

## “Wibbly-Wobbly, Timey-Wimey-Stuff:” Teaching with a Time Lord

Kristine Larsen

*Central Connecticut State University, 1615 Stanley St., New Britain,  
Connecticut 06050, USA*

**Abstract.** November 2013 marked the 50th anniversary of the premiere of *Doctor Who*, the longest-running science fiction television series in history (790 episodes spanning 1963–1989 and 2005–present). The revival of the BBC series in 2005 has been both critically acclaimed and commercially successful. The travels of the 900-plus-year-old Time Lord and his companions introduce viewers to the past, present, and future of our planet and many others. While the series is obviously fictional, there is also a surprising amount of fairly accurate science as well.

### 1. Introduction

The use of science fiction films, novels, and television series in teaching science to non-science majors is not a new concept (e.g., Fraknoi 2003). From *Star Trek* (in all its incarnations) to *Jurassic Park* and the novels of Kurt Vonnegut, science faculty have been able to channel their “inner geek” in order to excite this often hard-to-reach audience. With November 2013 marking the 50th anniversary of BBC’s *Doctor Who*, now is the perfect time to get on board the TARDIS (an acronym for “Time and Relative Dimensions in Space”) and travel through space and time (and even alternate realities) with this dual-hearted, 900-plus-year-old Time Lord from the planet Gallifrey. The Doctor’s companions (both terrestrial and extraterrestrial) are astounded at first that the Doctor’s time machine not only has the outward appearance of a 1960s vintage British police box, but that it is much bigger on the inside. The series has, in part, been able to continue over five decades because the Doctor can “regenerate” when mortally wounded, changing his appearance and temperament, and, of course, the actor portraying him. Although the series went on hiatus in 1989 (with the exception of a 1996 made-for-TV movie), it was revived in 2005, receiving both critical acclaim and worldwide popularity. An eagerly anticipated 50th anniversary episode, airing simultaneously around the world on November 23, 2013, paired with the recent announcement that seasoned Scottish actor Peter Capaldi will be assuming the role in the 2013 Christmas special, make references to *Doctor Who* all but unavoidable on the Internet. Your students know Who—so should you!

As is often the case with science fiction, scientific topics are frequently used as plot points in *Doctor Who*. In fact, former BBC Head of Drama Sydney Newman, who had initially commissioned the series, once said of the series that “as a children’s programme, I was intent upon it containing basic factual information that could be described as educational, or, at least, mind-opening for them. . . All the stories were to be

based on scientific or historical facts as we knew them at the time.”<sup>1</sup> While Newman’s vision was not exactly followed to the letter, there is sufficient, reasonably correct science in the series to have spawned two books on the topic (Parsons 2010, White 2006). The SLAC Association for Student Seminars at Stanford sponsored a talk on “The Science of *Doctor Who*” in 2012,<sup>2</sup> and the St. Louis Science Center hosted a series of *Doctor Who*-themed events as part of their First Friday adult program in July 2013.<sup>3</sup> The BBC has even produced a special, *The Science of Doctor Who*, first broadcast in 2012.<sup>4</sup> Finally, Lindy A. Orthia produced a detailed analysis of the portrayal of science and scientists in *Doctor Who* as her Ph.D. thesis at The Australian National University.<sup>5</sup> Clearly there are numerous, fascinating references to science in the “Whoniverse,” as it is called by fans, and with a little effort some of these can be easily integrated into introductory astronomy courses. The remainder of this paper will survey a number of distinct examples of astronomical topics and assignments, focusing on the post-2005 revival of the series (starring Christopher Eccleston, David Tennant, and Matt Smith as the 9th, 10th, and 11th incarnations of The Doctor, respectively).

## 2. Examples of Astronomical References in *Doctor Who*

### 2.1. Time Travel

Not surprisingly, time travel, including issues of paradoxes, causality, and free will, are often discussed within the series. For example, in the episode “Turn Left,” Donna Noble’s seemingly innocent decision to drive a different way at a traffic intersection has dire consequences for the entire Universe because as a result she is not in the proper place to save the Doctor’s life. In “Father’s Day,” Rose Tyler travels back in time and tries to save her father from being killed in a car accident, but she discovers that history cannot be changed without consequences. In “The Waters of Mars,” the Doctor attempts to rewrite history by saving members of a doomed Mars colony, only to have the leader commit suicide in order to keep the timeline intact. And in a recent episode, “The Name of the Doctor,” Clara Oswald is warned not to enter The Doctor’s time stream, but as she notes, she has already done so (as witnessed by a number of past events), and therefore must do so now. These are just a few examples of episodes that can be discussed and analyzed in any course that touches upon the possibility of time travel and its depiction in science fiction film and television.

### 2.2. Exoplanets and Astrobiology

Because the series takes place on a variety of planets (including Earth, Mars, and a number of fictional exoplanets), students can contrast the planetary bodies depicted in the series with known planets and exoplanets. An important example is the Doctor’s home world of Gallifrey, which orbits a binary star system. Students can compare and

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<sup>1</sup>[http://www.televisionheaven.co.uk/origin\\_of\\_doctor\\_who.htm](http://www.televisionheaven.co.uk/origin_of_doctor_who.htm)

<sup>2</sup><http://www.slac.stanford.edu/slac/sass/posters/DrWho2012.pdf>

<sup>3</sup><http://www.slsc.org/july-first-friday-doctor-who-2013>

<sup>4</sup><http://www.bbcamerica.com/doctor-who/guide/specials/the-science-of-doctor-who/>

<sup>5</sup><https://digitalcollections.anu.edu.au/handle/1885/49358>

contrast it with currently known exoplanets in circumbinary systems, such as Kepler-16, Kepler-34, and Kepler-35. *Doctor Who* is known for the diversity of extraterrestrial species portrayed, both among allies and enemies of the Doctor (Loborik et al. 2013). Each species is adapted to its planet of origin and has its own culture. Discussions of life beyond Earth can include examples from *Doctor Who*; students can investigate and hypothesize what conditions would have led to the evolution of specific species, including genetically engineered species such as the Daleks.

