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Ghostly Science or Scientific Ghosts: The Fourth Spatial Dimension in Children's Literature

Abstract: Ghost stories have always attracted a wide readership and although everybody knows and recognises 'typical' ghost stories, it is difficult to find a definition that accommodates the various different forms. This paper understands ghost stories in the widest sense possible and takes a scientific approach to explain certain phenomena. More precisely, it is concerned with the fourth spatial dimension in four book's for children, namely *Tom's Midnight Garden* (1958) by Philippa Pearce, *Marianne Dreams* (1958) by Catherine Storr, *A Wrinkle in Time* (1962) by Madeleine L'Engle and *The Boy Who Reversed Himself* (1986) by William Sleator.

To define a 'ghost story' is a difficult if not futile exercise, since one has to consider the cultural background as well as the time frame of the story. After all, although Lisa Morton ascertains that the "belief in ghosts seems to be nearly universal" (Morton 12), she also observes that "even in our own Western European tradition, the very word 'ghost' has altered in both meaning and form over the last five or so centuries" (ibid.). M.R. James, for example, "whose collection *Ghost Stories of an Antiquary* (1904) places him in the very top rank of ghost-tale writers" (Morton 146), never mentioned that "the tale should include a ghost" (Morton 147). Morton speculates that "perhaps the definition of 'ghost' was flexible enough for James to extend it to any supernormal creature that could not be easily explained" (Morton 147). This essay will also extend the concept of the 'ghost story' to what might be called the 'scientific ghost story'. In particular, it will focus on narratives for children that involve the fourth spatial dimension, namely *Tom's Midnight Garden* (1958) by Philippa Pearce, *Marianne Dreams* (1958) by Catherine Storr, *A Wrinkle in Time* (1962) by Madeleine L'Engle and *The Boy Who Reversed Himself* (1986) by William Sleator.

One of the first scientists to introduce the idea of a fourth spatial dimension was Gustav Theodor Fechner (1809–1887), a German physicist and experimental psychologist. In his essay "Der Raum hat vier Dimensionen"¹ (1846) he establishes the concept of the fourth dimension using analogies which have since then become the standard explanation for an extra dimension. Fechner introduces a two-dimensional man who lives on a sheet of paper. Therefore, the paper man only

1 German: "Space has four dimensions"

knows of two dimensions, namely breadth and length, and has never heard of a third dimension. Humans on the other hand, are aware of this additional dimension which is called height. In analogy to this paper man, humans are, however, not aware of an additional fourth dimension, because they cannot observe or experience it. Nonetheless, this does not mean that there is no fourth dimension. Fechner's introduction of time in his argumentation may be his greatest accomplishment. In contrast to H.G. Wells's *The Time Machine*, Fechner does not define time as the fourth dimension, but uses it to explain the fourth *spatial* dimension. Fechner assumes that the paper man was painted in a certain colour and moved through three-dimensional space. Different light incidences in the third dimension would alter the colour and texture of the paper man. He may initially be red and smooth but blue and wrinkled in the end. Although the paper man does not notice the motion within the three-dimensional space he will perceive a gradual change of his appearance. These transformations would be attributed by him to the passing of time. Humans experience the same phenomenon: they travel through the four-dimensional space and call its effect time. Fechner continues to argue that everything that was and will be is already present and should be imagined as a long beam in the fourth dimension. In other words, at the beginning of that beam a person is still a child, in the middle he is an adult and at the end he is an old man. The three known dimensions simply represent one particular piece of this beam which then represents one moment in time, similar to the Time Traveler's explanation in Wells' *The Time Machine*:

There is no difference between Time and any of the three dimensions of Space except that our consciousness moves along it. [...] For instance, here is a portrait of a man at eight years old, another at fifteen, another at seventeen, another at twenty-three, and so on. All these are evidently sections, as it were, Three-Dimensional representations of his Four-Dimensioned being, which is a fixed and unalterable thing. (5–6)

Taken for themselves, these pieces are the stages of that person's life and only through viewing different pieces at once can a transformation from child to old man be seen. If this person were able to travel to the fourth dimension he would see his whole existence and could jump to any moment in his life:

For centuries humankind has been interested in the idea of the past, present, and future all being together in parallel, or side-by-side, worlds. Authors and filmmakers have often used the idea. The physicist Albert Einstein (1879–1955) used his theory of relativity to prove that the existence of parallel time and space is possible. If it is, then sightings of ghosts may be glimpses of people's past or future lives in another dimension. (Guy 21)

With this explanation, John Guy facilitates the speculation that ghosts might actually be time travellers.

