

The Scientist’s Journey: Finding the “Hero” in the Research

Matthew Kemp¹ and Lucia Perez Diaz¹

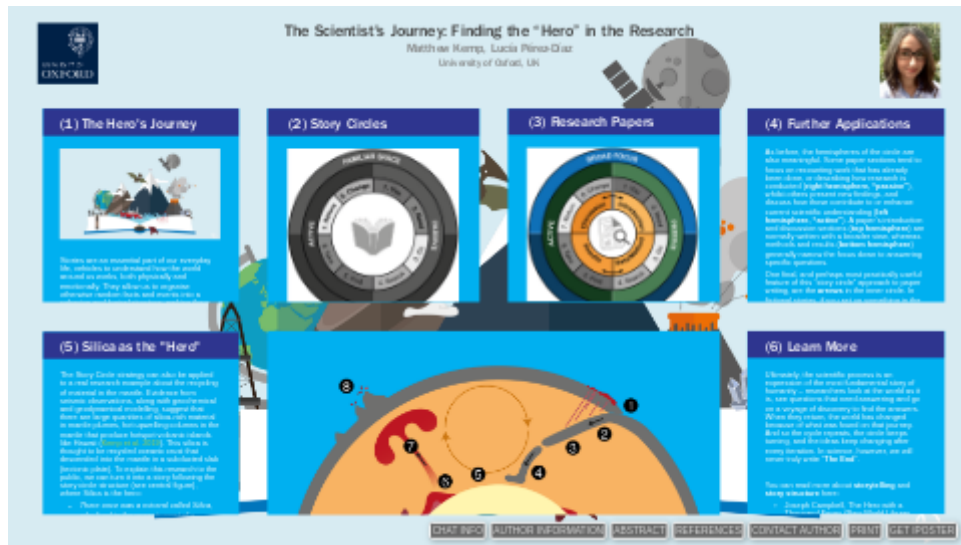
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November 23, 2022

Abstract

Stories are an essential part of our everyday life, vehicles to understand how the world around us works, both physically and emotionally. They allow us to organise otherwise random facts and events into a cohesive and logical structure, making them easier to understand and remember. Science itself is also full of facts and processes, often seemingly disconnected but that, when put in context, pave the road for scientific discoveries. We propose that classical story-telling strategies can also be used to communicate science to a variety of audiences, specialist and non-specialist alike, and present a few practical examples of how this can be achieved. We focus on what we call the “story circle” narrative structure (see Fig. 1), a distillation of the “Hero’s Journey” (Campbell, 1949; Harmon, 2009). In this storytelling framework, the circle begins with a hero who, posed with a question, chooses to venture beyond their familiar space in a quest for answers. When the hero returns to familiar territory, they have been forever changed by their journey. Firstly, we discuss how this story circle can be directly mapped onto the structure of a research paper, enabling researchers to write up their work in a way that makes it easier to follow for the reader. Then we apply the story circle strategy to a real research example aimed at explaining large-scale mantle convection, in a story where silica is the “hero” who descends into the deep in a subducting slab to then rise back up to the surface in an upwelling plume. This approach to communicating science by exploiting its story-like qualities is key when explaining complex deep Earth processes to the non-academic public who, understandably, can struggle to grasp these concepts due to their abstract nature and detachment from everyday life. Ultimately, the scientific process is an expression of the most fundamental story of humanity – researchers look at the world as it is, see questions that need answering and go on a voyage of discovery to find the answers. When they return, the world has changed because of what was found on that journey. And so the cycle repeats, the circle keeps turning, and the ideas keep changing after every iteration. In science, however, we will never truly write “The End”.

