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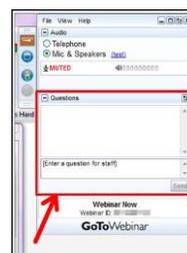
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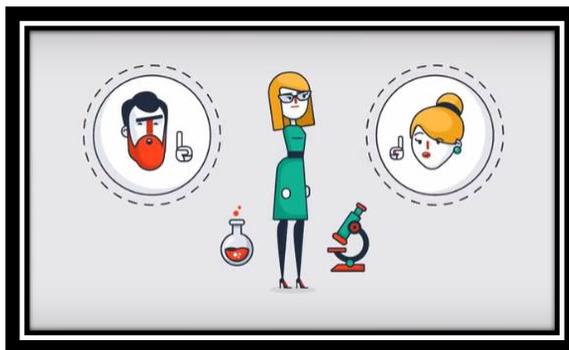
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Project Chemist, Environmental Science International, Inc.,
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Monday, October 9, 2017



Nano 2.0: Multi-scale Nanomaterials

Special Broadcast to Celebrate National Nano Day!

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How to Create Sustainable Product Design that Satisfies Production Demand and Eco-Awareness

Thursday, November 2 @ 2-3pm ET
Part ten of the 2017 Industrial Science Series



Chemical product design, with its emphasis on formulations and a mixture of quantitative and qualitative specifications, always leads to problems with trade-offs, where improvement in one desired outcome inevitably leads to a decline in another. In effect, you're trying to please two sets of customers, one human and the other Mother Nature. Join Eric Beckman, an entrepreneur and Professor of Engineering at the University of Pittsburgh, as he discusses thoughts on how to create viable new products in harmony with both.

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What You Will Learn

- Basic product design principles, from opportunity assessment to dealing with trade-offs
- The basics of life cycle impact analysis
- How to make the desired outcomes of both your human and natural customers work for you

Experts



Eric Beckman
University of Pittsburgh



Joe Fortunak
Howard University

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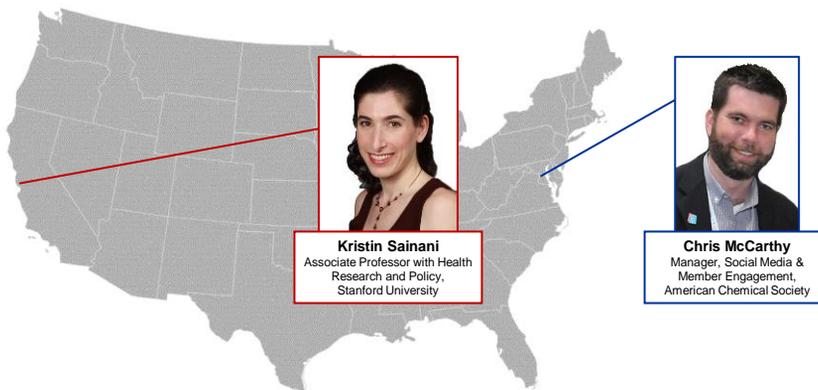


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"Writing for the Lay Public: Engaging and Educating the General Population" Session 9 of the 2017 Industry Science Series



Kristin Sainani
Associate Professor with Health Research and Policy, Stanford University



Chris McCarthy
Manager, Social Media & Member Engagement, American Chemical Society

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Writing for the Lay Public: Engaging and Educating the General Population



October 5, 2017

Kristin Sainani, PhD

kcobb@stanford.edu

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Why Communicate with General Audiences?

- **It's good for the world.**
 - The public must understand science to make informed decisions.
 - If scientists leave it to others to explain science, they leave the door open for misinformation.
- **It's good for your career.**
 - The skills you perfect while writing for general audiences will make your writing more accessible and engaging to scientific audiences as well. This will increase your chances of getting published and funded.

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Scientific Writing vs. Writing for the Lay Public: Similarities

Whether writing for a general audience or other scientists, you should:

BE CONCISE.

BE CLEAR.

BE ENGAGING.



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Scientific Writing vs. Writing for the Lay Public: Differences

When writing for a general audience, you must additionally:

1. Start with the take-home message.
2. Recognize and avoid jargon.
3. Unpack the science.
4. Filter out unnecessary details.
5. Get there faster.
6. Tell a story.



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Lay Summary Example 1

Original: “Here we leverage the wide usage of smartphones with built-in accelerometry to measure physical activity at the global scale. We study a dataset consisting of 68 million days of physical activity for 717,527 people, giving us a window into activity in 111 countries across the globe. We find inequality in how activity is distributed within countries and that this inequality is a better predictor of obesity prevalence in the population than average activity volume.” (excerpted from: *Nature* 547, 336–339, 2017.)

