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***Duck! Disaster! Destruction!  
Challenges in communicating about near-Earth objects***

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*Introduction: the current environment*

Near-Earth objects (NEOs) have been of interest to experts and to citizens ever since scientists named them and started studying them. While NEOs, and NEO impacts with Earth, have been with us for billions of years, only over the past few decades have we learned enough about them to start worrying about NEO hazards and risks.

Thus, over the past 10 years or so, we've witnessed a high and growing public interest in NEOs, among scientists, bureaucrats, politicians and policy makers, and all of their various "publics."

The NEO community's success in stepping up the pace of NEO searches and surveys, tracking, and analysis while at the same time providing more information to public audiences about the work that you're doing is a major contributor. The events of February 15, a combination of predicted and unpredicted occurrences, fanned the flames of public interest. While those flames have died down, they haven't died out, and I don't expect them to in the foreseeable future.

To maintain widespread public awareness and improve understanding, the NEO community must be prepared to communicate effectively about NEO discovery and characterization and identification and tracking of potentially hazardous asteroids (PHAs). And you're doing a great job so far. However, scare tactics, misinformation, loaded language, fuzzy thinking, and conspiracy theories are still all too common in the public discourse about NEOs and PHAs. I've been observing and analyzing communication about science, technology and risks for decades, and here are my thoughts on what we would do well to focus on in our communications with our various "publics."

*Lessons learned in communication*

What I've learned through research and through practice is that communication is contextual, contingent, situated, and symbolic as well as instrumental. "The public" is not a monolithic audience. Mass media and, increasingly, social media play a key role in public discourse about science. The professional values and practices that journalists and scientists employ in their work are different and sometimes conflicting.

The most prevalent model of science communication to date is the cognitive-deficit model, which posits that effective communication is a process by which knowledgeable scientists convey information they deem useful to ignorant non-scientists. This model has its historic roots in the propagandistic model of communication. This approach to science communication is not the most effective method of conveying useful information to the public. In the current environment, a more effective – and, I would argue, a necessary – approach to science communication is networked, dialogic, participatory. We need to give our "publics" a chance to tell *us* what *they* want to know. This approach promises to be especially useful in communicating about risks and uncertainties, as dialogue is critical to building trust. Top-down command-control communication won't work. A networked, flexible, responsive approach to communication is necessary.

*Be clear, concise, comprehensive, and correct. Always.*

Trust is key to sustainable public engagement. We need to earn public trust and avoid violating it. It is more difficult to regain trust than to build it in the first place. Toward building and maintaining trust, we need to be *clear, concise, comprehensive, and correct in our communications, always*. We need spokespeople who are skilled at communicating with expert as well as non-expert audiences and who are committed to openness, transparency, and true engagement – that is, people who are trustworthy.

What do I mean by true engagement? I would like to encourage you all to think more deeply about what it means to engage "the public." We may benefit from talking less and listening more, letting others form the questions and then helping them to find the answers. Engaging with our various "publics" requires taking our work AND public opinion seriously. Engaging with our "publics" will work best when we focus on making connections rather than producing sameness. If our goal is to ensure that our "publics" all think like we do, know what we do, understand the world the way we do, we're likely to be frustrated.<sup>1</sup>

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<sup>1</sup> What public engagement should aim for is "relationality," which requires an embrace of "particularity." This is in contrast to the "applied knowledge" approach, which aims to transfer knowledge from experts to non-experts. Equality is not equal to sameness. Equality enables a greater variety of differences. (Elizabeth Minnich, "Thinking what we are doing: reflections on public philosophizing," Public Philosophy Network Conference, Atlanta, GA, March 16, 2013)

*Acknowledge people's fears, beliefs, worldviews....*

Effective communication about risks and hazards requires acknowledgement of people's fears. Ignoring or dismissing people's fears does not build trust, and it does not dispel those fears. We need to acknowledge and accept different belief systems and worldviews. We don't need to like them. We do need to accept them and work from there.... By explaining what we know, what we don't know, what we need to learn about NEOs and PHAs, by being open and honest, by accepting our "publics" as they are, we can better engage citizens in the process of discovery and understanding.

