

# Interdisciplinary Approaches to Astronomy: Cosmic Fiction, Drama and Poetry

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I have spent four decades teaching introductory astronomy to university students whose primary subject of study is not astronomy, as well as developing activities to help the public appreciate astronomical ideas and developments. One of the more effective tools that I have found for capturing the interest of non-scientists has been approaching astronomy through its influence on the humanities. In this article I examine some examples of astronomical inspiration in the humanities, looking at plays, poetry and fiction. A second paper, devoted to music inspired by astronomy, will appear in a future issue of the *CAPjournal*.

## Introduction

Astronomy has long been an inspiration for creative people in other fields and examples of astronomical influence seem to be everywhere in modern popular culture — from astronomically named chocolate and beer to song lyrics, television programmes, plays, poetry and films.

To show this, one of the best ice-breaker activities for a class or workshop is to divide your audience into small groups and ask them to come up with as many astronomical product names and film and music titles as they can. By the end of this exercise, they will conclude for themselves that astronomical words and ideas are woven throughout modern culture. But I hope to demonstrate through this article that the inspiration of astronomy goes deeper than mere names and titles.

In such a short introduction, there is not enough space for more than a few specific suggestions and they will be restricted to relatively modern ones, leaving the astronomy of Shakespeare, Homer and other classics to more qualified scholars<sup>1</sup>. Resources that can be used to explore the topic in more depth will be signposted throughout. The examples are also restricted to materials in English, for which I apologise and welcome examples from readers of astronomically-themed works in other languages.

Classroom lectures and public astronomy talks can be easily enhanced by drawing

from these other fields. It creates a feeling of familiarity amongst students and audiences and makes the sometimes abstract scientific concepts more approachable by highlighting the influence they have had on writers, composers, and other artists they admire.

## Plays about astronomers

In the twentieth century Bertolt Brecht wrote a play about the later period of Galileo's life, which he revised twice<sup>2</sup>. At the time, a popular play about the life of an astronomer was unusual, but in recent years we have experienced a small flood of plays and operas about the lives of astronomers — a number of which have been professionally produced and performed.

Lauren Gunderson, a playwright from Atlanta, USA, now living in San Francisco, has written a number of plays about science, some more straightforward than others. Her play *Leap* explores how inspiration came to a young Isaac Newton, while *Background* is about the physicist Ralph Alpher, who helped George Gamow develop some of the theoretical underpinnings of the Big Bang, and his emotional reaction to Penzias and Wilson receiving the Nobel Prize. Both plays are published in her *Deepen the Mystery* (2005).

Gunderson's more recent — and so far unpublished — play, *Silent Sky*, follows the life and work of Henrietta Leavitt, exploring the role of women at the Harvard

Observatory, and her struggle with her hearing disability. The play has been performed on both the East and West Coasts of the USA<sup>3</sup>.

Other female astronomers have also been portrayed in drama. Irish actress and playwright Siobhan Nicholas has a play about Caroline Herschel, which has seen performances in the UK<sup>4</sup>, while New Zealand dramatist Stuart Hoar's play *Bright Star* concerns cosmologist Beatrice Tinsley, her brief life, her work, and her struggles with the barriers against women<sup>5</sup>.

A new play by William Kovacsik is currently premiering at the Fiske Planetarium. The play, called *Vera Rubin: Bringing the Dark to Light*, involves two actors who play Rubin and Isaac Newton, and the planetarium itself will play a central role in the



**Figure 1.** Photograph of Vera Rubin with Andrew Fraknoi in 1992. Credit: Andrew Fraknoi

performance with audiovisual materials being projected onto the dome<sup>6</sup>.

Many of the plays exploring the lives of astronomers focus on their relationships with one another. *Reading the Mind of God* is a play about Tycho Brahe and Johannes Kepler, by the American playwright Patrick Gabridge, which focuses on their relationship at the end of Brahe's life<sup>7</sup>. Another astronomical rivalry, that between Edmund Halley and John Flamsteed in England, has been explored by British dramatist Kevin Hood in *The Astronomer's Garden* (1991).

More recent plays have used fictional astronomers to highlight characters who are unworldly, or represent a scientific perspective. These include Kenneth Lonergan's *The Starry Messenger*, recently performed on Broadway, which features an astronomy instructor at the old Hayden Planetarium in New York City, USA, on the eve of its being torn down<sup>8</sup>. Jamie Pachino's *Splitting Infinity* explores interactions between a fictional female astrophysicist, her Christian Scientist postdoc, and a rabbi who has known her since childhood. The play received mixed reviews.

