Is Science on a Path to Irrelevance in Policy and Management?*

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Right up front, for the organizers of this conference, I have two shout-outs.

The first, somewhat personal, I'm always happy to be return home. I spent my childhood several hundred klicks to the west of here, and it always delightful to return.

The second, more professional, thanks for persuading me to grapple with a question that has persistently annoyed me for at least half of my career.

As well, it is also a question that may concern you.

So, what exactly is this irksome little question, who asked it, and why is it so troublesome?

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The question was asked by a high school student at the end of a routine "science day" tour, one of the ever-so-frequent show-and-tell tours at EPA's National Research Laboratory in Corvallis, Oregon.

Hosting tours is one of those "other duties as assigned" that we all do, but trust me, these tours are not normally memorable events in the life of a Deputy Director.

A little context . . . . with a staff of several hundred energetic but bureaucratically challenged scientists, as deputy, and for those of you early in your careers, keep working hard, and one day you too might have a job like this, one similar to working as a school principal, especially a principal assigned to a high school in a troubled neighborhood.

Actually, I enjoyed this job, but . . .

Lab science tours were often a welcome breather from my daily task of keeping the bureaucratic peace.

Better yet, lab tours were not intellectually demanding, nor did they ever get into deep and difficult topics, and students always accepted your statements as the revealed truth.

In fact, as a tour guide, I soon learned that your foremost challenge was finishing the tour with the same number of students you started with!

But one of these tours turned out to be very different.

After this particular tour, as we were all waiting for their bus to return, one of the high school students pulled me aside and spoke to me in a quiet, intense, and worried voice. She asked something like this:

> *"Nearly everyone in my family makes a living off the land, mostly as farmers and loggers. Every one of them thinks that scientists are biased against their activities — and even biased against most anything that people might do to change the natural environment. Are they correct? Are your scientists biased?"*

Clearly, she was not your typical 16-year-old!

Regardless, quickly recalling Philosophy 101, my answer was instant and unequivocal:

> *"Science, by definition, is policy neutral. Most definitely, it is not value free, but it is policy neutral. The science that we (that is, us taxpayer funded scientists) produce neither favors, nor opposes, natural conditions. Your family is incorrect."*

Great answer. Confident, clear, comforting. Indeed, I immediately liked my instant, dogmatic response. And, even better, she seemed relieved.

A great resolution! A job well done!

I felt good.

But nearly three decades later, her question still gnaws at me. It was like having a bad case of poison ivy. Scratch it and it feels better, for 30 seconds or so, and then it itches worse than ever.

My simplistic, confident, textbook answer never made the itch go away. Worse, the more I thought about her question, the less I liked my answer.

She was on to something.

The scientific enterprise — and the context in which it operates — has changed . . . . and changed a lot.

At least in natural resource related disciplines, the credibility, the impartiality, and the deference afforded scientists, have all diminished. I base this conclusion on my experiences as both a producer of science, and, in other jobs, as a user of science.

My experience is that many of those who don't trust scientists tend to be supportive of the "scientific method" as a way of acquiring knowledge. They just don't trust scientists to impartially follow the scientific method.

How about some data?

I couldn't find Canadian polling data, but the 2017 YouGov U.S. national poll found 55% of the respondents, more than half, had little or no trust that what they hear from scientists is accurate and reliable.

Even worse, only 29%, less than a third, said that scientific studies are rarely or never influenced by political ideology!

The bottom line, many people out there in the "real world" simply do not trust scientists to be impartial.

Here is what I think has happened.

The Scientific Enterprise

First, one caveat, it is not that the scientific enterprise has been broadly infiltrated with fabricators of data. Nor has scientific fraud become pervasive. These things do happen, but in my experience, they are fairly uncommon.

But, what is common these days is the tolerance, even encouragement, for *scientists* to intentionally push science beyond its proper and appropriate boundaries. And far beyond the basic standards of the scientific method, the core of the scientific enterprise for the past 300 years.

Using science to push personal and employer policy preferences is now widespread. And such now common behavior has consequences for everyone, scientists, natural resource managers, appointed bureaucrats, elected officials, and the public. In both Canada and the United States.

One result? The all-too-common view is that anyone, no matter how poorly informed, no matter how dubious the source of the quoted information, anyone has the right to his or her own facts.

As the late New York Senator Daniel Moynihan once counseled:

"Everyone is entitled to his own opinion, but he is not entitled to his own facts."

In the areas of the scientific enterprise where I spend my time, usually environmental, natural resource, and ecological policy disputes, many policy players take it as a given that scientists have often been corrupted. Corrupted not by sleazy financial shenanigans, but rather by something less obvious and perhaps more insidious.

Let me be specific.

When I venture outside the confines of my cloistered professional world, I run into many people on both sides of the border who are highly skeptical of what scientists say or write.

And the skepticism comes from both the political right ,and left. Oh, they still value scientific information, but increasingly such people have simply lost faith in the policy neutrality of scientists themselves.

