Cultural Daily

Independent Voices, New Perspectives

When Science is Wrong, It's Okay to Change Your Mind.

Lisa Bowers · Wednesday, November 2nd, 2016

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Following @Mashable's #SocialGood Conference, I was ready to form a social enterprise to right everything wrong with the world. Speakers from Vice President Joe Biden, one of the forces behind the cancer moonshot, to Jean Case, a tireless advocate for Millennials' influence and power, inspired the audience in a Ted Talks-like format. Many of the talks were about exciting new science and technologies that can change our world for the better.

I was particularly impressed by one speech. But it wasn't only because it highlighted inventive new technologies increasing aquaculture's sustainability potential.

You Can't Stop Science – or Can You? © Andrey Kiselev | Dreamstime Stock Photos

Changing Science

Brian Skerry is an accomplished underwater photojournalist passionate about the health of our oceans and all that live in them. He continued the day's barrage of sobering statistics with:

In the year 2050, there will be more plastic than fish floating in our oceans if plastic is manufactured and disposed of at the current rate. [World Economic Forum]

Seems almost inconceivable, doesn't it? He went on. Stocks of codfish, once an economic staple for New England, are at 1% of colonial levels. Every single year, more than 100 million sharks are killed. (I had to do a fact check. I'm afraid the fact checked.[1]) The culprits? Commercial overfishing and bottom trawling.

Mr. Skerry then focused on aquaculture as a solution to feed a hungry and growing world. ***He began by saying that he had once harbored negative thoughts about aquaculture as a solution.*** Brian's photographs accompanied a June 2014 *National Geographic* article entitled "*How to Farm a Better Fish.*" The blights of aquaculture described were not pretty. They included the replacement of ecologically important tropical mangroves by huge shrimp farms and aquaculture pollutants like nitrogen, phosphorus, and dead fish, very harmful to human health.

A diver inspects scallops being raised at an aquaculture company off Vancouver Island, Canada. This company, called SEAfarm uses a method called Integrated Multi-Trophic Aquaculture in which several different species are raised, each one used with the others to keep the ecosystem

clean and healthy. © Brian Skerry

But Mr. Skerry is optimistic about aquaculture's promise. Aquapods, in the open ocean, do not harm other species. And integrated multi-trophic aquaculture raises multiple species profitably and within a sustainable ecosystem. Both have a lot of potential.

> Brian's admission that he was initially not pro-aquaculture reveals a fragility and uncertainty in science that we do not always acknowledge. Aquaculture, now serving as a growing food source for millions of people and a viable counter to overfishing, was not always the best solution, based on the prevailing science of the time.

Flip-Flopping is Not Always Bad

When politicians change their minds, they are often accused of flip-flopping. But to ensure continued progress, scientists must play catch-up with a changing environment, our evolving physical make-up affected by new foods and unfamiliar particles in the air, and rapid-fire technological advances. Society must then be willing to change direction based on new findings, which can justify business and governments establishing new policies and practices. We should worry more when governments and businesses don't flip-flop, building infrastructures or establishing systems based on science that's no longer valid.

The history of 21st century aquaculture[2], hoped by many to ignite the "Blue Revolution," is just one example of changes in direction based on new science. Similar changes have occurred in the study of climate change, viewed by many as either the greatest threat to human survival or to our economy. Our environment has a lot to lose from ignoring trailblazing scientific theories that negate old assumptions. In a 2012 issue of *Yale Environment 360*, Fred Pearce writes, "from Rachel Carson's *Silent Spring* to James Hansen's modern-day tales of climate apocalypse, environmentalists have long looked to good science and good scientists and embraced their findings" (although Mr. Pearce later complains that environmentalists are starting to take anti-science stands).[3]

New Science Saves the Black-Footed Ferret from Extinction

The attitude of zoologists toward transitioning endangered animals to captivity has also done a 180. Says David Wildt, Senior Scientist and Head, Smithsonian Zoo Center for Species Survival,[4] "Of all the program's many successes, the greatest of all has nothing to do with ferrets and everything to do with human attitudes. . . . 30 years ago, there were really strong feelings against taking the first few animals and moving them into captivity. There were people in the field who would say that it would almost be better to have these animals go extinct than to have them go into captivity."

Unfortunately, the effort to keep the species alive only began when plague and a viral disease nearly wiped every last little ferret out. If the attitude about keeping endangered animals in captivity had been different and the effort had started before imminent tragedy moved the zoology community to action, things would have been easier. (When a population is reduced to nearly zero, inbreeding can be necessary. That has its own host of problems, including kinked tails and low sperm viability for the ferret.)

The scientists at the Smithsonian Conservation Biology Institute re-evaluated their approach and 50 kits were born in 2010. While the black-footed ferret remains one of the rarest mammals in the

United States, I am confident that the scientists striving to sustain the species will continually re-evaluate, be open to new findings, and do the right thing by these adorable animals.