The life and work of a somewhat more obscure astronomer, Guillaume Le Gentil, an 18th century observer who was especially unlucky with the locations he chose to measure the transits of Venus, is the inspiration for the play, *Transit of Venus*, by the Canadian playwright Maureen Hunter (2007). The play later became an opera with the same title, with music by Victor Davies.

### Astronomy at the opera

Operas about astronomers have also become more common in recent years. Paul Hindemith's 1957 opera, *Harmonie der Welt*, was inspired by some of Kepler's ideas on the similarities between mathematical and musical harmonies, which resonated with the composer's own views on harmony theory. It is a complex opera, which contrasts Kepler's search for laws and harmony in the Universe with the disharmony and chaos of human existence, and especially the times and wars during which Kepler lived<sup>9</sup>.

A more modern opera by Philip Glass about Kepler, titled *Kepler*, premiered in

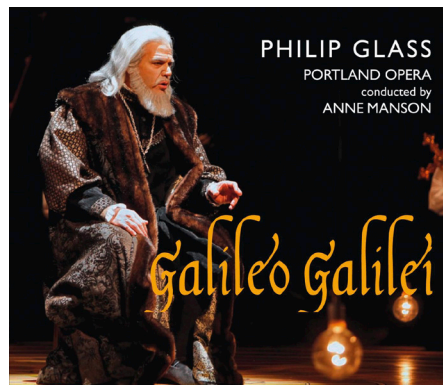


Figure 2. Cover of the Galileo Galilei opera by Philip Glass.

2009. Glass is one of the most successful of modern classical composers, with music that crosses over to film scores and is enjoyed by many who are not fans of classical music. His *Kepler* is more a meditation on themes and ideas than a complete story with a lot of action. Glass, like Hindemith, points out the contrast between Kepler's challenging, complex life and his dreams of order in the sky. An Austrian production of this opera is available on DVD from Orange Mountain Music. Glass has written a series of operas about noted scientists. The series began with the rather infamous *Einstein on the Beach*, a meditation on Einstein's life and ideas, now available in several recorded versions and first performed in 1976. Next was *Galileo Galilei*, which has recently been issued on CD by Orange Mountain Music label, featuring a performance at the Portland Opera<sup>10</sup>.

### A few films with astronomers

In cinema, astronomers have been portrayed in a range of roles, from hapless romantic foils to villains or unwitting victims whose discoveries lead to the end of the world. I will leave the older science fiction films to others to catalogue, but can mention a few examples from other film genres.

In *Roxanne*, a modern retelling of *Cyrano de Bergerac*, Daryl Hannah plays an astronomer who comes to a small town to look for a comet. In *Addicted to Love*, Matthew Broderick is an astronomer who follows the woman he is in love with to the city. In both films, astronomy takes a back seat to romantic comedy. Astronomy — and long nights at the telescope — are more central in the 1944 comedy *The Heavenly Body*,



Figure 3. Film poster for the 1944 comedy *The Heavenly Body*.

in which Hedy Lamarr plays the neglected wife of an astronomer who turns to an astrologer for advice. A 2011 Brazilian film, *Corpos Celestes* — rendered in English as *The Sky We Were Born Under* — uses the protagonist's profession as an astronomer not as a catalyst for romance, but to represent life and loneliness.

Two portrayals of astrophysicists in recent cinema take a more straightforward approach. In *Contact* Jody Foster plays a radio astronomer engaged in a Search for Extraterrestrial Intelligence (SETI) project, a character based, in part, on Jill Tarter, at the SETI Institute. The film is based on a best-selling book by Carl Sagan (1985), in which he tried to portray what a SETI success might involve<sup>11</sup>. In *The Theory of Everything*, which won actor Eddie Redmayne an Oscar for his remarkable portrayal of Stephen Hawking, it is the personal challenges of Hawking's illness, rather than his scientific work, that takes the fore.

### Science fiction with good astronomy

I recommend science fiction stories which build on good science in all of my classes



**Figure 4.** Fred Hoyle cuts a cake showing the Galaxy with a black hole centre at a reception in his honour at the Berkeley astronomy department, USA, in 1970. Credit: Andrew Fraknoi

and public talks. Over the years, I have put together a website which organises the stories that I have collected by scientific topic<sup>12</sup>. One interesting observation from pulling together this list is that the number of stories written by authors who have advanced degrees in astronomy or physics continues to grow<sup>13</sup>.