For sure, there are many causes for this unfortunate state of affairs, and the professional literature is full of speculation as to why it has developed.

Today, I want to zero in on one really important cause: the pervasive misuse of science as a weapon in policy advocacy. Specifically, I am referring to the increasing prevalence, and acceptance, of normative science.

Call it advocacy science, call it junk science, call it policy biased science, or stick with normative science, regardless of what you call it, it is deceitful, and it has no legitimate place in policy deliberations.

Normative Science

OK, what exactly is normative science and how does it differ from real science?

Think way back to Philosophy 101, normative science is a type of information that is *developed, presented, or interpreted based on an assumed — and usually unstated — preference for a particular policy or class of policy choices.*

Of course, there are various reasons why people have lost faith in the policy neutrality of scientists, but normative science is a big one, and it is one that we scientists, and users of science, can do something about.

Here's how it happens and here's what we can do about it.

Not one of you would slip into normative science, right? Now . . . be honest.

I admit, on a few occasions I have succumbed to the Dark Side of the scientific enterprise.

Not concerned? You should be. Its rampant prevalence threatens to marginalize the legitimate, and essential role that science ought to play in natural resource policy and management.

Still skeptical? For many years I have taught a graduate class in ecological policy at Oregon State University. Most of my students have one or more science or natural resource degrees. In class, I do my best to encourage students to watch out for normative science. And I talk a lot about how they, at least those who wish to work as scientists, ought to follow good practices and remain policy relevant, but policy neutral.

If they want to become policy advocates, fine, no problem, but keep their policy advocacy out of their science. At a minimum, eliminate those "ought" and "should" statements from their science.

Once again, back to Philosophy 101 for another definition:

At its most fundamental level, what we loosely call "regular" or "traditional" science is simply information, but *information gathered in a rational, systematic, testable, and reproducible manner.*

A first principles fact, right? Science contains no good or bad policy judgment, no implied policy preference, and it is only one type of information in policy and management debates.

This is also true of the applied science that most of us do. Someone has identified a policy or management problem for which scientific information might be helpful. No

problem, a typical situation, but the same rules apply.

However, science is not value-free. Let me explain.

Think about funding research. The decision about which science topic to pursue is a value-based choice. In fact, even the selection of the scientific method to answer a question rather than use alternative ways to acquire knowledge is, itself, also a value-based decision.

But science should be policy-neutral.

Yes, policy relevant for sure, but policy neutral.

The key point: "regular" science *becomes* "normative" science when a policy preference gets embedded in the research design or interpretation of the data, and often this transgression passes unnoticed.

I'm being careful here, I am using the term "scientist" to describe a person *who generates or interprets information by applying the scientific method, the same method you learned way back in your first middle school science course.*

Yes, I know that loads of people have science degrees and many are called "scientists," but many science degree holders are often employed as natural resource managers, pollution regulators, environmental advocates, commodity advocates, roles where using scientific information may be hugely important, but it is only one of many factors that such people deal with.

OK, enough of the definitions, back to my graduate class full of young, aspiring scientists.

After discussing the use and misuse of science in public policy, and mostly being met with body language showing skepticism, one student finally raised his hand, but his demeanor had an aura of frustration, if not complete futility.

But, he was one of the more reflective students and once I saw his hand go up, I instinctively knew that at least he would be supportive of my idealized vision, the high school civics vision of the proper role of science.

Yes, as only an idealistic and passionate young scientist might say:

> *"Dr. Lackey, things have changed since you were a graduate student. You are living in a dream world. Most of the public just assumes we are policy advocates. These days, the only people who really trust scientists to be policy neutral are scientists themselves. You need to get real!"*

Wow. Is this the breed of scientist our universities are now producing? Scientists who see themselves as members of a policy advocacy group? Is this what some scientists

have apparently become?

At the time, my instinct was to disregard such an assertion, especially one coming from an inexperienced graduate student, but I well remember a scolding that I received early in my career from a very experienced Government lawyer. And, it is not a pleasant recollection, even after many years.

We were relaxing in a pub after spending a long, long day listening to dueling scientists testifying in an U.S. Endangered Species Act hearing. I was trying to convince him, a lawyer, from my perspective, as a scientist, that it seemed reasonable to presume that the opposing sides should be able to agree on the basic science relevant to this particular case, or simply reach consensus on the so-called "scientific facts".

After all, the legal debate should be over interpretations of law, not science, right? My argument seemed self-evident to me, perhaps even a platitude. In retrospect, perhaps I was badgering him a bit too much, but his response still stuns me all these years later:

> *"Bob, you guys* [by that he meant you scientists] *have no credibility. All of you spin your science to lend support to whatever policy outcome you or your employer favors. I'm not sure science was ever a beacon of truth, but it sure isn't now, at least not in the legal arena. I watch scientists routinely misuse science in case after case."*

I didn't buy it at the time, but my thinking has changed. Pick any of today's policy issues, pipelines, wildfire, climate change, GMOs, endangered species, childhood vaccinations, fracking, much of the public no longer trusts scientists to present "just the facts."