Philippa Pearce's *Tom's Midnight Garden* (1958), one of the best-known examples of a time travel adventure, is based on this concept. While visiting relatives, Tom goes to a garden each night at the thirteenth hour which is not there during the daytime. In this garden he meets Hatty and befriends her. At first glance, this time travel story indeed alludes to ghost stories. After all, Tom himself considers ghosts as an explanation for the strange happenings:

Had it been a dream? Another possible explanation occurred to him: ghosts. That was what they could all have been: ghosts. The hall was haunted by the ghosts of a housemaid and a barometer and a stuffed fox and a stuffed owl and by the ghosts of dozens of other things. Indeed, if it were haunted at all, the hall was overhaunted. [...] He was dissatisfied with his own explanation, and suddenly sick of needing to explain at all. (Pearce 25)

Fechner's idea of a fourth spatial dimension and the different stages of a life beam are a more satisfying explanation for Tom's adventures. In *Tom Midnight's Garden*, it is Tom who visits different sections of the garden's beam of life. First of all, Tom always jumps back into his time at exactly the moment he had left it (Pearce 45). This way, no time passes in his present while he can technically stay in the garden with Hatty for as long as he likes (Pearce 186). Secondly, he visits the garden at different points in time, not always keeping to the chronological order of events (Pearce 176) and finding time to be an unreliable and confusing entity: "[F]orward to a tree's falling, and then back to before the fall; and then still farther back again, to a little girl's first arrival; and then forward again" (Pearce 101). Lesley Aers points out that Tom's time travel symbolises "the child growing up and changing; the destruction of the garden and its transformation into a housing estate; and a mean little yard mirroring a whole changed pattern of society" (Aers 79). To take the fourth spatial dimension as the basis for Tom's midnight adventures underpins Aers's argument. Being unfolded in the fourth dimension, the garden's beam of life represents change and Tom's visits symbolise different moments of this process. Consequently, "the deep-lying theme of the book is not travel in time but rather the four-dimensional wholeness of life" (Townsend 91).

Eventually, Tom finds out that Hatty is an old lady who lives in the same apartment complex as his relatives. Hatty had been dreaming of her childhood and Tom had joined her in those dreams. This aspect again links the fourth spatial dimension to ghosts, this time in the form of channeling. According to Matt Cardin's *Ghosts, Spirits, and Psychics: The Paranormal from Alchemy to Zombies*, channeling is:

an altered state of consciousness in which a human being, known as a "channel," accesses and expresses spiritual information from a source located in an alternate realm of reality. In this sense, channeling is a more contemporary form of the practice of Spiritualist mediumship, wherein human mediums communicated with the spirits of deceased human beings in rituals called séances. (43–44)

In this respect, the childhood experiences which Hatty relives in her dreams are located in “an alternative realm of reality”, in this case the past, and are accessed by Tom. Again, this phenomenon might easily be explained through the fourth dimension and the aforementioned life beam – this time not the garden’s life beam but Hatty’s. Tom merely enters Hatty’s life beam at a certain moment in her past, the precise time always triggered by Hatty’s dream.

The mental connection between Tom and Hatty can also be linked to telepathy. The term ‘telepathy’ was coined by Frederic Myers in 1882 “to describe cases where impressions were received at a distance by one individual from another without the apparent mediation of any known sensory organs” (Cardin 328). Again, similar to channelling and the life beam in the fourth dimension, telepathy can be apprehended as a phenomenon of the fourth spatial dimension. Given that everything of a two-dimensional sheet of paper can be seen from the third dimension, a three-dimensional being would be able to perceive everything on this sheet at once. This happens in Edwin A. Abbott’s *Flatland* (1884), where the two-dimensional protagonist A. Square is visited by a three-dimensional sphere. Being in the position to perceive the insides as well as the outsides of the two-dimensional world, the sphere is able to touch the very inside of A. Square at which “[he] felt a shooting pain in [his] inside, and a demoniacal laugh seemed to issue from within [him]” (Abbott 91). Taking this argument one step further, it seems only logical that someone from a higher dimension can also intrude into the thoughts and dreams of a creature from a lower dimension. This feature of the fourth spatial dimension supports the idea of telepathy or mind reading and explains special connections between people who have never met before, but feel as if they have known each other for years.

