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Science in the Era of Facebook and Twitter: Get Used to It

Reproduced, with minor editorial changes, from the author's blog

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Astrophysicist Heino Falcke reflects on the increased transparency of the scientific process with the rise of social media. He discusses the positives and negatives of having a spotlight shone on scientific results in the embryonic stage and, as a result, the rising number of false findings and claims that find their way into the public eye. What does this new age of communication mean for science? And how do scientists, science journalists and the public need to adapt to ensure a positive change in the way we conduct, communicate and trust science and scientific evidence?

Introduction

"Science is wrong, most of the time"

I am not sure who said that first, but I am sure someone did long before me. This is a banality for those who do cutting-edge science, yet it is a view that is difficult to accept in public discourse. In the days of social media, it is no longer possible to hide the frequency with which science is wrong from the ever-curious public, and it is a discourse that we as scientists and science communicators must not only accept, but actively engage with.

As an astrophysicist, I have had to reflect on this, following a series of small, and large, events that have brought the issue to my attention.

Cosmic Inflation and Other Inflated Stories

It all started with a press conference¹ at Harvard University, where astronomers announced that they had found evidence of cosmic inflation — the period of exponential expansion of space in the early universe. This news quickly spread throughout the world via Twitter and Facebook and was hailed as spectacular evidence for the Big Bang by the regular press². Just a few weeks later, however, the findings were called into question, along with the claims they had led to in social media and press outputs³. The immediate uncritical acceptance and praise of the results in social media by many colleagues was very surprising to me. Science seems not to be immune to the hype phenomenon.

Around the same time, the SWIFT telescope announced a new gamma-ray source in the nearby galaxy Andromeda, a finding that was picked up by various news sources and social media channels well before many scientists knew of it. The source, had it existed, would have been very interesting indeed but, alas, it turned out not to be there⁴. Fortunately, the source was discovered not to exist so quickly that neither print media nor TV could report it, but because of the fast pace of social media, the news still had time to spread around the world.

There have been other major false alarms in the past which many (astro) physicists will remember well, such as the announcement of faster-than-light neutrinos⁵, life on Mars or cold fusion⁶. However, the changing environment for sharing knowledge right when it is found, and before it can be verified, creates a new challenge, as well as, of course, new opportunities. The question is does it cause science to lose its credibility? This was the question I was asked by our university newspaper⁷ in connection with an ongoing debate here which led me to consider the issue in more detail. My answer was that we — scientists, the media and the general public — need to learn how to handle science in the era of social media and adapt to the changing world of communication. Scientists are no longer viewed as the almost omniscient divine beings that, thanks to their unchallenged wisdom, hover well above the ground that absorbs normal mortals. We do not always know better and a more humble self-image should be embraced even if it comes with difficulties.

Embracing Failure in the Public Eye

Failure is part of the scientific enterprise. It is good that some scientists stick their necks out and dare to claim something. However, it is equally good that other scientists try to chop these heads off with counterarguments. That is proper science and cherished academic tradition. Scientific truth is not the outcome of a single eureka moment but of a long sociological process and, hence, it is subject to all human deficiencies. This failure-based process is not new; it is how science has always been done, but traditionally it has been hidden in the ivory towers of academic institutions. Thus, the media and general public have tended not to be aware of it. Social media has changed this, shedding new light on the process of science and revealing the failures on the path to success all too clearly.

In the past, most scientific debates would take place in academic circles and results would only gradually diffuse to the general public. Now the information transfer is instantaneous and often no longer filtered by journalists, who can only follow the wave rather than steer it.

Is that a problem? It may seem so in a society where science seems increasingly optional, where scientific evidence is less and less valued and where science itself becomes part of entertainment and the political circus. The consequence: science is becoming defensive.

In subjects like climate change, vaccination, evolution and ethical issues such as stem cell research, there are vocal minorities, or sometimes even majorities, of the

general public that question positions that have a solid scientific evidence base. Moreover, science is big business for large institutions and groups, which raises suspicions about the evidence it produces and puts scientific credibility under even further pressure. Every additional false discovery, immediately amplified by social media, may serve to shatter that credibility further.

Sharing Science in the New World

So, what can be done? Shall we dig in and stop sharing our latest findings with each other and the public? Shall we stop making claims and just publish highly polished results?

The latter is, in fact, something that many big science collaborations have adopted as their working model and may become the model of the future. Perhaps too much money is at stake to risk making claims before results are polished, but even so science can still be wrong, so does this approach really give science more credibility?

However, I prefer honesty. Let us simply get used to the fact that science can be wrong — and that scientists can be wrong — without immediately dismissing the entire body of scientific knowledge. Let's raise awareness of what science is, and how it works, among the non-scientists of society, rather than finding new ways to hide it. Scientists should not be afraid of making claims or being wrong. Being wrong is as much a part of our job as is losing part of a football player's job. I am convinced that if scientists are less arrogant and more honest about the inner workings of science, credibility will naturally prevail in the long run.

However, we do need to develop an etiquette on how to communicate science results and how to involve the public in the scientific process in this new world of communication. It needs to be made clear what is discussion and what is an emerging consensus view.

