

## Evidence in the eye of the beholder: portrayals of risk and scientific (un)certainty in *Don't look up*

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### Abstract

In this invited comment, we discuss portrayals of risk and scientific (un)certainty in *Don't look up*. Specific scenes of the movie were selected, to reflect how within and between the spheres of science, politics, journalism, and economics an upcoming risk and its scientific (un)certainty is (re-)interpreted and (re-)framed, in line with the respective sphere's logic. We extend our assessment by common criteria of film analysis and comparisons to climate change, where applicable. This comment emphasizes how in the movie the logic of economy is taken over by politics and journalism, and how it prevails over the logic of science.

### Keywords

Representations of science and technology; Risk communication; Science and media

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### Portrayals of risk and scientific (un)certainty

According to common definitions, a *risk* can be seen as the probability of an occurrence of damage and the severity of that damage [e.g., Ruhrmann & Guenther, 2014]. In science, both a damage's probability and its severity can be assessed using criteria of scientific evidence. The concept of *scientific evidence* is inherent in science and its language, and thus part of its logic. Based on scientific standards and methods, as well as their evaluation, scientific findings can always be assessed as more or less *scientifically (un)certain* [e.g., Bromme, Prenzel & Jäger, 2014]. Uncertainty is an accepted standard in science. Gustafson and Rice [2020] refer to different types of uncertainty: (1) *deficit uncertainty* (when findings are new, and not yet proven or evaluated by other, independent scientists); (2) *tentativeness uncertainty* (due to limitations and the principle of falsification, see also Popper [1960]); (3) *technical or probabilistic uncertainty* (which refers to the statistical nature of data and the methods used); (4) and *expert disagreement* (shown, for instance, in controversies [see also Guenther, 2017; Stocking & Holstein, 2009]). Degrees of

certainty, in contrast, are achieved through replication, valid and reliable data, or confirmed hypotheses [e.g., Jensen, 2008].

Concepts such as risk, scientific evidence, and (un)certainty are difficult to communicate [e.g., Friedman, Dunwoody & Rogers, 1999], which makes their portrayal in (popular) media all the more relevant — and this has recently been an active field of research [e.g., Maier et al., 2016]. Thus, this comment will discuss portrayals of risk and scientific (un)certainty in selected scenes of *Don't look up*. In the movie, both the probability and severity of a specific damage (i.e., the risk) and its assessments as scientifically (un)certain are (re-)interpreted and (re-)framed through actors associated with different societal spheres: science, politics, journalism, and economics. Thus, in the following, we will reflect on how within and between the respective spheres risks and scientific (un)certainty are interpreted and framed, in line with the respective sphere's logic and language. Where applicable, we will also include common criteria of film analysis and make comparisons to climate change — the allegory intended by the filmmakers.

### The sphere of science: discovering the risk and assessing its (un)certainty

In the first scenes of the movie *Don't look up* a comet is discovered. Viewers enter a typical scientific setting: we see scientists, a large telescope in operation, computer screens, and we soon get *visual evidence* of a comet, generated through images that also chronologically depict its movement. Through close-ups of Ph.D. student Kate Dibiasky's face and her respective expressions, viewers discover the comet with her. Soon, other scientists surround her, and Dr. Randall Mindy, a Michigan State University astronomy professor, takes over calculations for which we hear, for instance, about orbital dynamics and ephemeris. Dr. Mindy runs calculations and then indicates that he cannot figure them out — this somehow refers to his disbelief but also to *deficit uncertainty* [Gustafson & Rice, 2020]. While initially tackling the calculations, quick cuts between his calculations on a white board, the close-ups showing Mindy's hand and the faces of his students, along with blurring effects and a short shot of blurring stars symbolize the dizzy state of Mindy's consciousness and the shocking finding he is about to make (00:03:48–00:04:28). Dr. Mindy's heavy breathing also gives a first indication that he may be personally affected (00:04:29–00:05:20).

The scientists quickly decide to get other authorities involved, for instance NASA, the Kennedy Space Center, and the Planetary Defense Coordination Office (Dr. Teddy Oglethorpe) (00:06:12–00:06:20). Dr. Mindy explains why Dr. Oglethorpe might not recognize his name, as he has not published in a while — which may indicate that he is actually not well recognized in his field. Dr. Oglethorpe first trivializes the findings, by referring to the comet and his dimensions as a “big boy” (00:06:49). Nevertheless, Dr. Mindy and Dibiasky indicate that they have run calculations all day to increase their validity. The result they get is always the same: a direct hit of the comet, an extinction level event. Hence, the risk is severe (extinction) and the probability is generated, soon to reach almost a 100%. The scientists involved do what other scientists would do: share the data with colleagues working at other institutions, to increase the evidence gathered and reach more independent certainty; hence, to minimize ever-present *tentativeness uncertainty* [Gustafson & Rice, 2020; Popper, 1960].

The scenes of the movie mentioned above largely stay in the realms of science. Based on their profession, scientists are aware of risks and assessments of scientific evidence — and how to use these concepts in their communication [e.g., Post & Maier, 2016]. The first scenes of the movie refer to these concepts; hence, viewers get an idea of the scientific method and how certainty is generated within science.