A perfect example for this four-dimensional telepathy is Catherine Storr’s *Marianne Dreams* (1958). Marianne is confined to her bed after a serious illness and starts to draw a house. While she sleeps, she finds herself within her picture and meets a boy called Mark. She soon realises that Mark is a real person and that he suffers from polio. The children’s interactions in Marianne’s dream world seem to have an immediate effect on Mark in real life. The first instance occurs when Marianne gets very angry with Mark and threatens him: “[A]nd then I’ll stop dreaming about you and you’ll die! You’ll be dead if I won’t dream about you, and I won’t” (Storr 58). Shortly after, she learns that Mark is in hospital because he caught a cold and his life is truly at risk (Storr 63). Secondly, Marianne now believes that it is indeed her doing which caused Mark’s serious condition (Storr 64) and resolves “to draw him getting well” (Storr 66) which results in Mark’s increasing health. Marianne even draws furniture and food for Mark in their

dream house which affects the real Mark and leads to his full recovery from the infection. Thirdly, since Mark suffers from polio, he cannot walk and is unwilling to exercise his muscles on a daily basis in real life. Nevertheless, Marianne fulfils Mark's wish and draws a bicycle in their dream world. She encourages him to practice riding it and even though he is reluctant at first, he starts to enjoy the exercise. In real life, Mark's condition improves as well and before long Marianne hears that he is getting better every day (Storr 131). In the end, Mark recovers from polio and is "so much better than the doctors ever thought he could be in such a short time" (Storr 176).

Incidents in which terminal cases are miraculously healed permeate history and common explanations of Mark's case might include his young age (Signori 81–86), a form of healing sleep (Signori 95–97) or the mind's power over the body (Signori 131–136). Being a qualified doctor and psychiatrist (Eccleshare), Catherine Storr was acquainted with the power of the mind and its importance during the process of recovery. Her prime concern in the novel was "to show the possibilities of explaining events in more than one way, both scientific or 'real', and magical" (Eccleshare). One such scientific explanation is the fourth spatial dimension. The drawn house symbolises Mark's consciousness and Marianne, or rather her mind, enters it while she is sleeping. Similar to Abbot's sphere and A. Square, Marianne enters Mark's thoughts through the fourth dimension. This psychological connection helps Mark to recover without any actual physical treatment and substantiates Storr's conviction of the powerful mind. Only by invading his mind can Marianne help Mark to find the courage to struggle on and defeat his illness. Therefore, the fourth spatial dimension employed in the story combines the scientific with the magical side of the narrative.

Besides establishing a connection between the minds of two people, the fourth spatial dimension also bears risks for the 'space' traveller, for example being trapped in a higher dimension or coming back mirrored. One of the earliest philosophers giving thought to the latter problem was Immanuel Kant (1724–1804). Although it was not his intention, Kant introduced the notion of mirror images into the discussion of the fourth dimension in his essay "Von dem ersten Grunde des Unterschiedes der Gegenden im Raum"² (1768). Certainly, he did not talk about a possible fourth dimension, but his deliberations about the impossibility of mirror images were taken up by numerous authors. Kant argues that the right and left hand are never exactly the same because their surfaces cannot be identical. Again, this can be explained with analogy of a paper man

2 German: "Foundation for the Distinction of Positions in Space."

living on a sheet of paper. The paper man can rotate on the surface of his world but he cannot produce his symmetrical twin. In order to do this he would have to lift himself off the sheet into the three-dimensional space, flip himself over, and return to the paper. The same holds true for humans: a person would have to travel to the fourth spatial dimension to create a mirror image of himself. H.G. Wells and Arthur C. Clarke used this explanation in their short stories “The Plattner Story” (Wells 1897, 103) and “Technical Error” (Clarke 57–59) respectively. Both stories deal with the effects of an involuntarily adventure of their protagonist in the fourth spatial dimension. In “Technical Error” the main character Nelson “has been rotated in the Fourth Dimension” (Clarke 59) and is now starving to death “because he can no more assimilate certain molecules of food than we can put our right foot into a left boot” (Clarke 60–61). In “The Plattner Story”, Gottfried Plattner disappears for nine days (Wells 1897, 107) only to come back with his anatomical structure being inverted (Wells 1897, 101). His tale is a remarkable one and bears many elements of a ghost story. First of all, he talks about being in an “Other-World” (Wells 1897, 110), which seems to be a ghostly version of the real world. Secondly, he himself becomes a ghost which haunts others in their dreams (Wells 1897, 105–106) but is unable to communicate in real life (Wells 1897, 108–109). As Guy explains:

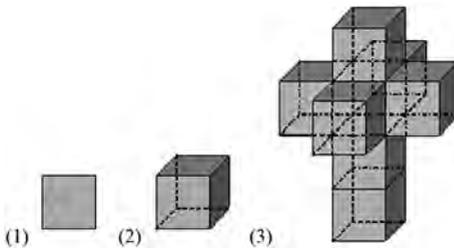
Ghosts may not be the spirits of dead people from this world. Perhaps they are beings from a parallel world. They are not normally visible to our human senses but occasionally we may catch a glimpse of them. (21)

In Plattner’s case, this parallel world is the fourth dimension and people only get glimpses of him in their sleep. Lastly, he encounters “Watchers of the Living” (Wells 1897, 111–113) which he describes as faces that surround and follow people in the real world unnoticed. Although Plattner himself offers no real interpretation (Wells 1897, 113), these creatures are at times linked to “childhood memories” (Wells 1897, 112), “the Dead” (Wells 1897, 113) or “human souls” (Wells 1897, 113) which clearly present links to ghost stories of any kind. However, since “The Plattner Story” is more concerned with science and the possibilities and dangers of a spatial fourth dimension, it is unmistakably a science fiction story rather than a ghost story.

