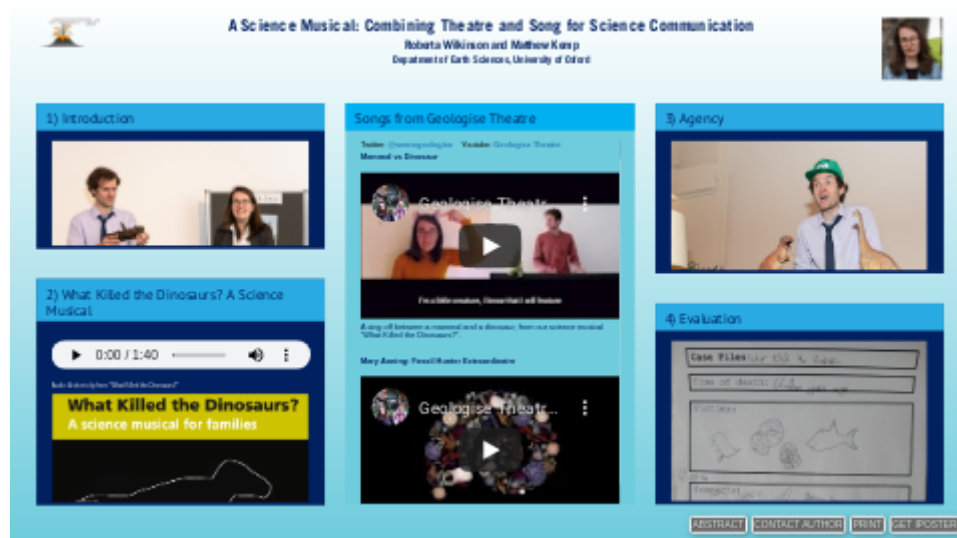


A Science Musical: Combining Theatre and Song for Science Communication

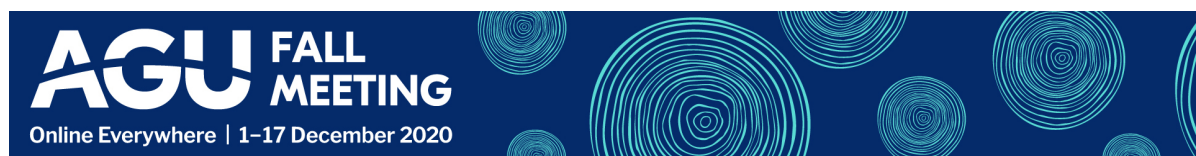


Roberta Wilkinson and Matthew Kemp

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PRESENTED AT:



1) INTRODUCTION



Photo credit: Oxford University Museum of Natural History. Matthew Kemp and Roberta Wilkinson performing their science musical.

Geologise Theatre is a science communication project by Roberta Wilkinson and Matthew Kemp, both Earth Sciences PhD students at the University of Oxford. Between us we have backgrounds in music, drama and performance. We wanted to combine these skills with our passion for science for the purposes of education, and so we created our own musical theatre duo.

We write and perform musical theatre shows and songs about geoscience. Our work is primarily aimed at children but we also write songs aimed at adults. We have performed in museums, lecture theatres, schools and the back rooms of pubs, using a mixture of narrative and song to convey a scientific message.

Between 2017 and 2019 we developed an hour-long “science musical” – a show whose main aim is to educate about science but strays from the bounds of a regular lecture or lesson by incorporating dramatic techniques, including character and narrative, as well as music. The use of drama in education is well established – from the practice of Theatre In Education (TIE) to television shows like the BBC’s *Horrible Histories*¹. We draw on some of the techniques from these examples, whilst bringing a valuable perspective to the writing as scientists ourselves.

Here we present our geoscience communication methodology and reflect on its efficacy. We focus specifically on our science musical, “What Killed the Dinosaurs?”, which aims to teach children and their families about the dinosaur extinction and the process of scientific discovery.

We’d like to thank the Oxford University Museum of Natural History and the Sedgwick Museum of Earth Sciences for their support with this project.

2) WHAT KILLED THE DINOSAURS? A SCIENCE MUSICAL

Audio: A short clip from "What Killed the Dinosaurs?" describing the meteorite impact. Voiced by Roberta Wilkinson, piano accompaniment by Matthew Kemp.

