Against storytelling of scientific results

To the Editor: Krzywinski and Cairo[1] beautifully illustrate the widespread view that scientific writing should follow a journalistic 'storytelling', wherein the choice of what data to plot, and how, is tailored to the message the authors want to deliver. However, they do not discuss the pitfalls of the approach, which often result in a distorted and unrepresentative display of data—one that does not do justice to experimental complexities and their myriad of interpretations.

If we project the features of great storytellers onto a scientist, the result is a portrait of a scientist far from ideal. Great storytellers embellish and conceal information to evoke a response in their audience. Inconvenient truths are swept away, and marginalities are spun to make a point more spectacular. A storyteller would plot the data in the way most persuasive rather than most informative or representative.

Storytelling encourages the unrealistic view that scientific projects fit a singular narrative. Biological systems are difficult to measure and control, so nearly all experiments afford multiple interpretations—but storytelling actively denies this fact of science.

The 'story-told' scientific paper is a constrictive mapping between figures and text. Figures produced by masters of scientific storytelling are so tightly controlled to match the narrative that the reader is left with little to ponder or interpret. Critical reading of such papers becomes a detective's game, in which one reads between the lines for clues of data relegated to a supplement for their deviance from 'the story'.

Dissecting the structure of scientific papers, Bruno Latour explains the utility of the storytelling approach in giving readers the sense that they are evaluating the data along with the authors while simultaneously persuading them of the story. The storytelling way to achieve this is "to lay out the text so that wherever the reader is there is only *one way* to go"[2]—or as Krzywinski and Cairo put it, "Inviting readers to draw their own conclusions is risky"[1]. Authors prevent this by "carefully stacking more black boxes, less easily disputable arguments"[2]. This is consistent with the visualization advice that Krzywinski and Cairo give: the narrower and more processed the display of the data is to fit the story, the more black boxes are stacked, making it harder for the reader to access data raw enough to support alternative models or 'stories'.

Readers and authors know that complex experiments afford multiple interpretations, and so such deviances from the singular narrative must be present somewhere. It would be better for both authors and readers if these could be discussed openly rather than obfuscated. For those who plan to follow up on the results, these discrepancies are often the most important. Storytelling therefore impedes communication of critical information by restricting the scope of the data to that agreeable with the story.

Problems arise when experiments are driven within a storytelling framework. In break rooms of biology research labs, one often hears: "It'd be a great story if X regulated Y by novel mechanism Z." Experiments might be prioritized by asking, "Is it important for your story?" Storytelling poses a dizzying circularity: before your findings are established, you should decide whether these are the findings you would like to reach. Expectations of a story-like narrative can also be demoralizing to scientists, as most experimental data do not easily fold into this framing.

Finally, a great story in the journalistic sense is a complete one. Papers that make the unexplained observations transparent get penalized in the storytelling framework as incomplete. This prevents the communal puzzle-solving that arises by piecing together unexplained observations from multiple papers.

The alternative to storytelling is the usual language of evidence and arguments that are used—with varying degrees of certainty—to support models and theories. Speaking of models and their evidence goes back to the oldest of scientific discourse, and this framing is also standard in philosophy and law. This language allows authors to discuss evidence for alternative models without imposing a singular journalistic-like story.

There might be other roles for storytelling. Steven McKnight's lab recently found, entirely unexpectedly, that a small molecule can be used to purify a complex of RNA-binding proteins in the cell, revealing a wide array of striking biological features[3]. It is that kind of story of discovery—what François Jacob called "night science"—that is often best suited for storytelling, though these narratives are often deemed by scientists as irrelevant 'fluff'.

As practiced, storytelling shares more with journalism than with science. Journalists seek a great story, and the accompanying pressures sometimes lead to distortion in the portrayal of events in the press. When exerted on scientists, these pressures can yield similar results. Storytelling encourages scientists to design experiments according to what constitutes a 'great story', potentially closing off unforeseen avenues more exciting than any story imagined a priori. For the alternative framing to be adopted, editors, reviewers and authors (particularly at the higher-profile journals) will have to adjust their evaluation criteria and reward authors who choose representative displays while discussing alternative models to their own.

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