Black-footed ferrets. Photo by Meghan Murphy, Smithsonian's National Zoo

Changing What you Eat Because of New Science

Individuals also change habits based on new scientific findings. Each of us has experienced the havoc keeping to old science can play with our nutrition. For decades, American parents have encouraged their kids to drink milk for strong bones, based on what is thought to be basic medical science. But some health authorities are now promoting the exact opposite behavior, pegging milk as the culprit behind many health issues. Their theories are supported by, humans being the only animals that continue to drink milk after infancy. Besides being difficult for some adults to digest, milk is also blamed for obesity and compromised immune systems.

I eschewed the dairy milk I grew up and drank almond milk. Did it taste good in my coffee? Not really. But I didn't want to ingest something that was harmful to my health and that had a significant effect on greenhouse gas emissions. Two years into my almond milk habit, I learned some things that surprised me. One, almond milk can contain harmful additives. And two, almond milk is bad for the environment. More than 80% of the world's almonds are grown in California. It takes 1.1 gallons of water to grow one almond! That is a lot of water for a state experiencing a severe drought. Scientists tell us that the demand for almonds is also harming honeybees, already in decline. Because almond trees need to be pollinated, 1.6 million hives are brought to California every year. Therefore, large amounts of insecticides are used, killing off colonies.[5]

Thank you, new science. I'm going to curb my almond milk consumption. What should I replace it with? It is unclear, much as many commonly accepted nutrition assumptions are, as food researchers try to find the right answers. I'll try cinnamon as I wait for conclusive new findings.

CFL vs. LED. A Scientific Sleight of Hand?

There's also the quick-change act in which light bulbs we should buy. Natalie Portman matter-of-factly informs us that using 1 CFL light bulb is the equivalent of removing 1 million cars annually in National Geographic's "This Bulb." Actors Kyra Sedgwick and Chloe Sevigny also encourage CFL use if you want to save dogs, cats, redwood forests, and polar bears. This was pretty compelling. If *National Geographic* was endorsing it, I was sure it was smart science. I switched to CFL.

Several years later, I read another article in *National Geographic*, this time citing LED's efficacy over CFL technology.[6] LED's are now less expensive. Most noteworthy, a Department of Energy-funded study confirmed LED's environmental edge. CFL's are difficult to dispose of. I am happy that we have a new and better technology.

The Evolution of Scientific Thinking: Hope for our Future

The beauty of new research findings is that they allow mankind to make continual progress. In his article "*Into the Future*," Udo Gollub reminds us that digital cameras were invented in 1975 and only had 10,000 pixels. In conformance with Moore's Law, digital cameras go mainstream and taking pictures with film is a lost art, just a few years later. Hence, Mr. Gollub calls the current age the 4th Industrial Revolution or the Exponential Age.[7]

It's okay to question science. The United States has become a world powerhouse due to an uncountable number of scientific discoveries. Indeed, despite all of its ills, the quality of life of

most of the world's peoples has improved, by most measures. Progress occurs when we do not look at scientific research and discoveries as unrefutable or concepts. Living in the new normal requires an open mind, one that considers consensus of the scientific community, as well as one's personal perspective and values.

The science of the future will produce life-and Earth-changing new technologies in a virtual world. © TMarchev | Dreamstime Stock Photos

Despite the super-sonic speed of technological progress, no one will deny that our world is troubled and needs help. If new scientific norms that change they way we used to do things can help solve our problems, then bring them on! New discoveries can uncover holes in past theories and reveal innovations better suited to today's world. The result: more progress, better processes, and a new normal. Thank you, Brian Skerry, for reminding me that *science can course-correct and lead to better ways of doing things . . . and a better world.*

Footnotes

[1] Kaplan, Sarah. "By 2050, there will be more plastic than fish in the world's oceans, study says." *Morning Mix. The Washington Post.* January 20, 2016.
[2] Aquaculture. (n.d.). In *Wikipedia*. Psychology. (n.d.). In *Wikipedia*. Retrieved October 14, 2016, from https://en.wikipedia.org/wiki/Aquaculture#cite_note-DuarteMarbaHolmer-29
[3] Pearce, Fred. "Why are Environmentalists Taking Anti-Science Positions?" Opinion. environment360, October 22, 2012. Accessed in 2016.
[4] *Smithsonian Zoogoer*, Sept/Oct 2011.
[5] Philpott, Tom. "Your Almond Habit is Sucking California Dry." *Mother Jones*. Web. July 14, 2014. Accessed in 2016.
[6] Nunez, Christina. "An Unloved Light Bulb Shows Signs of Burning Out." *National Geographic*. February 16, 2016. Web. Accessed in 2016.
[7] JAD. "An Author's Look Into the Future." Forums. Tesla. May 20, 2016. Accessed in 2016.

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