And it is not only members of the public who are distrustful! Many natural resource managers and policy makers, are badgered by self-professed experts, wrapped in the accoutrements of the scientific enterprise, but corrupting science for use as an advocacy weapon.

A deplorable state of affairs for sure!

Action Item

OK, what can scientists, themselves, do to help clean up this mess? Let me offer a common-sense action item that every newly minted scientist — and every seasoned scientist can, and should, adopt.

Only one action item, but whether you work for a government agency, a consulting firm, a policy advocacy organization, a business enterprise, or a university, post this item prominently on your office wall.

"Scientists' values, that is, their policy preferences, are no more important than those offered by anyone else."

Let me slightly rephrase this message:

"Scientists' values, that is, their policy preferences, are not, in any way, special."

They are not.

When scientists step outside the narrow bounds of science, in reality our only area of special expertise, we should remember the blunt admonition of Nobel Prize winner Richard Feynman, often called the "scientist's scientist". It was Feynman who famously cautioned us:

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy."

And policy-making is most definitely a nonscientific problem.

At its core, policy making is essentially the process of picking winners and losers. No wonder the policy game is so contentious.

But shouldn't it be reasonable to agree on the scientific facts about the policy issue at hand and the let the political process select from competing values and trade-offs?

Apparently not.

And worse, think about the practical challenge confronting the public, who of the many so-called scientists who offer opinions about natural resource and environmental issues will the public trust?

Those employed by the Sierra Club? The Canadian Association of Petroleum Producers? Greenpeace Canada? The Canadian Wind Energy Association? The Union of Concerned Scientists? Monsanto? The United Nations?

Not likely.

Loss of Trust

Let me use a final example, one uncomfortably close to our disciplinary homes, how slipping into normative science undermines trust in scientists.

Remember that question from the high school student?

"Is Our Science Biased Toward Natural?"

A simple question, but I'm working in academia these days, so a straightforward yes or no will not suffice.

To start, put on your science hat, and be honest here, imagine that the public owns a 5,000 acre stand of old growth spruce, scientifically, is preserving this landscape preferable to removing the trees to access oil under the same 5,000 acres?

It is not! At least not without assuming, perhaps unwittingly, a policy preference, a value choice. The result, a textbook example of normative science.

It may look like a scientific statement. It may sound like a scientific statement. It is often presented by people who we assume to be operating as scientists. But, such statements in science are nothing more than "policy advocacy masquerading as science."

Anyone following basic scientific principles would say:

"Pristine ecosystems are neither superior, nor inferior, to human altered ones. Different, for sure, but not better or worse."

Many of my natural resource graduate students choke when they hear this assertion. Are not pristine ecosystems self-evidently in better shape than human altered ones? Is not an old growth forest obviously superior to a tree farm? Better than a corn field? And surely vastly better than the same land covered by another Canadian Tire parking lot?

But who says that natural ecosystems are superior to human altered ones? Some advocates push this policy assertion all the time, and we all expect this. No surprise for sure.

But certainly not scientists, right?

Wrong!

All those years ago — the high school student was correct. My new answer:

"Science is often policy biased toward natural."

When you confronted with scientific material, look for the telltale clues to normative science.

When you see the words, "natural, "healthy," "degraded," "biological integrity," all these terms, and many others, have embedded assumptions about what someone or some organization regards as a desirable value choice, a preferred policy choice.

These and similar words have no place in science. They are classic examples of normative science. Their use in scientific publications is simply policy advocacy disguised as science.

The words are fine for management, expected in policy advocacy, but not OK in science.

Conclusion

Let me wrap up by offering Charles Darwin's advice to scientists. Remember that he was under a lot of social pressure to make his scientific findings conform to the dominant political and theological views of the time. His pithy guidance to scientists:

"A scientific man ought to have no wishes, no affections, a mere heart of stone."

Strict, uncompromising, and unequivocal advice, but spot-on for scientists both then and now.

For those of you who receive information from scientists, information that only they can credibly provide, it is unvarnished facts, including probabilities, uncertainties, and caveats that you should demand from them.

Expect nothing less from scientists, but don't tolerate anything more.

Thank you.

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About the Speaker

Dr. Bob Lackey is professor of fisheries science at Oregon State University. In 2008, he retired after 27 years with the Environmental Protection Agency's national research laboratory in Corvallis where he served as Deputy Director, Associate Director for Science, and in other senior science leadership positions. Since his very first fisheries and wildlife job as an undergraduate mucking out raceways in a trout hatchery, he has worked on an assortment of environmental and natural resource issues from various positions in government and academia. His professional assignments involved diverse and politically contentious issues, but mostly he has operated at the interface between science and policy. He has published over 100 articles in scientific journals and is a fellow of the American Fisheries Society and the American Institute of Fishery Research Biologists. Dr. Lackey has long been an educator, having taught at five North American universities and currently teaches a graduate course in ecological policy at Oregon State University. Canadian by birth, he is now a U.S.-Canadian dual-citizen living in Corvallis, Oregon.

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