been great at masking up to help control the pandemic. Robert Soroka, a Professor of Marketing at Concordia University says this boils down to three problems:

1. Our health messages are going out on traditional media, which millennials don't use.
2. Our health messages use painfully contrived, fear-based language, like "you're gonna die." Millennials don't believe you.
3. Our health *messengers* are stuffy, middle-aged authority figures.

This guy is American actor and comedian Paul Rudd, and this video is called "Certified Young Person Paul Rudd Wants You to Wear a Mask." It's the right medium, the right language, and the right messenger. Released on September 14, it went viral, with 1.4 million views – so far – in two weeks.

Of course, the real measure is to see whether millennials are wearing more masks, but Paul has certainly got their attention.



Collect resources

- Certain questions come up again and again
- Build your own file of credible resources to answer these questions
- Take measures to ensure your sources are credible

There's a lot of misinformation and disinformation out there. But there are also a lot of folks out there fighting the good fight against it, and using some innovative ways to do it.

For many issues, the same questions come up again and again. So keep a file of credible sources where you can get the answers to respond quickly. Keep this up to date by putting fresh references in your resource file as they come through your feeds.

How do you know what's the good stuff?

As a general rule, I try to avoid any outlets that are selling me something. However, I also use refer to some very good corporate-backed sites that offer excellent information. Corporations do, after all, conduct much research and have money for great communications programs. But that pesky profit motive makes them automatically suspect, so check what they say against neutral sources such as government and university research.

B***** detection



- How to tell if a source is credible?
- Government, university research
- Corporate sources (with extra skeptical eye)
- Check claims against peer-reviewed research
- Tool: Carl Sagan's 20-item "baloney detection kit" to test veracity

So, how do you know what information is good and what isn't?

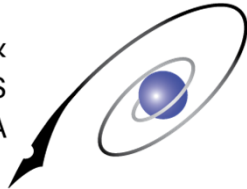
There's a book you should read, if you already haven't called "The Demon-Haunted World: Science as a Candle in the Dark." It was written in 1995 by the late great Carl Sagan, probably one of the best science communicators since, well, ever. In it, he offers some tips on separating fact from baloney. (In less polite company, we do of course use another word...).

Sagan's "baloney detection kit" (go ahead and Google it) contains 20 essential tools to keep you from stepping in it. In true skeptic style the kit comes with a disclaimer:

"Like all tools, the baloney detection kit can be misused, applied out of context, or even employed as a rote alternative to thinking. But applied judiciously, it can make all the difference in the world — not least in evaluating our own arguments before we present them to others."

[Carl Sagan's Baloney Detection Kit](#)

SCIENCE WRITERS &
COMMUNICATORS
OF CANADA



Think locally, network globally

- Find groups dedicated to science communication
 - SWCC, Canadian Farm Writers Federation
 - Examples: McGill Office for Science and Society, Cornell Alliance for Science
 - Seek out science social media feeds – Veritasium, SciShow, scientists on Twitter, Instrgram, etc.
 - Caveat: don't create a filter bubble around yourself
-

Develop contacts across the country. I'm going to do a shameless plug for the Science Writers and Communicators of Canada. I've been a member for some years and am a board member now. Member fees are very reasonable – about a hundred bucks, last I checked – and you get access to a Canada-wide network of really informed and passionate science folks. If you want to go ag-specific, the Canadian Farm Writers Federation is a good choice.

Develop international contacts. Conferences are out for now, but follow and interact with knowledgeable people on social media. There are quite a few scientists that are active on Twitter who will respond to queries with answers and references, for example.

As I've said, everyone's needs will be a bit different, so your resources will end up being specific to your needs. One caveat: don't create a filter bubble around yourself, filled only with people that agree with you.



We're all in this together

- Find allies in your own community
- Create networks and groups
- Build and maintain connections

Develop your local network of science communicators. There is no shortage of topic areas, but the strategies will be often interchangeable. So certainly seek out colleagues in your field, but if you're working in energy and you know a person struggling with the issue of vaccine hesitancy, take them for a coffee. Buy them some lunch. Zoom them if you can't meet face-to-face just yet.

Identify people that are on the front lines of science communication in your community. Join them. Café Sci Saskatoon is one of these – you may have attended their first online event earlier this week as part of Global Biotech Week. They're easy to find via their Facebook page.

Thank you

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Saskatchewan!



Ag-West Bio coordinates Global Biotech Week activities in Saskatchewan
Thanks to support from our local organizing committee!

That's it! Go forth and communicate. Believe in yourselves!