In the episode “The Christmas Invasion,” the fictional British Rocket Group’s first Mars probe, *Guinevere One*, is captured by the warlike Sycorax, and a vial of A+ blood on board the spacecraft is used to control all humans of that blood type. The blood is included with human, bird, and whale songs, greetings in 120 human languages, water, and wheat seeds, an obvious nod to the *Voyager* spacecraft picture disk and *Pioneer 10/11* plaque. Students can compare and contrast fictional and real-world attempts at ET communication. The BBC released a fake website for the probe in order to promote the episode.<sup>6</sup> It contains information not only on the fictional probe, but also about Mars in general. Students can analyze the website and search for scientific inaccuracies, and they can also compare and contrast the Guinevere mission to the failed British Mars probe *Beagle 2*.

In “The Waters of Mars,” Mars base Bowie is threatened by an alien presence called “The Flood.” Students can compare the structure of Bowie Base to real world prototypes of possible Mars bases and compare the depiction of Martian surface conditions to astronomical fact.

### 2.3. Black Holes and Worm Holes

Black holes are a staple in science fiction. In the episodes “The Impossible Planet” and “The Satan Pit,” the Doctor and Rose Tyler visit a scientific base on an impossible planet, one in a stable orbit near a black hole. A mysterious energy source deep within the planet counteracts the gravitational pull of the black hole. We often rattle off in class without further explanation that if the Sun suddenly became a black hole, the Earth’s orbit would not appreciably change. This is an interesting fictional counterexample that can facilitate discussions of the spatial extent of the influence of a black hole. If wormholes are part of the class content, the episode “The Planet of the Dead” can be used to illustrate the point that current theoretical models of traversable wormholes predict that they will be accompanied by harmful radiation.

### 2.4. The Birth and Death of Earth

The Doctor and Donna Noble visit the birth of the Earth in “The Runaway Bride.” Unfortunately for the human species, the planetesimals that form the Earth coalesce around the arachnid Racnoss’s spacecraft. Ignoring that obvious bit of creative license, this scene can be used to illustrate the planetary formation process and engage students in testing their understanding of the topic by watching for other scientific inaccuracies. In “Hide,” the Doctor and Clara Oswald briefly visit the infant Earth (at the time of the so-called magma ocean). Astute students will note that the Doctor gives the incorrect age for the Earth. Students can be asked to write about what event in the history of the Universe they would like to visit with the Doctor (or what particular place, such as the

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<sup>6</sup><http://web.archive.org/web/guinevere.org.uk/aboutguin.html>

Orion Nebula or Andromeda Galaxy) and what they would expect to see if they could make such a journey.

When asked what event they would want to visit in person, students may request the obvious: the death of the Earth. In “The End of the World,” the Doctor takes Rose Tyler five billion years into the future to witness the destruction of the Earth as it is enveloped by the Sun. Students can critique “The End of the World” for astronomical facts and fictions, and discuss the decisions humanity might face if it still exists when the Sun leaves the main sequence. An interesting “what if” scenario is depicted in “Dinosaurs on a Spaceship,” in which the Doctor, Amy Pond, and others discover that a spaceship is an “ark” built millions of years ago by the reptilian Silurians when a large asteroid threatened Earth. What if aliens had landed on Earth 65 million years ago and tried to save the dinosaurs from extinction?

### **2.5. The Birth and Death of the Universe**

Another astronomical event that students may express an interest in viewing firsthand is the death of the Universe. In the common imagination, this is usually depicted to be when the last stars burn out. In “Utopia,” the Doctor, Martha Jones, and Captain Jack Harkness journey farther than the TARDIS has ever done before, 100 trillion years into the future, when the last stars burn out. Is this date accurate? Is the depiction of the end of the Stelliferous Era true to the science? You will not know if you and your students do not view it! As for the birth of the Universe, in “The Big Bang,” the Doctor has to use the restorative field of the Pandorica and the exploding TARDIS to reboot the Universe, in a sense creating a second Big Bang. Taken in tandem, these episodes can be compared to the classic Isaac Asimov short story “The Last Question.”

### **3. Conclusion**

With the imminent departure of Matt Smith and the introduction of his replacement, the highly acclaimed Scottish actor Peter Capaldi, fans of the series will be eagerly tuning in during the 50th anniversary celebration and beyond. Consider adding the escapades of the eccentric Time Lord to your repertoire of teaching tools—your students will thank you for it!

### **References**

- Fraknoi, A. 2003, AER, 1(2), 112  
 Loborik, J., Gibson, A., & Laing, M. 2013, *Doctor Who* Character Encyclopedia (NY: DK Publishing)  
 Parsons, P. 2006, *The Science of Doctor Who* (Baltimore: JHU)  
 White, M. 2006, *A Teaspoon and an Open Mind* (London: Penguin Books)