Perhaps the best-known example from the 1950s and 1960s is the late British cosmologist Fred Hoyle.

It is rumoured that Hoyle wrote science fiction to get into print those of his ideas that the scientific journals were not willing to indulge. For example, his best known novel, *The Black Cloud*, suggested the possibility of organic molecules — and life itself — in interstellar clouds years before such molecules were discovered<sup>14</sup>. His novel, *October the First is Too Late* (1966) may well be the first fictional working out of the implications of the many-worlds interpretation of quantum mechanics. These works present a strong case for the value of fiction as a platform for exploring new scientific concepts.

Nowadays a good number of practicing astronomers and physicists are writing interesting science fiction, among them Alastair Reynolds in England; Gregory Benford from the University of California, USA; Yoji Kondo — pen-name Eric Kotani

— and Geoff Landis, who both work at NASA; Mike Brotherton at the University of Wyoming, USA; and Michael Shara at the American Museum of Natural History, among others.

Several other distinguished astronomers have written works of fiction that can be worth searching out for their informed take on the science. These include planetary scientist William Hartmann of the Planetary Science Institute, USA, who wrote *Mars Underground* (1977), describing the search for life on and under the surface of the red planet; nuclear astrophysicist Donald Clayton of Clemson University, USA, whose novel *The Joshua Factory* (1986) tells a tale of neutrinos; and J. Craig Wheeler, the former President of the American Astronomical Society, who explored threat of quantum black holes in *The Krone Experiment* (1986).

Among these authors, Benford has perhaps the highest reputation for writing outstanding fiction. Many of his novels make a point of showing scientists at work in realistic laboratory and academic settings, whilst grappling with fictional scientific problems<sup>15</sup>. Benford's early novel, *Timescape* (1980), features astronomers like Fred Hoyle, Margaret and Geoffrey Burbidge, and Carl Sagan as characters. His novels featuring organic and machine life locked in a life-and-death struggle at the centre of the Galaxy are now classics, and his recent short stories have addressed cosmological and SETI issues from interesting viewpoints anchored in current scientific thinking<sup>16</sup>.

Reynolds established his reputation a generation later than Benford, but is winning many awards for his film noir portrayals of our future in space. His novel *Revelation: Space* (2000) is a marvellous place to begin exploring his work and it is worth finding an anthology that features his short story, *Beyond the Aquila Rift* (2005) — rarely has an author succeeded in portraying the truly astronomical distances of the objects we study so movingly<sup>17</sup>.

Some of the most engaging science fiction stories are those in which the reader is given a realistic picture of what it might be like to stand on the surfaces of other worlds and experience their alien environments. Biologist Paul McAuley is one master of such stories, for example in his

*Quiet War* (2002) series which explores all of the Solar System's planets during a time of war over the genetic modification of organisms. Engineer G. David Nordley has also written some wonderful stories about Solar System exploration, including *Crossing Chao Meng Fu* (1998), set on Mercury, and *Into the Miranda Rift* (1994). For a gripping tale on what it would be like to be stranded on the Moon, I recommend *A Walk in the Sun* (1992) by Geoff Landis. These are just some of the stories that could seize the imagination of a young reader and lead them toward science. You can do your students and audiences a life-long favour by recommending some of the stories that celebrate our modern understanding of the Universe<sup>18</sup>.

## Poetry and the Universe

Doing justice to the wealth of astronomical inspiration expressed through poems is not possible in such a short introduction, but there are some key examples of informed astronomical poets whose work can be used to illustrate outreach work.

A number of astronomical poets wrote from an informed perspective. The American poet Robert Frost, for example, was an amateur astronomer. Poet and essayist Diane Ackerman received her Masters and PhD at Cornell University, where she took astronomy classes from Carl Sagan. Her 1976 collection, *The Planets: A Cosmic Pastoral*, shows the influence of her study of astronomy most directly, although you can find other astronomy poems in her collection, *A Jaguar of Sweet Laughter* (1993).