**The sphere of politics: (re-)interpreting the risk and its (un)certainty**

When Dr. Mindy, Dr. Oglethorpe, and Ph.D. student Dibiasky meet United States (U.S.) President Orleane and her son Jason, who is chief of staff, viewers get an idea of how the spheres of science and politics can clash over risks and questions of scientific evidence, as well as their implications. In the movie, this is also done visually: the U.S. President wears a photogenic, catchy red blazer and a gold chain (00:18:07–00:18:12), compared to the rather functional clothing of Dr. Mindy and Dibiasky (00:18:13–00:18:16). The president is portrayed rather superficially, especially in some short close-ups: she is looking at her watch or stroking her hair (00:18:23–00:18:26; as compared to a close-up on Dibiasky’s alternative boots; 00:19:27–00:19:29). There are several indicators of the President’s past, for instance, a few short close-up inserts of framed photos of her with Steven Seagal and Bill Clinton, and an award for the Best Short Film Series *Lady Biz* (00:23:06–00:23:08). This visual contrast extends the different points of view (scientists vs. politicians), ideas about scientific evidence, and respective interpretations.

Dr. Mindy’s attempts to explain what they have found stay scientific: we hear about the discovery of a comet, its origin in the Oort Cloud, Gauss’s method of orbital determination, and average astronomic certainty. The message is nevertheless clear: a comet is headed towards Earth, with a direct hit expected in the Pacific Ocean near Chile and catastrophic consequences. The immediate political reaction is boredom and criticism of Mindy’s anxious breathing (00:19:36–00:19:39). When President Orlean asks how *certain* the hit is, the scientists first say 100 percent, which gets translated politically to “potentially significant event” (00:20:09). When the scientists later are more exact (i.e., 99.78 percent), this relates to both tentativeness uncertainty but also *technical or probabilistic uncertainty* [Gustafson & Rice, 2020]. For the politicians involved, this again is interpreted and translated, to a 70 percent chance (which seems to be picked randomly); with the reason involved that one cannot tell people there is a 100 percent certainty they will die (00:20:29–00:20:33).

The politicians plan to have more scientists involved, especially those of Ivy League institutions. This is an implied attack on the credibility and reputation of the scientists involved, to which they answer with criteria relevant to their expertise (e.g., work experience, the reputation of their institutions). What seems more important politically are the costs involved and the upcoming midterm elections. Hence, the scenes mentioned here show how the risk and its (un)certainty are re-interpreted when leaving the sphere and language of science to criteria relevant in politics, and how this can result in inaction. What comes to mind is the connection to (debates about) climate change, its scientific assessment as certain, and the political inaction we have witnessed for decades.

**The sphere of journalism: (re-)framing the risk and its (un)certainty**

Out of frustration with how the meeting with the U.S. President went, the scientists decide to leak information about the discovery and its implications to journalists. In a first interview setting, the message of Dr. Mindy and Dibiasky is clear. However, the journalists Brie Evantee and Jack Bremmer seem to be interested in other things, for instance, if there is life out there in space. Dr. Mindy first refers to a *lack of evidence* but gives in and states that aliens are real (00:37:18–00:37:23). This is the first time he moves from deep scientific assessments into popularizing science. The journalists are also interested in questions such as if Subaru builds telescopes, they show excitement about exploding stars, and Bremmer jokes about the comet hitting his ex-wife's house. Dibiasky gets frustrated by this and the ignorance towards scientific facts make her emotional. Her anger explodes, and she makes it clear that the comet will *very likely* hit Earth, that the planet will be destroyed, and all humans are going to die. She leaves the interview crying. In this scene, she makes the risk and its certainty very clear, referring again to *100 percent certainty*. The journalists try to explain themselves that they aim to keep the negative news light. Nevertheless, this scene represents the clash between science and journalism, and the different interpretations and framing they use when talking about risks and scientific information.

What is shown in the movie has been an issue of scientific investigation. Already Fleck's [1979] theoretical work proposed that scientific knowledge is popularized when leaving the circle of science and being represented in mass media. Empirical studies largely show that journalism often transfers uncertain knowledge into certain facts [e.g., Cooper, Lee, Goldacre & Sanders, 2012]; but also that uncertainty is depicted prominently when risks are involved [e.g., Ruhrmann, Guenther, Kessler & Milde, 2015; Stocking & Holstein, 2009]. What is agreed on is that journalists use their own rationales, logic, and language when reporting on science — and that these are naturally different from those used in science [e.g., Guenther, 2017]. Again, the way the journalists in the movie treat scientific facts bears connections to how journalists portray(ed) climate change: for instance, how journalistic representations deviate from the scientific view on the issue [e.g., Weingart, Engels & Pansegrau, 2000].