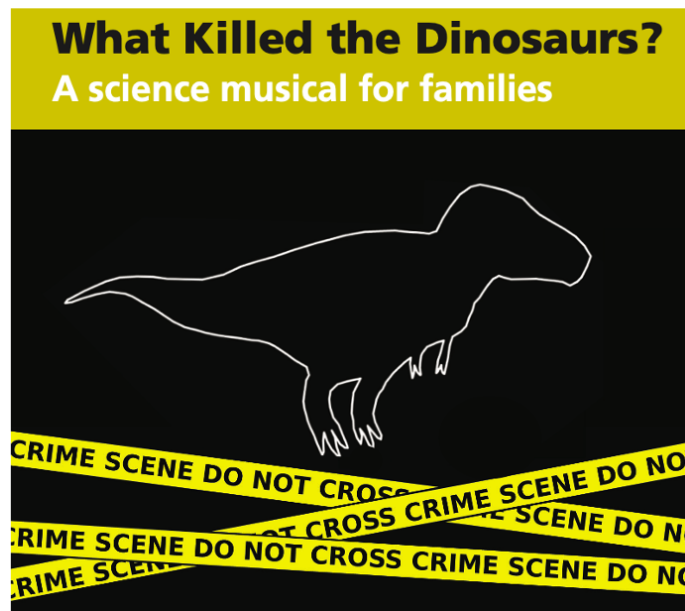


Figure: Flyer for a performance of "What Killed the Dinosaurs?" at the Oxford University Museum of Natural History

"What Killed the Dinosaurs?" is an hour-long musical aimed at children aged 7+ and their families or carers. We did three sets of performances between 2017 and 2019 at the Sedgwick Museum of Earth Sciences and the Oxford University Museum of Natural History, UK. After each performance we re-wrote and adapted the show in response to audience feedback and evaluation.

In the show we play science detectives (with a habit of breaking into song) who are investigating the case of the extinction of the dinosaurs. We present the theories for the cause of the mass extinction, the associated evidence and how it was discovered. Along the way we introduce and explain key concepts in geoscience such as the fossil record.

Through the narrative structure of the show, we also aim to teach the audience about how scientific discoveries are made. We find that using the structure of a story helps to convey the ups and downs of the scientific process. You can read more about this at Matthew Kemp's poster on science and stories - see author information.

We use songs and music to facilitate learning. The songs in the show simplify and clarify the scientific concepts we discuss. We use choruses and hooks to make complicated key words or phrases more memorable. In the central box of this poster you can view a video of Dinosaur vs Mammal, one of the songs from the show. We also use music as an emotional signifier to underscore the spoken parts of the performance. You can listen to an example of this in the audio recording at the top of this panel.

We give the audience a role in the performance – they are trainee science detectives (our new recruits!) who must help us to solve the mystery. We ask them to fill out "case files" during the performance and use call and response to engage them throughout. After each performance we had an informal question and answer session about the topics raised in the show – this sort of interaction highlights the benefit of having scientists as performers, as we were able to engage with the audience's questions using our backgrounds in geology and research.

SONGS FROM GEOLOGISE THEATRE

Twitter: [@wearegeologise](https://twitter.com/wearegeologise) (<https://twitter.com/wearegeologise>) Youtube: [Geologise Theatre](https://www.youtube.com/channel/UCTV3B11GE8vI4EzAZoMHdNg?fs=1&modestbranding=1&rel=0&showinfo=0) (<https://www.youtube.com/channel/UCTV3B11GE8vI4EzAZoMHdNg?fs=1&modestbranding=1&rel=0&showinfo=0>)

From the musical: Dinosaur vs Mammal

[VIDEO] https://www.youtube.com/embed/ShSBc-x_Zbw?rel=0&fs=1&modestbranding=1&rel=0&showinfo=0

A sing off between a mammal and a dinosaur, from our science musical “What Killed the Dinosaurs?”.

Other songs from Geologise:

Mary Anning: Fossil Hunter Extraordinaire

[VIDEO] https://www.youtube.com/embed/rq8LQT_hPjM?rel=0&fs=1&modestbranding=1&rel=0&showinfo=0

A song aimed at children about the life of the paleontologist Mary Anning. She lived between 1799 and 1847 in Lyme Regis on the Dorset Coast in England. Anning was never given the recognition she deserved during her life because she was a woman, despite her great contribution to the field.

Climate Crisis: A Musical Flyer for a Climate Change Denier

[VIDEO] <https://www.youtube.com/embed/u8YbzNQDJb4?rel=0&fs=1&modestbranding=1&rel=0&showinfo=0>

A song written for adults about climate change and some of the common misconceptions around it.

3) AGENCY



Photo credit: Oxford University Museum of Natural History

We have found the "science musical" to be an effective way to communicate complex science, especially to children. But good drama requires characters with agency - creatures acting on wants and desires that we can understand and connect with on an emotional, human level. There is a tension, therefore, between the need for agency in a story and the lack of it in many of the scientific processes we want to explain. Where does this leave us when trying to describe natural processes that don't directly involve people? Or when diving back into the geological past to a time when no humans were around?

This can present challenges to science communicators who want to convey complex concepts in an interesting and emotionally engaging way – but it can also be an opportunity. In our science musical for children, "What Killed the Dinosaurs?", we fill the late Cretaceous with a host of characters – from the competitive dinosaur and mammal who have an on-stage sing-off for their survival, to the science detective who performs a dramatic reconstruction of the meteorite impact as if she had really been there as a witness to the crime.

By granting agency, we gain access to a world that is otherwise inaccessible to us. But this has its own issues – do we compromise scientific accuracy in giving agency to otherwise inanimate actors?