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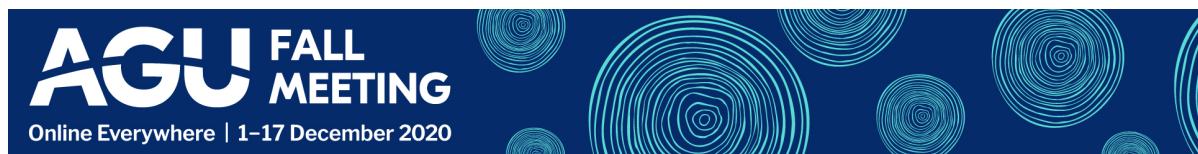


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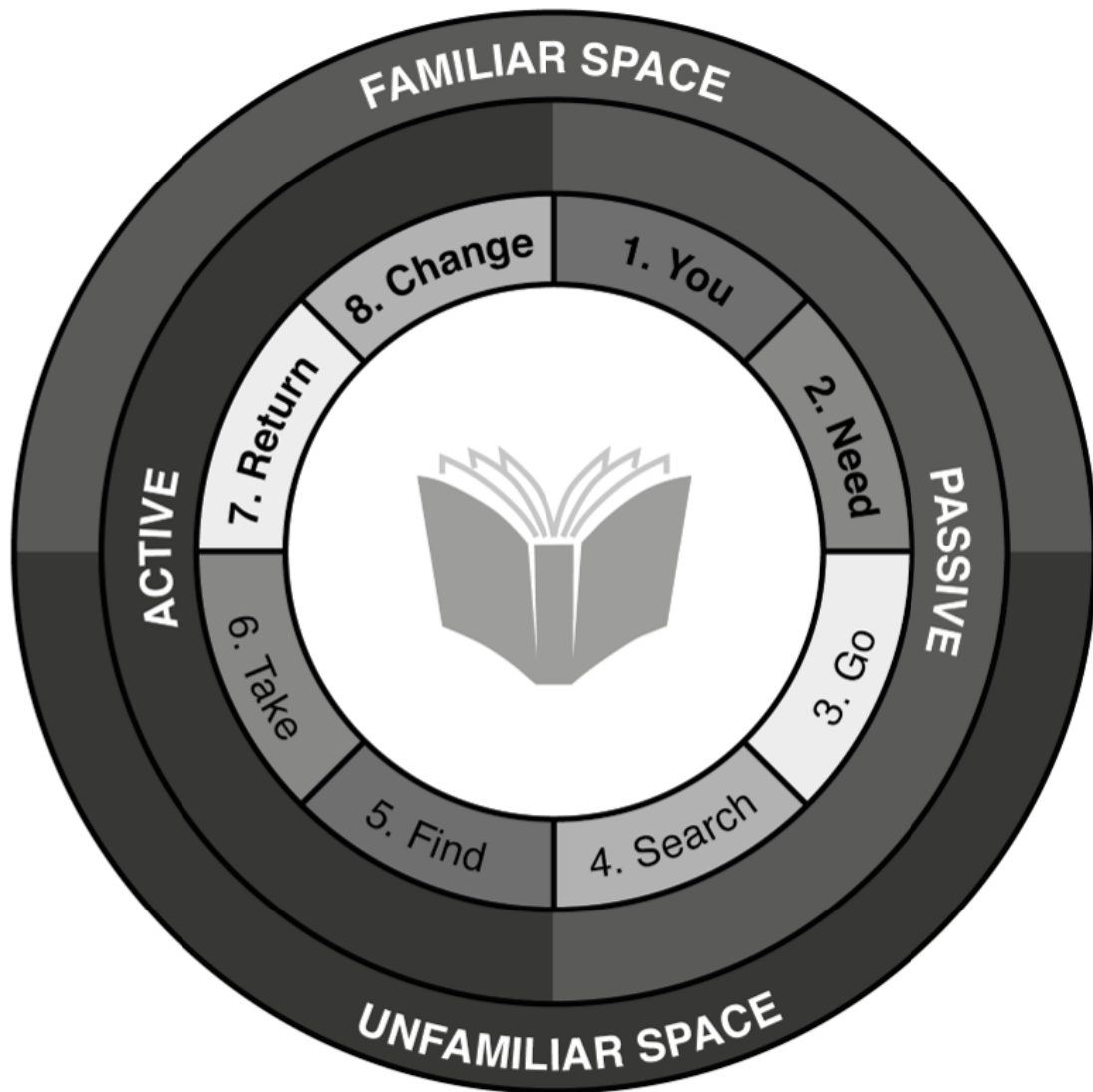
(1) THE HERO'S JOURNEY