Robinson Jeffers (1887–1962) was a 20th century poet who celebrated nature and the coast of his native California. The poet's brother was the Lick Observatory astronomer Hamilton Jeffers; as a result, the poet Jeffers was well informed about developments in astronomy and included them in his works. One of his most powerful poems, *Margrave* (1932), contrasts the vast impersonality of the expanding Universe with the horror of a child kidnapping and killing here on Earth<sup>19</sup>.

Astronomer Rebecca Elson was actively writing poetry alongside technical papers on globular clusters. Some of the poems celebrate astronomy, while others movingly anticipate the inevitable course of her





**Figure 5.** Astronomer Rebecca Elson.  
Credit: Wikimedia

illness — she died of leukaemia at the age of 39. The poems are collected in the posthumous volume, *A Responsibility to Awe* (2001), part of the Oxford Poets series.

I should note that several astronomers share my interest in poetry that is inspired by astronomy, including Canadian-born comet hunter David Levy, who has a degree in English, and the British discoverer of the first pulsars, Jocelyn Bell-Burnell. Both of them have put together anthologies of astronomical poetry, which cover a range of poetic styles, from old-fashioned odes to modern experiments with the power and pattern of language.

Maurice Riordan and Jocelyn Bell-Burnell's collection, *Dark Matter: Poems of Space* (2008), brings older poems together with a number commissioned specifically for the book, while David Levy's *Starry Night: Astronomers and Poets Read the Sky* (2001) interweaves poems with the story of the poets and the history of astronomy.

A number of others have put together anthologies of poems related to science.

Although many of these collections are out of print, a little research will unveil a number of useful websites that list and even give the text of astronomical poems<sup>20</sup>.

### Literature with astronomy: A sampling

There are two authors in the United Kingdom who have been writing biographies of astronomers with a fictional twist, which may attract the general public to some of the interesting history of our field. Astrophysicist and science journalist Stuart Clark, a senior editor for the European Space Agency, has written a trilogy of such novels, which includes *The Sky's Dark Labyrinth* (2011), on Kepler and Galileo; *The Sensorium of God* (2012), on Halley and Newton; and *The Day Without Yesterday* (2013), on Einstein and Lemaître. Award-winning Irish novelist John Banville wrote *Kepler: A Novel* (1981) and *Dr Copernicus* (1976), which are directly biographical in nature, and *The Newton Letter* (1982), which is more of a meditation on the difficulty of capturing the life of someone as complex as Newton in a narrative.

The novel *Theatre of the Stars* by N. M. Kelby has as its protagonist a female astronomer who has discovered an X-ray binary system that contains a black hole and, at the same time, is trying to unwrap the complex life story of her mother, a physicist and Holocaust survivor. Steve Maran and Alyssa Goodman are among the astronomers that the author thanks in her acknowledgements.

Another novel in which the author thanks astronomers for their contribution — in this case, Canadian astronomers James Hesser and Dennis Crabtree — is *Cold Dark Matter* by Alex Brett (2005). This one is a mystery whose plot centres on astronomical observations of the effects of dark matter on the rotation of the Andromeda Galaxy. Another astronomical mystery is laid out in *Total Eclipse* by Liz Rigbey (1966) which takes place at a Californian mountain-top observatory, with a lot of atmospheric detail; it received mixed reviews for its plot, however.

More recently, Pippa Goldschmidt, who has both a PhD in astronomy and a Masters in creative writing, has published

her first novel, *The Falling Sky* (2013). Goldschmidt's intriguing short stories are collected under the title *The Need for Better Regulation of Outer Space* (2015) many of which have scientific themes, and some of which include characters like Albert Einstein and Robert Oppenheimer.

### Conclusion

I hope these few examples have provided an indication of the wealth of interaction between astronomy and the humanities that exists for your exploration, or for the exploration of the students or audiences who we, as science communicators, work with. Whether you include them in your PowerPoint slides, or provide a printed resource guide to take home, they should reinforce in the minds of your students or audiences the idea that their appreciation of astronomy is shared by many creative people the world over.