Lay Summary: Researchers used data from smartphones to look at the walking habits of 717,527 people from 111 countries. Countries with the widest gaps between the most active and least active people also had the highest obesity rates. Surprisingly, this “activity inequality” was a stronger predictor of obesity than the total amount of activity.



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Lay Summary Example 2

Original: “Atmospheric water is a resource equivalent to ~10% of all fresh water in lakes on Earth. However, an efficient process for capturing and delivering water from air, especially at low humidity levels (down to 20%), has not been developed. We report the design and demonstration of a device based on a porous metal-organic framework {MOF-801, $[\text{Zr}_6\text{O}_4(\text{OH})_4(\text{fumarate})_6]$ } that captures water from the atmosphere at ambient conditions by using low-grade heat from natural sunlight at a flux of less than 1 sun (1 kilowatt per square meter). This device is capable of harvesting 2.8 liters of water per kilogram of MOF daily at relative humidity levels as low as 20% and requires no additional input of energy.” (excerpted from: *Science* 356: 430-434, 2017.)

Lay Summary: Scientists have created a device that can pull water out of the air. Water-harvesting devices have been built before, but they were impractical for everyday use because they only worked on extremely moist air or required high amounts of energy to run. The new device contains a porous crystal (called a metal-organic framework) that soaks up water vapor like a sponge; a small solar panel provides the energy needed to condense the water into liquid. A prototype containing two pounds of the crystal extracted 12 cups of water from desert air in one day using only sunlight for power.



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Skills: Writing for Lay Audiences

1. Start with the take-home message. Tell readers up front why they should care!
2. Recognize and avoid jargon.
3. Unpack the science.
4. Filter out unnecessary details.
5. Get there faster.
6. Tell a story.



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Start with the Take-Home Message

Original: “Atmospheric water is a resource equivalent to ~10% of all fresh water in lakes on Earth. However, an efficient process for capturing and delivering water from air, especially at low humidity levels (down to 20%), has not been developed. We report the design and demonstration of a device based on a porous metal-organic framework {MOF-801, $[\text{Zr}_6\text{O}_4(\text{OH})_4(\text{fumarate})_6]$ } that captures water from the atmosphere at ambient conditions by using low-grade heat from natural sunlight at a flux of less than 1 sun (1 kilowatt per square meter). This device is capable of harvesting 2.8 liters of water per kilogram of MOF daily at relative humidity levels as low as 20% and requires no additional input of energy.” (excerpted from: *Science* **356**: 430-434, 2017.)

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Audience Challenge Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



Which of the following sentences contains jargon?

(multiple correct answers possible)

- This finding is important because localization of bacteria in the lining of the gut is associated with inflammatory bowel disease. (Statement 1)
- The drug stimulates the damaged cells to regrow in a robust manner. (Statement 2)
- We find that this inequality is a better predictor of obesity prevalence in the population than average activity volume. (Statement 3)
- None of the statements contain jargon.

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Skills: Writing for Lay Audiences

1. Start with the take-home message.
2. **Recognize and avoid jargon. This includes not just technical terms, but also “scientist-speak.”**
3. Unpack the science.
4. Filter out unnecessary details.
5. Get there faster.
6. Tell a story.



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Jargon/Scientist-speak

Original: “Here we leverage the wide usage of smartphones with built-in accelerometry to measure physical activity at the global scale. We study a dataset consisting of 68 million days of physical activity for 717,527 people, giving us a window into activity in 111 countries across the globe. We find inequality in how activity is distributed within countries and that this inequality is a better predictor of obesity prevalence in the population than average activity volume.”

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Jargon/Scientist-speak

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Jargon/Scientist-speak

This protein is interesting as it seems to be a **gain of function** protein. We thought **prions** were formed by an entirely **aberrant process** that was **confined to the space of disease**, but we've realized that prions are formed by **natural conformation changes** that happen **stochastically** or **are induced by** environmental signals as an **adaptive mechanism**. There are actually plenty of examples of prions that have this ability to take on **alternate conformations**.

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Skills: Writing for Lay Audiences

1. Start with the take-home message.
2. Recognize and avoid jargon.
3. **Unpack the science. Your audience may be unfamiliar with basic scientific concepts that you take for granted. You need to explain the science—without handwaving!**
4. Filter out unnecessary details.
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Unpack the Science

Original: ...We report the design and demonstration of a device based on a porous metal-organic framework {MOF-801, $[Zr_6O_4(OH)_4(\text{fumarate})_6]$ } that captures water from the atmosphere at ambient conditions by using low-grade heat from natural sunlight at a flux of less than 1 sun (1 kilowatt per square meter).