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We focus on what we call the "story circle" narrative structure, a distillation of the "Hero's Journey" (Campbell, 1949; Harmon, 2009). In this storytelling framework, the circle begins with a hero who, posed with a question, chooses to venture beyond their familiar space in a quest for answers. When the hero returns to familiar territory, they have been forever changed by their journey.

(2) STORY CIRCLES

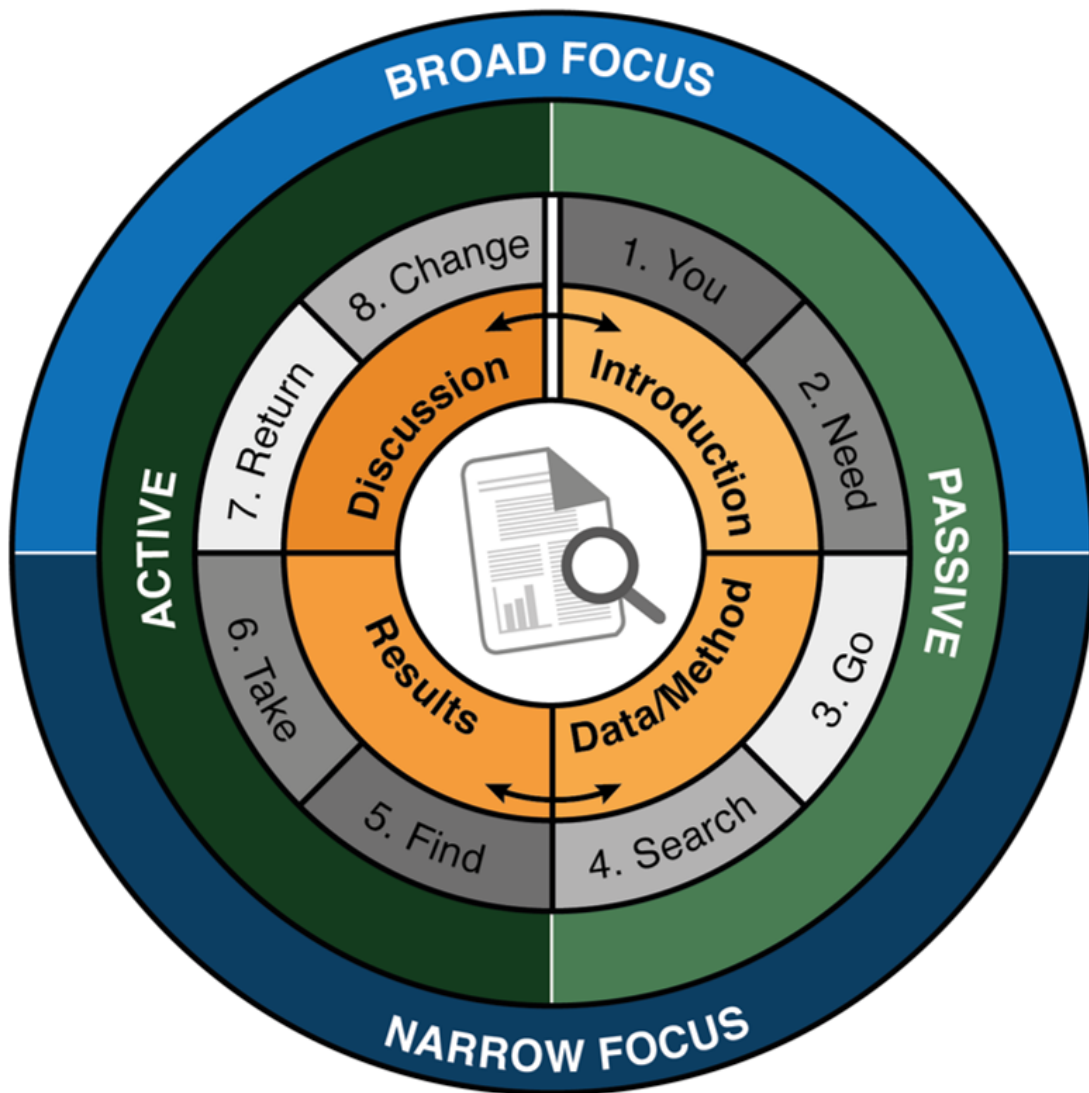


Firstly we'll explore how the Story Circle structure is used in classical storytelling. The circle is split into eight segments, each of which represents a crucial part of the story, as follows:

YOU (1) introduce the hero in a familiar setting, but they **NEED (2)** something, so they **GO (3)** into an unfamiliar situation, they **SEARCH (4)** for it by undergoing trials, they eventually **FIND (5)** what they wanted, **TAKE (6)** it with difficulty, **RETURN (7)** to the familiar situation, and are **CHANGED (8)** because of that journey.

In the right hemisphere of the story circle the hero is more passive whilst in the left hemisphere they are more active. Similarly, whilst in the upper hemisphere, the hero is within familiar settings, whereas within the lower hemisphere they are venturing into the unknown.

(3) RESEARCH PAPERS



It turns out that the main sections that scientific research papers are often split into conform extremely well to the Story Circle (with the exception of the abstract and the conclusions, as those are essentially mini story-circles bookending the paper).

In the **Introduction**, YOU (1) set the scene, introducing the scientific ideas on a broad scale, explaining the work that has already been done in this area of research. However, this work is incomplete, and there is a question that you NEED (2) to answer, so the paper then crosses the threshold into a specific and focussed research area (3. GO). The **Methods** section describes the variety of skills and processes needed to answer the question (4. SEARCH), before detailing the FINDings (5) of these trials in the **Results** and giving hints at how the question can be answered (6. TAKE). Finally, in the **Discussion**, the paper RETURNS (7) from the specific research area to the wider context of the study. In doing so, it shows how current understanding has CHANGED (8) as a result of the journey taken whilst carrying out the research presented in the paper.

(4) FURTHER APPLICATIONS

As before, the hemispheres of the circle are also meaningful. Some paper sections tend to focus on recounting work that has already been done, or describing how research is conducted (**right hemisphere, “passive”**), whilst others present new findings, and discuss how those contribute to or enhance current scientific understanding (**left hemisphere, “active”**). A paper’s introduction and discussion sections (**top hemisphere**) are normally written with a broader view, whereas methods and results (**bottom hemisphere**) generally narrow the focus down to answering specific questions.