What is particularly noticeable within the film is that Dibiasky and her message are reduced to her personality and appearance. Evantee and Bremmer refer to her as "yelling lady" (00:40:55) and "mullet girl" (00:41:27), which culminates in online mockery. It is not quite clear if this relates to her sticking to scientific evidence or her emotional reaction. In contrast, Dr. Mindy is praised for his appearance and performance. Even his children admit that he looks great, and notice that he did something to his beard. He seems more media-savvy, seems open to the logic of journalism, and in the following becomes a visible scientist.

In the aftermath of the first interview, Dr. Jocelyn Calder of NASA (based on own interests) comes forward calling the risks associated with the comet a hysteria; hence, questioning the risk and its certainty. These assessments then turn into a public debate, with *expert disagreement* involved [Gustafson & Rice, 2020]. Although other scientists later confirm the data (working towards more certainty) and the President decides to act (with the goal of winning the midterms), voices about there not being a comet get louder. In later scenes, viewers get to know that the number of people thinking there is no comet is rising, which could be a result of expert disagreement shared in public. It seems that the science is not able to convince all audiences.

There is another interview scene including Dr. Mindy, Evantee, and Bremmer (but not Dibiasky), which mirrors the first one. Before this interview scene, viewers see Dr. Mindy getting a make-up brush through his face, for better looks on camera (01:29:34–01:29:36). It seems like he is preparing — almost transforming — to approach the stage of the media yet again. During the interview though, he realizes that his place is actually in science, and starts defending science, referring to sound data, facts, proof, certainty, and the truth, but he also shares his concerns about the second prevention plan, due to the missing peer-review, which he thinks is essential to any assessment of a prevention plan. The journalists do not seem to be interested; they rather argue in line with demonstrators and politicians. Dr. Mindy then actually shows a similar emotionally laden reaction as Dibiasky in the first interview scene. He speaks so loud that viewers can hear an echo. As Dibiasky did before, he defends the seriousness and truth of the sphere of science in violating the logic and rules of the sphere of journalism, in what we assume is a staged show (rather than a “live” news broadcast) on television. In general, both Dr. Mindy and Dibiasky show reactions as defenders of the scientific method, including assessments of scientific evidence.

**The sphere of economics: benefitting from the risk**

When Peter Isherwell from a company called BASH stops the first prevention plan through an intervention, another re-framing begins, in which the danger of the risk becomes an opportunity. Both BASH but also the U.S. government want to benefit from the comet. Here, the President relies on non-peer reviewed work done by scientists within BASH, who are aiming to extract the comet’s rare minerals using the most recent spectrometer readings done by astrogeologist. There is a hard contrast to the first prevention plan, for which it is stated that the science behind the plan was sound and that hundreds of scientists did peer-review. In a scene with Isherwell, Dr. Mindy is concerned about the synchronization of the explosions and too much reliance on technological advancement, and refers to a study/report he has read. He also mentions that scientists were removed from their positions due to asking too many questions (01:24:41–01:25:15). His aim is for BASH to be open to the peer-review process (to minimize deficit uncertainty) and for Isherwell to approach this mission not like a businessperson. For raising this, he is put in his place, both by Isherwell (who refers to himself as working in evolution, with God-like predictions due to data points and algorithms) and President Orlean. It seems like the prospect of benefitting from the risk is more important than criteria relevant to scientific evidence.

The logic and language of economic success seem to prevail, and they are actually taken over by the journalistic and political sphere. Regarding journalism, in the second interview scene mentioned, journalist Bremmer declares that BASH’s stock is a stronger indicator of success than scientific peer-review (01:30:03–01:30:15). Regarding politics, President Orlean completely changes her approach. When the comet can be seen from Earth, she has her own answer to the visual proof of the risk: do not look up and put your head down. There is even a social media campaign involved. For her, in her speech in which she visually takes a bath in the crowd due to fade-in and fade-out montages of medium and wide shots (01:39:40–01:39:55), she finds reason for an actual irrational behavior: looking up means to be afraid. Scientists want people to look up because they are looking down their noses at people; they think they are better than the average people;

and they even want to rob people of their freedom. This can be seen as an attack on science and its standards, which includes assessments of risks and (un)certainty.

Although there is a counter social media campaign, referring to fact and proof, at the end, the scientists are not successful. Relating to climate change, scientists likewise do not seem to be successful. Also in this case, there is much lobbying from industry, and some fear there could be too much reliance on technological advancements.

## Conclusion

As this comment has shown, in the movie *Don't look up* the logic and language of science were either not powerful or beneficial enough to have an impact on journalism and politics. In most instances, the scientists acted as defenders of the scientific method, relying on assessments of risk and scientific (un)certainty. Politicians rather re-interpreted these assessments and journalists re-framed them in line with their own logic and language. Just like in the debates about climate change, this resulted in portrayals very different from the one painted by scientific facts, and it led to initial political inaction.

At the same time, due to politics and journalism and the behavior of their representatives, disagreement and debates were already out in the public, with the effect that the science was questioned. Here again the comparison to (debates about) climate change comes to mind. There are still people questioning climate change, its anthropogenic causes, or countermeasures although also in that case, we have visual proof of a changing climate and its effects. In the movie, the sphere of economics entered late, but eventually prevailed over the voice of science. Something we can accept in a movie, but hopefully not in reality.

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