MIXED MESSAGES: *MISLEADING COMMUNICATION IN PLANETARY DEFENSE*

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Two goals in conflict

Communication in planetary defense has two goals that are in conflict. One goal is to generate sufficient public concern to assure adequate political and budgetary support for an effective planetary defense. But another goal is to reassure the public that we need not live in a state of perpetual panic regarding the impact threat. My personal observation after a decade and more of involvement in planetary defense is that a proper balance has not been struck, because the second goal has taken precedence over the first. The result is that insufficient urgency attends the development of a truly effective and comprehensive planetary defense. My particular aim in this poster is to highlight one contributing factor to the imbalance, namely, the prevalent use of certain locutions that convey a misleadingly diminished picture of the real threat posed by potential impactors.

"once every"

Impactors do not show up like clockwork.

Perhaps the most frequently used locution of the offending sort is "once every," as in, "We can expect a potential impactor of such-and-such size to show up *once every* n years." The proper expression is "once every n years *on average*," but the latter phrase is often dropped as obvious among those who are conversant with statistics. But even among the experts, a certain complacency may be induced by the abbreviated wording.

I know of no more telling instance of this than the remark by Russian Emergency Minister Vladimir Puchkov regarding the lack of preparedness for what took place in Chelyabinsk in 2013:

> **"We thought that humanity would not have to face such an attack for another couple of thousand years, but the opposite happened and Russia was hit with a large-scale natural emergency." (RT News 2013)**

This is of course absurd. To extrapolate from the historical frequency of a certain type of event to a prediction of the date of its next likely occurrence is simply fallacious. It would be different if an actual *regularity* (however complex) had been discerned, such as is the case with eclipses. It also helps instill confidence in a prediction if one has a theory to explain the regularity. But merely statistical regularity, which is all we have for potential impactors, offers no guarantee at all.

The simple truth about potential impactors is that their apparitions are random. Therefore, given also the potential for catastrophic harm from an impact, and the possible short advance warning, it behooves us to prepare to defend against a potential impactor at any and all times, without lag or lapse, starting today and forevermore.

We cannot afford the luxury of preparing at our leisure, or waiting for the next potential impactor to be discovered. That would be to gamble, with human civilization itself possibly at stake.

"low probability"

Low probability does not mean low risk.

Closely tied to the previous locution is "low probability," as in "An impact the size of Chicxulub is a very *low-probability* event." But the impression that is conveyed by this is that there is a very low *risk* of another such impact. Properly speaking, however, the *risk* is the *product* of low probability *and high consequence* of the event. Here again, the latter part of the description is often lopped off, so we are left with "low probability," which makes it sound like the risk is low. But it is not low; it is high when the consequence is properly factored in.

One might suppose that the low probability and the high consequence cancel each other out. Thus, what is the risk of all the atoms that constitute our planet suddenly veering off in all directions? The consequence would be the ultimate human disaster; but the probability is so low that for all practical purposes the risk is zero. We need not lift a finger to try to prevent this catastrophe, if we even knew where to begin.

But the impact threat is not like this, and in two significant respects. One is that we actually do have the potential means to protect ourselves from the threat, provided sufficient resources were devoted to preparing to do so. The other is that when one actually works out the figures, an adequate investment in this undertaking, and one far higher than what we make today, can be justified; see for example:

Matheny, Jason G. 2007. "Reducing the Risk of Human Extinction." *Risk Analysis* 27:5 (1335-44)

"risk reduction"

Real reduction of risk is not merely statistical.

Yet another related locution is "risk reduction," as in "When we track a newly discovered PHO, invariably *the risk* of impact *is reduced*." Yes, fortunately this has been the case so far. But, as they say about the stock market, past performance is no guarantee of future results. There is nothing in the nature of things that guarantees risk reduction of the next PHO to be discovered.

Sometimes the locution is used more broadly to refer to the overall impact threat. Thus, "*The risk* of a major impact *has been* dramatically *reduced* by the Spaceguard Survey." This has a clear statistical meaning: Of the estimated 90% or greater of 1km or larger NEOs that have been discovered in this survey, none is on a collision course with Earth for the next century at least. That is certainly good news.

However it has not reduced by one iota the risk of catastrophic impact by the as-yet-undiscovered 1km or larger NEO (or LPC or ISO etc.) that is currently on its way (in the sense of Laplacean determinism) to collide with Earth. For it is the consensus that the Earth *will* be struck by another such object sooner or later (unless we stop it).

The only thing that will reduce *that* risk is to have a robust planetary defense in place; and this is the truly objective sense of "risk reduction" (as it is used in the title of the previously cited article by Matheny).