4) EVALUATION

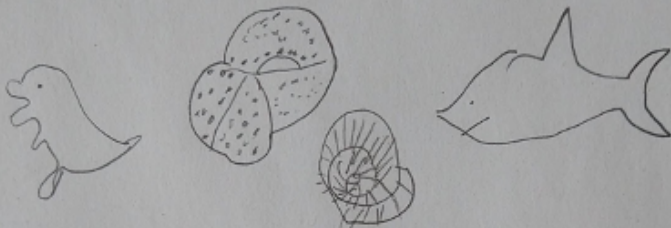
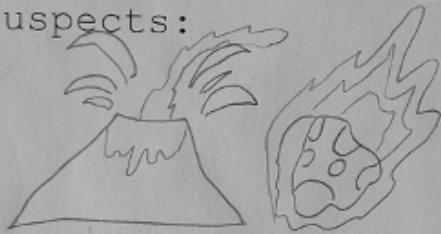
<h1>Case Files: What Killed the Dinosaurs</h1>	
<p>Time of death: 66 million years ago</p>	
<p>Victims:</p> <div>  </div>	
<p>PI 66 Z⁺ NA</p>	<p>Suspects:</p> <div>  <p>Deccan traps</p> </div>
<p>E 66 Z⁺ NA</p>	<div> <div> <p>Evidence:</p> <p>High iridium at K-Pg boundary Fossilized</p> </div> <div> <p>Survivors:</p> <p>Mammals birds</p> </div> </div>

Figure: Case files from "What Killed the Dinosaurs?", filled in by a young audience member

We carried out a variety of qualitative, informal evaluations of our science musical. The children were asked to fill out case files during the performance – drawing or writing the names of the 'victims' and 'suspects' in the case and listing the evidence. We used these to informally assess their understanding, and found that many had taken on board the key concepts. We also gave out a short questionnaire which suggested the audience found the performances enjoyable with the music and songs being a key part of that. Some audience members had an issue with the complexity of information and speed of delivery, but this varied greatly from child to child and was not necessarily based on their age. We are still working on finding the right balance of complexity and accessibility in our shows for this age group.

AUTHOR INFORMATION

Roberta Wilkinson is a PhD student at the University of Oxford researching earthquakes and active tectonics. You can view her poster about her PhD research here:

G021-0007 - A time-series InSAR study of faulting and folding in the Tajik Basin
(<https://agu.confex.com/agu/fm20/meetingapp.cgi/Paper/681066>)

Matthew Kemp is a PhD student at the University of Oxford. Matthew has a poster on science communication and a talk on his research which can be found here:

SY032-0008 - The Scientist's Journey: Finding the “Hero” in the Research
(<https://agu.confex.com/agu/fm20/meetingapp.cgi/Paper/691429>)

DI003-04 - X Marks the Spot: Seismic Signals of Silica and Hidden Hawaiian Heterogeneities (Invited)
(<https://agu.confex.com/agu/fm20/meetingapp.cgi/Paper/680232>)

ABSTRACT

We present our work as science communication duo Geologise Theatre – two graduate geoscience researchers who use theatrical techniques and music to communicate scientific concepts to a range of audiences. Through our performances we explore the concept of the “science musical” – a show whose main aim is to educate about science but strays from the bounds of a regular lecture or lesson by incorporating dramatic techniques, including character and narrative, as well as music.

Between 2017 and 2019 we developed and performed the hour-long science musical “What Killed the Dinosaurs?”, aimed at children (age 7+) and their families. We play science detectives with a habit of breaking into song, who must investigate the hypotheses for the cause of the dinosaur extinction. We are helped out along the way by our new recruits - the audience. We did three sets of performances, each time re-writing and adapting the show in response to audience feedback and evaluation.

Here we present our process in developing this work. We explore the idea of agency - good drama requires characters to act on wants and desires that we can understand and connect to on an emotional, human level. So how can we dramatise inanimate scientific processes? Or stories set in the geological past before humans were around? We try to access these concepts using a whole host of characters, from a sing-off between a mammal and dinosaur competing to survive, to a father and son duetting about their discovery of a global iridium anomaly.

We also present a qualitative assessment of the efficacy of a science musical as a method of science communication. While writing about science within the constraints of a song or storyline can present compromises between accessibility and accuracy, we find that narrative structures help to convey the ups and downs of the scientific process. Songs and music play an important role in summarising key ideas and making them memorable. We qualitatively assessed the children’s understanding through drawings and found that most came away having grasped the key concepts.

In our science musicals, the burden of conveying information takes precedence over the core drivers of a solely theatrical work, but we can draw on the techniques that theatre and musicals offer in order to introduce emotional connection with the audience and better convey a complex scientific message.



Photo credit: Oxford University Museum of Natural History

https://agu.confex.com/data/abstract/agu/fm20/8/4/Paper_687448_abstract_657974_0.png

REFERENCES

1. *Horrible Histories* (2009-2014). CBBC.