Lay Summary: ...The new device contains a porous crystal (called a metal-organic framework) that soaks up water vapor like a sponge; a small solar panel provides the energy needed to condense the water into liquid.

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Unpack the Science

Biology's power budgets are incredibly low compared with computers. The key is that biology uses a combination of analog and digital computing, whereas computers are almost exclusively digital. **To understand the tradeoffs, consider how one might add graded lighting to a room: The analog solution is to use a dimmer switch. A digital solution is to install 10 light bulbs, each with a separate on/off switch.** The digital setup offers extreme precision—turning on five bulbs gives the exact same lighting each time, whereas sliding a dimmer is inconsistent. But the analog setup saves energy, space, time and parts.



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Unpack the Science

Different brain regions are connected by cables called neural projections. The team used the new method to study specific neural projections in the mice's brains.



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Audience Challenge Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



Read the following excerpt from an abstract in *Science*:

“The reward generated by social interactions is critical for promoting prosocial behaviors. Here we present evidence that oxytocin release in the ventral tegmental area, a key node of the brain’s reward circuitry, is necessary to elicit social reward.”

Which detail would likely be omitted in an article for the lay public?

- Social interactions impact the brain’s reward circuitry. (Statement 1)
- The hormone oxytocin is involved in mediating social reward. (Statement 2)
- The specific area of the brain involved is called the ventral tegmental area. (Statement 3)
- None of the above.

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Skills: Writing for Lay Audiences

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2. Recognize and avoid jargon.
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4. **Filter out unnecessary details. Lay audiences don't need to know all the nitty-gritty scientific details.**
5. Get there faster.
6. Tell a story.



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Filter out Details

Original: “Here we leverage the wide usage of smartphones with built-in accelerometry to measure physical activity at the global scale. We study a dataset consisting of ~~68 million days of physical activity~~ for **717,527 people**, giving us a window into activity in **111 countries** across the globe. We find inequality in how activity is distributed within countries and that this inequality is a better predictor of obesity prevalence in the population than average activity volume.”

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Filter out Details

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Skills: Writing for Lay Audiences

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5. **Get there faster. Trust your reader!**
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Cut to the Chase

Original: “Here we leverage the wide usage of smartphones with built-in accelerometry to measure physical activity at the global scale. We study a dataset consisting of 68 million days of physical activity for 717,527 people, giving us a window into activity in 111 countries across the globe. We find inequality in how activity is distributed within countries and that this inequality is a better predictor of obesity prevalence in the population than average activity volume.”

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Get there Faster. Trust your reader!

In order to examine if this rewiring led to changes in behavior, researchers observed the amount of times mice licked certain bitter or sweet tasting chemicals. Mice whose bitter taste buds had been altered **seemed to have more of a tolerance for bitter taste** as they licked bitter quinine more than mice that did not have altered taste buds.

The mice with the altered bitter taste buds licked quinine (a bitter substance) more than control mice.

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Skills: Writing for Lay Audiences

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3. Unpack the science. Your audience may be unfamiliar with basic scientific concepts that you take for granted. You need to explain the science—without handwaving!
4. Filter out unnecessary details. Lay audiences don't need to know all the nitty-gritty scientific details.
5. Get there faster. Trust your reader!
6. **Tell a story. Use story-telling techniques to set a scene, (appeal to the 5 senses), focus on characters (human beings!), follow a plot (drama and suspense).**



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Tell a Story: Set the Scene

JUST AFTER DAWN on a chilly September morning, Virginia Walbot strolls among the rows in a cornfield near the western edge of campus. She peels the husks off purple-spotted ears—the result of a genetic cross—and drops them into labeled bags. All at once, the field awakens with life, as birds suddenly blanket the plants. When the air hits a certain temperature, Walbot explains, tiny bugs called aphids start moving; they draw the ladybugs, which in turn draw the birds. **“There’s lots of life on life out here.”**



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Tell a Story: Character and Plot

WALBOT BEGAN HER CAREER in what she describes as a “dark” era for women in science. After studying biology at Stanford, she attended Yale for her doctorate. At the time, Yale was still an all-male college at the undergraduate level. Walbot remembers women being prohibited from the main library, for fear they would disturb the men. On her first day, the department head proudly announced that about half of the incoming class of biology graduate students was female, adding, **“There is no better combination than a male professor with a PhD-wife to run his lab.”**

