Stories, Storytelling and Storylines for Geoscience Communication

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Abstract. Geoscientists need to recognize and embrace our role as storytellers, so that we can more effectively use storytelling to advance our science. As narrative-driven storylines become an increasing tool in disaster and climate risk communications, understanding the 'science' of stories and storytelling becomes an ever more critical geoscientific skillset.

1. Stories and Storytelling

A critical way to ensure geoscience communications resonate with non-geoscience audiences is to convey dry, abstract technical information as stories (Stewart & Nield, 2013). The narrative formats of stories offer increased comprehension, interest, and engagement, especially for complex ideas (Dahlstrom, 2014). They help people to connect personally and emotionally with ideas and information that may otherwise be mundane, complex and remote. In practical terms, the use of narratives reflects the everyday reality that non-experts get most of their science information from the mass media, which is itself constructed around stories. In fact, stories are so intrinsically persuasive, offering tactics for winning over otherwise resistant audiences, that they need to be used with great caution (Dahlstrom, 2014).

In many ways, geoscientists, as the narrators of our planet's history, are natural storytellers, and so honing and finessing our use of stories ought to be a standard geoscientific skillset. Indeed, geoscientists implicitly embed their 'Earth stories' in science-based plot lines, but their impact can be enhanced if '…Earth scientists recognize – and perhaps even embrace – our role as storytellers, so that we can more effectively use (and evaluate) storytelling to advance our science' (Phillips, 2012, p.153). Effectively using the power of narrative means appreciating that there is a 'science' to storytelling, one which has evolved from Aristotle's 'beginning', 'middle' and 'end', through Gustav Freytag's five-part 'pyramid' to modern versions of a three-act structure, such as Robert McKee's 'Central Plot' theory (McKee ,2010) (Fig 1). McKee's narrative format was a foundation for much BBC science documentary output during the 1990s, especially in its flagship *Horizon* strand, in which episodes often started with a tease (inciting incident), followed by two 'acts' of human and intellectual discovery and exploration, building to a false climax (‘end of act 2 plot twist’), and closing with a rush to final resolution in which the scientific journey was neatly wrapped up.

Narratives can have a multiplicity of plot lines (e.g. Booker, 2004), but the basic notion of a three-act structure remains a simple but powerful template for unpacking complex scientific ideas. The three-act format of Hollywood movies and popular literature maps broadly onto the standard format of academic articles (Fig). Common storyline plots such as the ‘Hero’s Journey’ - a story structure in which a hero goes on a quest or adventure to achieve a goal, and has to overcome obstacles and fears, before ultimately returning home transformed - share elements of a typical research proposal. Technical talks and conference presentations can usefully draw inspiration from the crafted choreography of Ted talks, as outlined in the ‘sparkline’ analysis of Duarte (2010) (Fig). And even South Park, the cartoon animation series, can lend its 'And, But, Therefore’ (ABT) storytelling device (“whenever you can exchange your **and**’s with **but**’s or **therefore**’s, it makes for better writing” [Lamb, 2021]) to help scientists condense tension, drama, and revelation into a funder’s one-minute elevator pitch or a three-line ‘plain language’ research summary (Olsen, 2015).

2. Storylines

Story-telling has always been a core element of journalistic and popular media approaches to communicating science, and is an integral element in many science communication training courses. But in geoscience this element is growing in importance because narrative-driven approaches are being increasingly adopted by geoscientists to convey complex and contested technical risks to non-technical audiences. Conventional risk communication typically portrays the likelihood of an event using model-based probabilistic projections, which are not only technically complex but also are notoriously difficult to convey to non-experts. In risk decision making, when knowledge is uncertain, experts are encouraged to resist the pressure (or temptation) to over-simplify the situation by framing their information in a “single, definitive” form (Stirling, 2010). Instead, they ought to frame their available information in a “plural, conditional” form (scenarios) in order to adequately reflect and convey the complexity of the situation. Event-based storylines – scenarios which explore plausibility rather than probability - are common practice in ’stress testing’ emergency preparedness in crisis management, but are now being applied to the challenges of disaster management and climate risk (De Bruijn et al., 2016, Shepherd, 2019). Similarly, revisionist narratives of past events – alternative realities about how actual risk events might have turned out worse

– provide compelling *counterfactual* perspectives on the nature of hard-to-grasp compound risk threats (Woo, 2019).