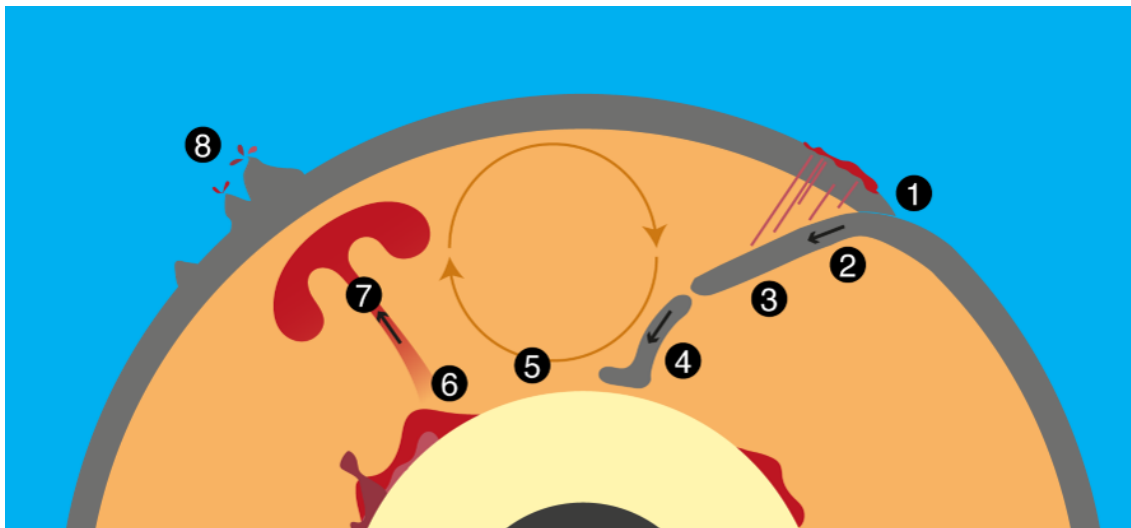
One final, and perhaps most practically useful feature of this “story circle” approach to paper writing, are the **arrows** in the inner circle. In fictional stories, if you set up something in the beginning of the story, you should have a payoff for it at the end. Equally, you shouldn’t randomly bring something new to the story in the final act if it’s not already been set up in the first act. This works for scientific paper writing too: you shouldn’t ramble in the introduction about something that you have no intention of discussing later on, neither should you draw conclusions you haven’t supported with background information (or present results obtained by methods you haven’t explained).

(5) SILICA AS THE "HERO"

The Story Circle strategy can also be applied to a real research example about the recycling of material in the mantle. Evidence from seismic observations, along with geochemical and geodynamical modelling, suggest that there are large quantities of silica-rich material in mantle plumes, hot upwelling columns in the mantle that produce hotspot volcanic islands like Hawaii (Kemp et al. 2019 (<https://www.sciencedirect.com/science/article/abs/pii/S0012821X1930473X>)). This silica is thought to be recycled oceanic crust that descended into the mantle in a subducted slab (tectonic plate). To explain this research to the public, we can turn it into a story following the story circle structure (see central figure), where Silica is the hero:

- *There once was a mineral called Silica, who lived in the oceanic crust of a tectonic plate (1).*
- *Though Silica was happy living on the surface of the Earth, they always wondered what lay beneath them, and often dreamed about journeying to the centre of the Earth (2).*
- *The oceanic crust that Silica lived in started to subduct underneath another tectonic plate, dragging Silica down into the mantle - Silica's journey had begun! (3)*
- *As Silica descended into the mantle, they got hotter and hotter, and was put under a lot of pressure, so at certain depths they transformed from one form into another (4).*
- *Eventually Silica and the plate they were on reached the Core-Mantle-Boundary, and they could go no further (5).*
- *Silica found the depths of the mantle a fascinating place, with deep mantle mountains stretching upwards above them. However, Silica felt that they were too constricted down there, so decided to hitch a ride in a very hot upwelling mantle plume (6).*
- *Silica rose towards the surface, and at about 300 km depth hit a special boundary called the X-discontinuity. At this point they started to change back into a less pressured form, and left behind some of their friends in a pool (7).*
- *Finally Silica reached the surface and erupted out of a volcano onto an island called Hawaii. Though they were glad to have gone on that exciting journey into the depths of the Earth, Silica was glad to be back at the surface again (8).*

This approach to communicating science by exploiting its story-like qualities is key when explaining complex deep Earth processes to the non-academic public who, understandably, can struggle to grasp these concepts due to their abstract nature and detachment from everyday life.



(6) LEARN MORE

Ultimately, the scientific process is an expression of the most fundamental story of humanity – researchers look at the world as it is, see questions that need answering and go on a voyage of discovery to find the answers. When they return, the world has changed because of what was found on that journey. And so the cycle repeats, the circle keeps turning, and the ideas keep changing after every iteration. In science, however, we will never truly write “**The End**”.