“We were in shock, especially those of us who came from co-ed schools,” Walbot recalls. **“But it was an inkling of what the next 10 years would be like for women in science like me.”**



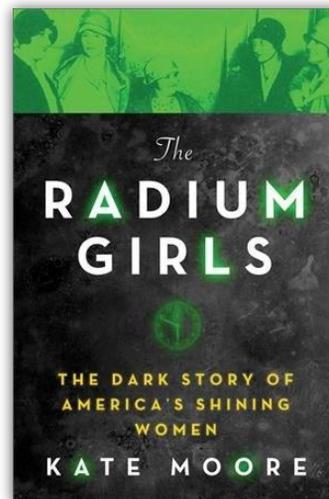
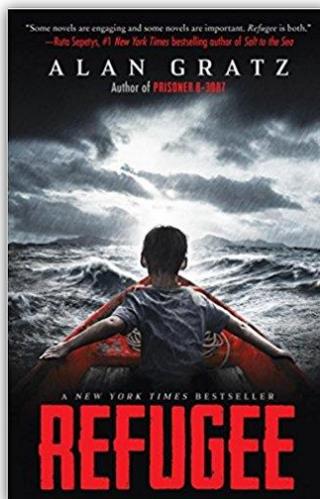
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Two Book Recommendations!



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Take-Home Messages

Writing for general audiences is harder than writing for scientific audiences.

Making your writing more accessible not only serves the public but also increases your chances of getting published and funded.

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Resources

-*Writing in the Sciences*, full 8-week course:

<https://www.coursera.org/learn/sciwrite/>

New session starts this week!

Level	Beginner
Commitment	8 weeks of study, 3-5 hours/week
Language	English
How To Pass	Pass all graded assignments to complete the course.
User Ratings	★★★★☆ Average User Rating 4.9 See what learners said

-*Friends of Joe's Big Idea* (led by Joe Palca, Science Correspondent at NPR):

<http://www.npr.org/2017/08/24/537735624/friends-of-joes-big-idea-fojbis>

“A community of young scientists that includes undergrads, graduate students, post docs and faculty interested in improving their science communication skills.”

“The community is open to anyone actively engaged in science, no matter their training level. We're here to help scientists talk about science.”



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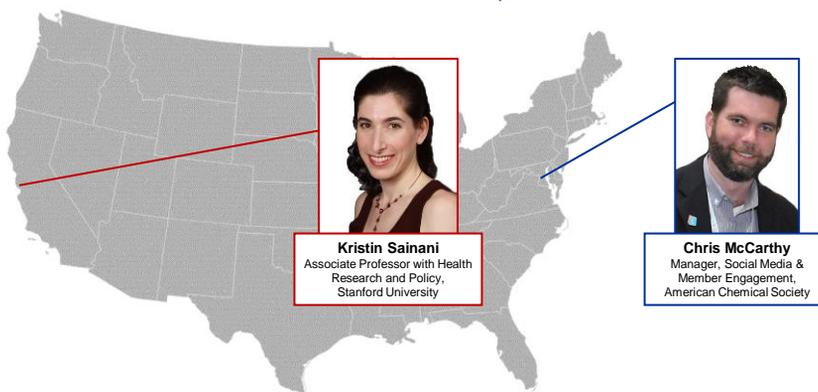
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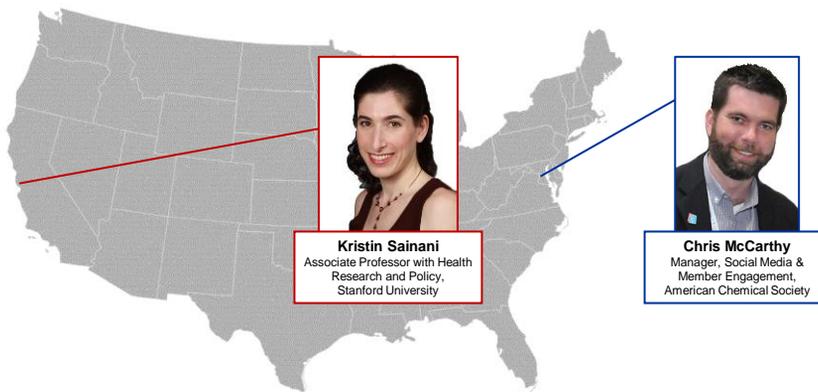
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Project Chemist, Environmental
Science International, Inc.,
ACS member for 9 years strong!

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