### Notes

- <sup>1</sup> There is a regular series of international conferences entitled *The Inspiration of Astronomical Phenomena*: <http://www.insap.org/>. Their proceedings, recently published through the Astronomical Society of the Pacific Conference Series, are a treasure trove of more scholarly articles and resources in this field.
- <sup>2</sup> Bertolt Brecht's play *Galileo* can also be found on film directed by Joseph Losey, and starring Topol as Galileo, available on King Video.
- <sup>3</sup> A brief, humorous excerpt from *Silent Sky* can be found on YouTube at: <https://www.youtube.com/watch?v=KiwG6r-9gcw> and Gunderson describes the astronomy and history behind the play in this short video: <https://www.youtube.com/watch?v=b7XQG-Mnxikw>.
- <sup>4</sup> Video excerpts of Siobhan Nicholas's play about Caroline Herschel are available at: [https://www.youtube.com/watch?v=\\_nzf-1wZNQhY](https://www.youtube.com/watch?v=_nzf-1wZNQhY) and a brief review in *New Scientist* can also be found online: <https://www.newscientist.com/article/dn23863-new-play-shines-light-across-time-on-women-astronomers/>.
- <sup>5</sup> Stuart Hoar's play *Bright Star* has now been retitled *The Smallest Universe in the World*, and the play's website is at: <http://www.brightstar-theplay.com/>.

- <sup>6</sup> More information about William Kovacsik's play premiering at the Fiske Planetarium: <http://betc.org/fiske-planetarium-boulder-ensemble-theatre-company-collaboration>.
- <sup>7</sup> More information on *Reading the Mind of God* by American playwright Patrick Gabridge: <http://www.gabridge.com/full-length-plays/reading-the-mind-of-god/>.
- <sup>8</sup> The *New York Times* review of *Starry Messenger* can be read at: [http://www.nytimes.com/2009/11/24/theater/reviews/24starry.html?\\_r=0](http://www.nytimes.com/2009/11/24/theater/reviews/24starry.html?_r=0)
- <sup>9</sup> The first complete recording of Paul Hindemith's play is available from the Wergo label catalogue for: [http://www.wergo.de/shop/en\\_UK/3/show,132906.html](http://www.wergo.de/shop/en_UK/3/show,132906.html).
- <sup>10</sup> Some excerpts from *Galileo Galilei* showing key scenes in the opera can be seen on YouTube at: [http://www.youtube.com/watch?v=IhL\\_C3QqaY8](http://www.youtube.com/watch?v=IhL_C3QqaY8).
- <sup>11</sup> Jill Tarter discusses the novel, the film and her relationship to them in this brief video: <https://www.youtube.com/watch?v=1-akFL-FLgAk>.
- <sup>12</sup> For the author's topical guide to science fiction with good astronomy see: <http://www.astrosociety.org/scifi>.
- <sup>13</sup> A brief list of science fiction authors with science degrees can be found in Appendix 1 of my article on teaching with science fiction: <http://dx.doi.org/10.3847/AER2002009>.
- <sup>14</sup> Jennifer Ouellette discussed *The Black Cloud* in a 2014 web post at: <http://skullsinthestars.com/2014/08/03/fred-hoyles-the-black-cloud/>.
- <sup>15</sup> For a slightly eccentric introduction to Benford, see: <http://www.gregorybenford.com/gregory-benford-intro/>.
- <sup>16</sup> Some of his stories available on the web include *The Final Now*: <http://www.tor.com/stories/2010/03/the-final-now> and *SETI for Profit*: <http://www.nature.com/nature/journal/v452/n7190/pdf/4521032a.pdf>.
- <sup>17</sup> To find any published science fiction story by title or author, check the Internet Speculative Fiction Database at: <http://www.isfdb.org>.
- <sup>18</sup> For a list of ten favourite science fiction authors to recommend to students, and what stories of theirs to start with, see my essay at: [https://www.researchgate.net/publication/261364023\\_Ten\\_Science\\_Fiction\\_Writers\\_for\\_Scientists\\_and\\_Science\\_Enthusiasts](https://www.researchgate.net/publication/261364023_Ten_Science_Fiction_Writers_for_Scientists_and_Science_Enthusiasts).
- <sup>19</sup> The full text of *Margrave* can be found at: <http://www.poemhunter.com/best-poems/robinson-jeffers/margrave/>.

- <sup>20</sup> Among the collections, you might start with: Brown, Kurt, ed. *Verse and Universe: Poems about Science and Mathematics* (1998, Milkweed) and Heath-Stubbs, John & Salman, Phillips, eds. *Poems of Science* (1984, Viking). Good websites to begin with include Mario Tessier's *Nox Oculis* at: <http://pages.infinet.net/noxoculi/poetry.html> and *Astropoetica* (a journal publishing new astronomy poems, which has ended its run, but has beautiful archives) at: <http://www.astropoetica.com/>.

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