In bemoaning the limited effectiveness of current disaster risk communication efforts, Lejano et al. (2021, p.7) contend that '…experts and agency representatives need to privilege narrative, and gain skills in translating technical knowledge into this form'. Descriptive 'storylines' of plausible events in the past or the future provide potentially powerful ways to disentangle the key drivers of risk, and their interaction. Storylines allow risk experts to represent multiple and alternative outcomes, navigate high uncertainty, and link disparate kinds of interdisciplinary evidence (Young et al., 2021). An essential ingredient in human decision-making is the emotional ('affective') connection that stories provide. They allow those at risk to take in, make sense of, and make use of technical knowledge because: (1) dramatization, which describes an event in vivid terms, makes it more tangible and realistic to the audience; (2) narratives that are contextualized and personalized offer messages that speak more directly to people and to their situation; and (3) risk messages that are framed in ways that everyone can re-tell can be more easily shared across the community (Lejano et al., 2021). In post-disaster settings, storytelling can variously be part of the healing exercise, a way to gather insights into what worked and what went wrong, or explorations about future pathways for community recovery and renewal (Seeger & Sellnow, 2016).

Perhaps the most powerful use of stories is their intrinsic role as a spark for social conversations. Shared discussions of risk and resilience allow at-risk individuals, households and communities to engage with experts about the threats that potentially confront them. For the geoscientist expert, a practical training in stories, storytelling and storylines realigns the communication focus. It shifts from an over-reliance on the restrictive one-way dissemination of 'matters of fact' to a more expansive and participatory two-way dialogue around 'matters of concern'.

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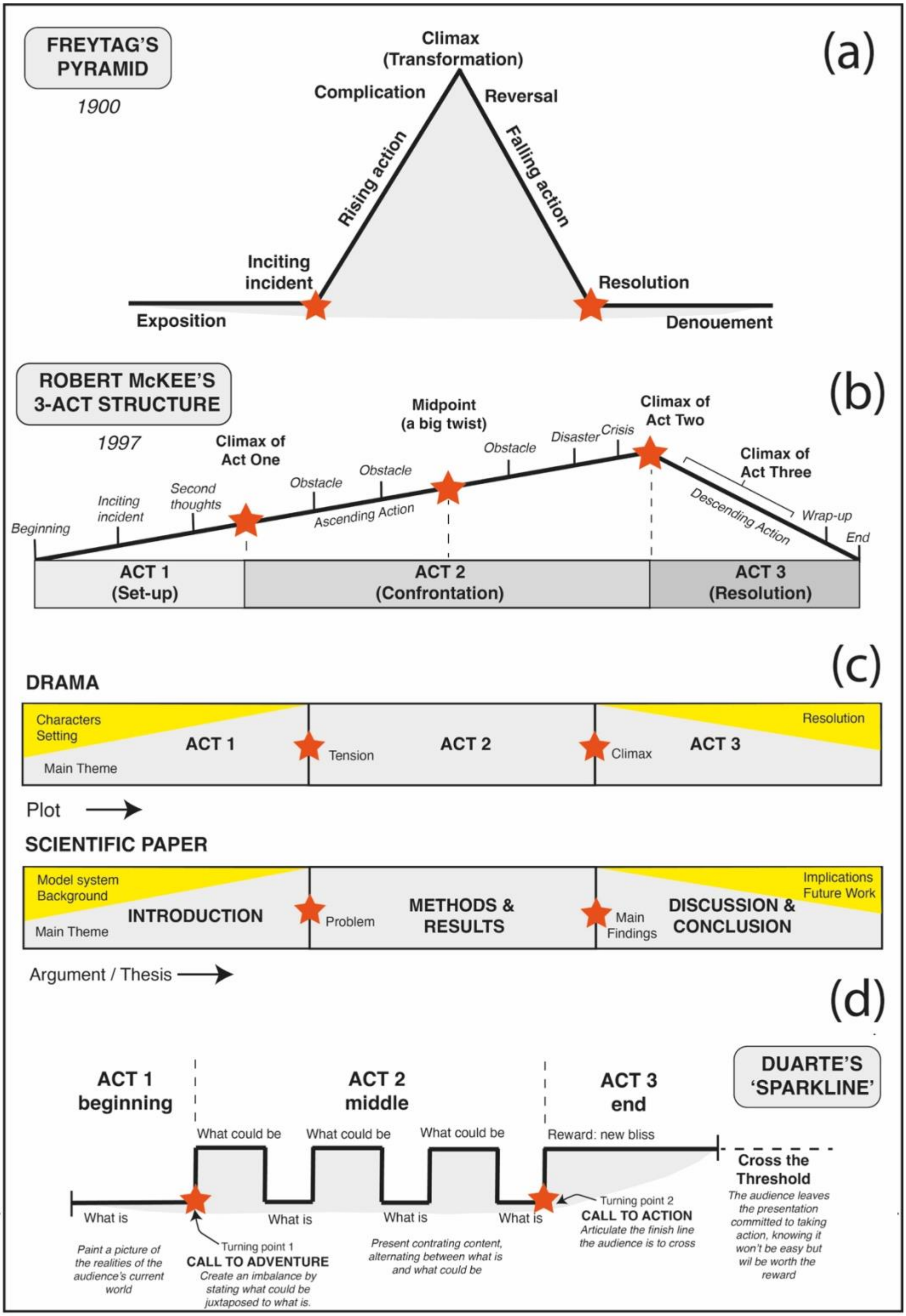
FIGURE 1