Misinformation, both unintentional and purposive, is plentiful, and thus misunderstandings are plentiful. For reasons that psychologists have explored, misinformation can be "resistant to correction," and "efforts to retract information can even backfire and, ironically, increase misbelief." An individual's worldview or belief system "can override fact, and corrections can backfire. One might be tempted to conclude from those findings that people are somehow characteristically irrational, or cognitively 'insufficient'." This is a misunderstanding in itself, however. A straightforward approach to correcting misinformation in the face of different belief systems depends on accepting different worldviews and on cultivating healthy skepticism, which is a long-term process.<sup>2</sup>

Risk assessment and risk communication are two different animals, each standing on different theories and assumptions. Sometimes the two activities are conflated, which tends to be problematic for communication. "Practitioners of risk assessment and risk communication have adopted conceptualizations of risk that are naively oblivious to ambiguities in the way that the word 'risk' functions grammatically in ordinary language. Risk communication must take ordinary, nontechnical usage into account."<sup>3</sup>

*Tell people what they can do in the face of risks and hazards.*

When people feel helpless, they feel vulnerable and even fearful. Involving citizens in the process of learning about NEOs and PHAs and enabling them to participate in the process of mitigation planning will go far toward empowering them to make sound decisions. Disaster planning, management, and mitigation has some common core elements regardless of the cause of the disaster – flooding, tsunami, earthquake, volcanic eruption, or NEO impact – and the current administration is

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<sup>2</sup> Stephan Lewandowsky et al, Misinformation and its correction: continued influence and successful debiasing, *Psychological Science in the Public Interest* 13(3), 106-131, 2012.

<sup>3</sup> Paul B. Thompson, Ethics and risk communication, *Science Communication* 34(5) 618-641, 2012.

taking steps to ensure public “resilience” in the wake of disasters, from the community to the federal level. (Remember the Boy Scouts motto: be prepared.) A recent tabletop exercise at the Federal Emergency Management Administration’s National Response Coordination Center earlier this month was a big step toward raising awareness in the disaster response and mitigation community of the reality of PHAs. We’ll have another exercise here tomorrow.

### *Pay attention to rhetoric*

Words are the way we construct our social realities. Loaded language can grab public attention, and it also lead to misunderstandings and even fan people’s fears, toward no productive end. The common language of the military-industrial complex – for example, speaking of challenges in terms of “threat/response” – is “loaded” and may be problematic in communicating with non-expert audiences about NEOs and PHAs. I’m not convinced of the utility of painting nightmare scenarios. I’m also not convinced of the utility of debunking. The debunking approach – put simply, “You’re wrong, I’m right, here’s why” – is not a useful way of engaging with publics and building trust. Again, acknowledging people’s fears, engaging them in dialogue, and promoting understanding is a more productive long-term strategy.

Over the past 10 years, NEOs and/or PHAs have been described as “killers,” a “threat [from] the heavens,” “interplanetary projectile,” “mass extinction impactor,” “civilization destroyer,” “city buster,” “tsunami/regional killer...” This kind of language gives inanimate objects agency, like NEOs have wills and suddenly have decided to come after us. It would be no wonder if those who are not in the business of studying NEOS got a bit worried.

We’ve been offered impact scenarios like this one: “Global firestorms...lethal blast wave...planet wide tsunamis [and] earthquakes...consequences...worse than a full-scale nuclear war....” Fifty-plus years of social science research shows panic is rare even when people are feeling really scared. Belief in the likelihood of panic can lead to ineffective risk communications, so it’s best to consider the science....

Some of us may love our action verbs, and our superlatives, and our really really big numbers, as much as journalists do. And that’s not necessarily a bad thing. Sometimes action verbs can help us be clear and concise. Oversimplification can be just as confusing as “too much information,” however. And superlatives and really big numbers may or may not serve the goal of being clear, concise, and correct. It’s important to acknowledge ambiguity and uncertainty, too.

As to “facts” and “truth” and even “knowledge,” I’ll mention again, at the risk of oversimplifying a complicated picture, how a person’s values, beliefs, and worldview determines what constitutes facts, and truth and knowledge.