You can read more about **storytelling** and **story structure** here:

- Joseph Campbell, *The Hero with a Thousand Faces* (New World Library, 1949)
- Dan Harmon, *Story Structure 101* (Channel 101 Wiki, 2009)
- John Yorke, *Into the Woods* (Penguin Random House, 2013)
- Ursula Le Guin, *The Carrier Bag Theory of Fiction* (Ignota Books, 2019)

To see how story structure can be used in the form of **songs** and **musicals** about science, see the poster (<https://agu.confex.com/agu/fm20/meetingapp.cgi/Paper/687448>) by the Roberta Wilkinson and Matthew Kemp, aka **Geologise Theatre** (@wearegeologise (<https://twitter.com/wearegeologise>)).

To delve deeper into the research behind Silica's journey through the mantle, see the AGU Talk by the author Matthew Kemp (@MatthewGeoKemp (<https://twitter.com/MatthewGeoKemp>)) - "*X Marks the Spot: Seismic Signals of Silica and Hidden Hawaiian Heterogeneities*" (<https://agu.confex.com/agu/fm20/meetingapp.cgi/Paper/680232>)"

All the illustrations are created by the author Lucía Pérez-Díaz (@drperezdiaz (<https://twitter.com/drperezdiaz>)). See more of her illustrations: @theflatype (<https://twitter.com/theflatype>)

This poster is based on an original EGU Geodynamics Blog Post (<https://blogs.egu.eu/divisions/gd/2020/07/01/story-telling-for-scientists/>) by the authors.

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ABSTRACT

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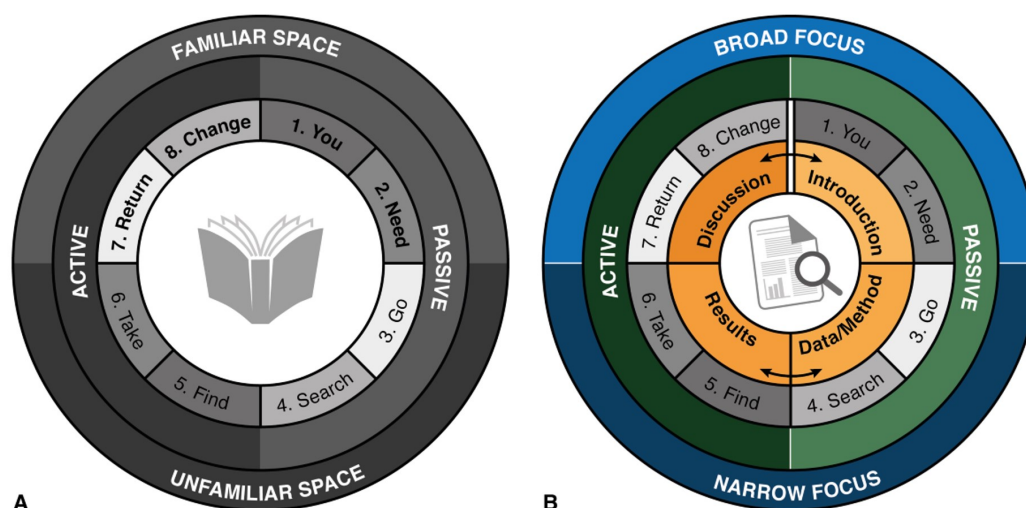


Fig 1: Diagram illustrating the concept of the story circle (A) and how it can be applied for scientific paper writing (B)

(https://agu.confex.com/data/abstract/agu/fm20/9/2/Paper_691429_abstract_670660_0.jpg)

REFERENCES

Story Structure:

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Research Basis:

Kemp, M., Jenkins, J., MacLennan, J. and Cottaar, S., 2019. X-discontinuity and transition zone structure beneath Hawaii suggests a heterogeneous plume. *Earth and Planetary Science Letters*, 527, p.115781.