Different narrative structures: (a) Freytag's Pyramid - a five-part dramatic structure that goes from an introductory set-up, a reactive (rising) action motivated by an inciting incident, through a transformational climax, and in that transformed state impels a proactive (falling) action that brings about a resolution. (b) Robert McKee's three-act structure comprising multiple 'turning points' of tension: an inciting incident and the climaxes of Acts One, Two and Three; (c) a comparison between a simple three-act storyline structure and the conventional narrative of an academic article, highlighting the importance of tension ('the problem') and climax ('the findings') in partitioning three discrete 'acts'; (d) Nancy Duarte's 'sparklines' method, which shifts attention back and forth between "what is" and "what could be" in an oral presentation in three acts.


FREYTAG'S PYRAMID
1900
(a)
Climax (Transformation)
Complication
Reversal
Rising action
Falling action
Inciting incident
Resolution
Exposition
Denouement
ROBERT McKEE'S 3-ACT STRUCTURE
1997
(b)
Midpoint (a big twist)
Climax of Act Two
Climax of Act One
Climax of Act Three
Beginning
Inciting incident
Second thoughts
Obstacle
Obstacle
Ascending Action
Obstacle
Disaster
Crisis
Descending Action
Wrap-up
End
ACT 1 (Set-up)
ACT 2 (Confrontation)
ACT 3 (Resolution)
(c)
DRAMA
Characters
Setting
Main Theme
ACT 1
Tension
ACT 2
Climax
ACT 3
Resolution
Plot
SCIENTIFIC PAPER
Model system
Background
Main Theme
INTRODUCTION
Problem
METHODS & RESULTS
Main Findings
DISCUSSION & CONCLUSION
Implications
Future Work
Argument / Thesis
(d)
DUARTE'S 'SPARKLINE'
ACT 1 beginning
ACT 2 middle
ACT 3 end
What could be
What could be
What could be
Reward: new bliss
What is
What is
What is
What is
Cross the Threshold
The audience leaves the presentation committed to taking action, knowing it won't be easy but wil be worth the reward
Turning point 2
CALL TO ACTION
Articulate the finish line the audience is to cross
Paint a picture of the realities of the audience's current world
Turning point 1
CALL TO ADVENTURE
Create an imbalance by stating what could be juxtaposed to what is.
Present contrating content, alternating between what is and what could be