Finally, let me plead with you to consider the strong, deep, and persistent stigma attached to anything “nuclear,” largely due to the effects of radiation. This stigma

has nothing to do with knowledge or ignorance of the “facts.” It’s about fear and loathing. Even if the NEO community’s fondness for nuclear terminology in characterizing the energy potential of NEOs and PHAs is helping to advance public understanding of the challenges we face, at the same time this terminology may be stirring negative feelings.

*The current news environment: global, mobile, 24/7*

“Today’s increasingly expanded, fragmented and digital mediascape is marked by uninterrupted change.”<sup>4</sup> We live in an era where information, infotainment, and plain old entertainment are offered up as news. We feed on a news and information cycle that is global, mobile, and 24/7. We live in an era of citizen journalism (the good, the bad, and the ugly), news and information customization and repurposing. Ours is an era of increasing conglomeration of media ownership, whose effects include declining diversity of perspectives. Blogs, Twitter feeds, and Facebook postings become mainstream-media news content. In the current environment, a blog post or a Twitter thread can be as influential as a front-page story in the New York Times.

Consolidation of media ownership has intensified the recycling or repurposing of news and information. A story produced for the space-aficionado readership of space.com also appears on NBC and other media outlets with larger audiences. Often headlines are rewritten to be more engaging and sometimes less accurate. Phil Plait’s TED talk of 2011, “How to defend Earth from asteroids,” was prepared for a highly educated, well-to-do audience of people who can afford to spend \$7,500 to go to a conference. Then the TED organization went about recycling the talk to media outlets reaching larger and more diffuse audiences – for instance, the Huffington Post’s “TED Weekend” feature (December 2012) and National Public Radio’s new “Ted Radio” show (after the events of February 15, 2013).

*In the media: some recent examples*

In the U.S. Public Broadcasting System’s March 27 program, “Meteor Strike,” about the Chelyabinsk event, NEO experts did an excellent job of explaining what happened, what we know about NEOs, and how we’re learning more about them. However, the level-headed experts were up against a typically over-the-top mass-media narration. While NEO experts may be careful to avoid extreme terms, media content producers are not. In fact, they’re quite fond of them. Some examples from this program:

- “It came from outer space.” These were the opening words of the narrative (and, by the way, the title of a 1953 Hollywood SF film).
- “The race is on to find out what *really* happened.”
- “Why was there no warning?”
- “The real threat we face from outer space....”
- “Exploding death rocks from space.”

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<sup>4</sup> Oscar Westlund, Mobile news: a review and model of journalism in an age of mobile media, *Digital Journalism* 1(1), 6-26, 2013.

- “Two celestial hammer blows aimed at planet Earth on the same day.”

During the first 5 ½ minutes of this program, we saw the same dramatic video clips of people screaming, glass shattering, and so on, at least three times in a row (and once or twice more later in the program).

In 2012, we learned about 2011 AG5, space.com reported in February that this “Big asteroid could pose threat to Earth in 2040.” By June, the Daily Mail reported, “Well that’s a relief! NASA says asteroid won’t hit us in 2040.” (Daily Mail, 6/18/12) In between, we heard from Planetary Resources. The Daily Beast reported in April, “James Cameron and investors seek to lasso and mine an asteroid.” No financing, no business plan, but rich principals aplenty.... If people are confused, it’s understandable.

Also in 2012, we learned of 2012 DA14. Here’s what we heard from NASA: “On Feb. 15 (2013) at approximately 2:30 p.m. EST, a 150-foot sized asteroid will safely pass by Earth. Designated Asteroid 2012 DA14 by researchers, it will skirt by our planet at about 19,000 miles. This distance is well outside our atmosphere but inside the orbits of our communications and weather satellites stationed 22,300 miles from Earth. While this celestial object does not pose any threat to Earth or satellites, it creates a unique opportunity for researchers to observe and learn more about asteroids. “

And here’s a small sample of what we heard from the media on the matter:

- “‘Atomic bomb’ asteroid will definitely miss us this time ... but it comes back every year” (UK Daily Mail, March 12, 2012)
- “Alert: deadly asteroid bounds toward Earth out of the blue” (Realist News, March 2012)
- “Asteroid 2012 DA14 WILL HIT Earth on 15th February 2013 ? IMPACT IMMINENT?” (YouTube, 80sSkyChild1987, 46,000+ views)
- “Asteroid 2012 DA14 Won't Hit Earth, NASA Says, But Don't Rule Out Satellites” (Huffington Post)
- “Asteroid With Power Of H-Bomb To Miss Earth, Experts Say” (Huffington Post U.K.)
- “No, asteroid 2012 DA14 will not hit us next year” (Bad Astronomy)

For my final example, in his 2011 TED talk on potentially hazardous asteroids, Phil Plait described the NEO impact believed to have led to the extinction of the dinosaurs this way:

“Sixty five million years ago, the dinosaurs had a really bad day.... A chunk of rock six miles across, moving something like 50 times the speed of a rifle bullet, slammed into the Earth, [causing] an explosion that was mind-numbing. If you took every nuclear weapon ever built at the height of the Cold War and lumped them together and blew them up at the same time, that would be one one-millionth of the energy released at that moment” 65 million years ago.

As noted above, this story continues to recirculate in media channels.

*Statistics, probabilities, scales, and other quantitative quandaries*

Numbers, statistics, probability calculations, rating scales, and other quantitative tools allow us to impose some sort of order on the natural world. While these tools are meaningful, useful, and even necessary to NEO experts, they don't translate well across the boundaries that separate experts from non-experts.

The 2003 annual meeting of the American Association for the Advancement of Science featured a session on NEOs. After a series of excellent presentations, an experienced wire-service reporter told the experts on the panel to forget about their Richter scales and Torino scales and Palermo scales in attempting to communicate about asteroid impact risks. What people want to know, he said, is, "Am I at risk and, if so, what is that risk?" Be clear, concise, and correct.

At a recent tabletop exercise designed to enable officials from NASA and other government agencies interested in NEO impact risks to run through a hypothetical impact scenario with officials of the Federal Emergency Management Agency, FEMA officials pretty much in unison told the NEO experts that Palermo scales and Torino scales and probability calculations don't and won't work for them in trying to understand impact risks. If it won't work for FEMA officials, it's safe to assume that it won't work for our various "publics."

*Conclusions*

I do not and will not advocate euphemistic terminology. Neither do I advocate the practice of "dumbing down" communications between experts and non-experts. I loathe the very concept.

NEO communication strategy, planning, and analysis are matters for social science to tackle in cooperation with NEO experts. Plenty of good social science, along with the scientists who produced it, is available to draw on. The Secure World Foundation's workshop of November 2011 pulled a few of us into the discussion, largely thanks to Leonard David.

Given human nature and scientific uncertainty, it's safe to assume that the challenges we're discussing here today will be with us indefinitely. I believe, however, that we can get better at responding to these challenges.

I'll wrap up by sharing an anecdote with you, supplied by a historian of science:

"In 1773 the French astronomer Jérôme Lalande wrote a paper on comets and their unstable trajectories, stating that it was possible that a comet could come close to the Earth, thus producing catastrophic events. When the Paris Académie des sciences, due to lack of time, cancelled his lecture – already announced [in] newspapers – people started to think that Lalande had been censored, in order not to reveal the imminent apocalypse.

Rumours and fears spread out in Paris, and soon after in the provinces of France and all over Europe: many intellectuals commented [on the story, and] many journals propagated [it]. Lalande tried to calm down the public, writing [in] the “Gazette de France” and printing a popular version of his [memoir], titled “Réflexions sur les comètes”, which had a considerable [distribution], but apparently the panic did not stop.

Her study showed “that at Lalande’s time, scientists were concerned about these problems and discussed them in a way that closely resembles the recent debates on risks related to asteroids and high-energy accelerators.”<sup>5</sup>

Thank you for your attention, and I look forward to discussion.

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<sup>5</sup> Ilaria Ampollini, “Communicating risk in Enlightenment Europe: Laland and the comets approaching the Earth,” Public Communication of Science and Technology, Florence, Italy, April 18-20, 2012.