For example, announcements like that of a sudden outburst of a cosmic source need to be made as soon as possible to the community, so others can react before the flare is over. In the case mentioned above, the SWIFT team did nothing wrong. They communicated their result as they usually



Figure 1. Science in the era of Facebook and Twitter — a whirlwind of hypes and likes. Credit: Heino Falcke, Radboud University

do: swiftly and properly. The event turned out to be a glitch; that can happen. Any media reporting on such events must make its own choice: either be too late to report or report on something that is premature. To make this call, hire and train good science journalists and do not be afraid of correcting your story if it is wrong.

Very different, however, is the story of the Big Bang result. It was presented in a press conference as 'the first direct evidence of cosmic inflation' accompanied by a rumor-based social media campaign. Nobel prize winners were invited to be present at the data release, and soap opera-style reality TV movies about potential Nobel prize winners went viral. The authors of the paper asked for the media and social media attention, they got what they asked for, and they will have to face the consequences — potentially, along with the rest of the community. The paper in question had not been submitted to a journal and was not vetted by experts; instead, it was released to the entire world together with a very bold claim. Many colleagues hailed this as a major step towards openness and a transition from traditional publishing methods to modern swarm intelligence and social media-based interaction.

I think that is very wrong — or, at least, naive.

The procedure was primarily adopted to beat others (e.g. Planck), to secure dreamed-of Nobel prizes and perhaps to

secure tenure and other jobs for collaborators. Does anyone really believe none of these things factored into the story? Science can be a fierce competition, it is not a culture where being honest or humble are necessarily rewarded, and our Harvard colleagues certainly know how to play the game.

So, may I suggest three possible options on how to proceed?

Option One: Engage the public via social media from the start in a transparent and open way. Make it clear that your results are preliminary and need to be discussed. In fact, make your quest for the result public and let the process take its course. Have a press release summarising the conclusion and any premature media frenzy is the media's problem. Let the public find a way to deal with the process and get used to it.

Option Two: Be quiet and have your work refereed thoroughly and traditionally and then have a press release or even a press conference organised by your institution, following some clear ethical guidelines. In the case of extraordinary claims, the editors of journals should be very careful in selecting a number of very different referees, rather than prioritising speed. Still, be precise and humble in your claims as an author. Let the scientists involved be available on social media to discuss results afterwards.

Option Three: Release your results to the media before submission, but then make it

clear that this is just one possible explanation, an interesting hypothesis, a contribution to the discussion. The media needs to learn to understand and report that properly. Certainly refrain from press conferences and emotional YouTube videos in this case.

Which method you choose (I have chosen two and three already and may like to evolve towards one, if allowed to by my peers) also depends on the significance of the result. If you really have Nobel-prize winning results (which I have not had, yet), then method two is perfectly fine — you will get the award irrespective. If you don't, even the biggest press campaign will not get you one. However, for large and long running collaborations funded by the taxpayer it is questionable to me, whether one can or even should expect scientists to refrain from talking about the status of their results via social media. After all, scientists have a right and a duty to the freedom of speech. Maybe option two is no longer the right thing to do?

No matter which method is chosen, let us above all be clear that science is an ongoing discussion. Science can benefit a great deal from social media interaction with sci-

entists and the public but it requires honesty, less agitation, more understanding from the public and a sense of humility among us scientists. In the end, however, it makes us vulnerable — whatever we do. We need to learn to live with that.

Reader's Response

What are your thoughts on the issues raised in this piece? If you would like to share your thoughts with the author, or submit a short response for publication in the next issue of CAPjournal, contact us at editor@capjournal.org.

Notes

- 1 Press conference proceedings: <http://www.cfa.harvard.edu/news/2014-05>
- 2 News of the finding in influential press: <http://www.bbc.com/news/science-environment-26605974>
- 3 Press coverage of back pedalling: http://www.washingtonpost.com/national/health-science/big-bang-backlash-bicep2-discovery-of-gravity-waves-questioned-by-cosmologists/2014/05/16/e575b2fc-db07-11e3-bda1-9b46b2066796_story.html

- 4 Gamma-ray source coverage: <http://blogs.nature.com/news/2014/05/rare-cosmic-blast-sends-astronomers-racing-to-telescopes.html>
- 5 Faster-than-light neutrinos coverage: http://en.wikipedia.org/wiki/Faster-than-light_neutrino_anomaly
- 6 Cold fusion coverage: http://en.wikipedia.org/wiki/Cold_fusion
- 7 Article from author in University newsletter: <http://www.voxweb.nl/wetenschap-moet-wetenschap-uitleggen/>

Biography

Heino Falcke is a German astrophysicist who studies black holes, radio astronomy, cosmic rays and the Galactic center and a professor at Radboud University, Nijmegen. He is a member of the Royal Netherlands Academy of Arts and Science (KNAW), winner of the Dutch Spinoza award and of several grants of the European Research Council. He is involved in the Event Horizon Telescope and the Auger collaborations. He lives in Frechen near Cologne, but works in the Netherlands. He has also been ordained as a lay minister of the protestant church in Germany. He maintains a blog on politics, science, society and religion at: <https://hfalcke.wordpress.com/>

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