Similar to Wells’s short story, William Sleator’s *The Boy Who Reversed Himself* core element is the fourth spatial dimension. It also extensively uses the metaphor of the paper man and its rotation in the third dimension. In the novella, a character named Laura finds out that the new student Omar can travel to the fourth dimension but often reverses himself in the process. She tricks him into taking her along. Although she dislikes the experience at first, Laura finds herself

fascinated with this higher dimension and, after travelling with Omar a few times, manages to go there on her own. Sleator's novella is indeed the best example of an author using the fourth dimension as a central theme for his work. Omar explains the additional spatial dimension to Laura in great detail using analogies such as Fechner's paper man (Sleator 17–20). The whole story is based not only on the possibility of another spatial dimension, but it furthermore plays with its many attributes and peculiarities. Sleator thus creates a fantastical world with strange creatures and many dangers which are scientifically plausible and fully explainable but still unimaginable and uncanny.

In contrast to Wells's creatures, however, Sleator tries to explain how four-dimensional creatures and objects would look like using a more scientific rather than spiritualistic approach. His explanations echo Charles Howard Hinton's (1853–1907) deliberations. Hinton was one of the first scientists who not only studied the possibility of a fourth dimension but who also tried to establish a visualisation of such objects. In his essay "What is the Fourth Dimension" (1884) he creates a theoretical four-dimensional cube:



He explains that four lines create a square which is a two-dimensional figure (1). Six squares in turn generate a three-dimensional cube (2). By analogy, he concludes that a four-dimensional 'four-square' would be formed by eight cubes (3). He calls this object in the fourth dimension a *tesseract*. As mesmerizing as the tesseract is for scientists, it also bewitches artists, philosophers and authors alike and inspires them to explore the possibilities of such a dazzling object.³ *Crucifixion (Corpus Hypercubus)*, one of the most famous paintings by Salvador Dalí, for example, depicts Jesus Christ nailed to a tesseract. The Grande Arche in Paris resembles another form of representation of the tesseract. In Robert Heinlein's

3 for more information on the fourth dimension in art see Linda Dalrymple Henderson's *Fourth Dimension and Non-Euclidean Geometry in Modern Art*.

short story “And He Built a Crooked House” (1940) the main characters barely escape a building in the form of a four-dimensional hypercube. Most famously, however, Madeleine L’Engle utilised the tesseract in her Newbery Medal-winning novel *A Wrinkle in Time* (1962), as Anna Quindlen summarises “the action of the book, the search for Meg and Charles Wallace’s missing father, relies on something called a tesseract, which is a way to travel through time and space using a fifth dimension” (qtd. in L’Engle 2). Similar to *Tom’s Midnight Garden*, readers are led astray as to whether this story deals with ghosts when Charles Wallace confronts Mrs Whatsit:

‘I really don’t think you ought to have taken Mrs. Buncombe’s sheets without consulting me,’ he said, as only a very small boy can be. ‘What on earth do you want them for?’
[...]

The little woman sighed. The enormous glasses caught the light again and shone like an owl’s eyes. ‘In case we need ghosts, of course,’ she said. ‘I should [43] think you’d have guessed. If we have to frighten anybody away Whatsit thought we ought to do it appropriately. That’s why it’s so much fun to stay in a haunted house.’ (L’Engle 42–43)

However, the light tone of this conversation as much as the rather amusing explanation already suggests that this is not a ghost story after all as the opening line “[i]t was a dark and stormy night” might have implied.

L’Engle’s religious belief always plays an important part in her stories, as seen for example in Mrs. Whatsit, Mrs. Who and Mrs. Which, who are associated with “guardian angels” (L’Engle 210), “messengers of God” (L’Engle 210) or simply “supernatural entities” (McGrath 158). In contrast to C.S. Lewis and his *Narnia Chronicles*, however, L’Engle’s interest in modern science enables her to exploit science as the frame work to depict the struggle between good and evil. While the frequent allusions to politics and religion have been studied numerous times, L’Engle’s references to science have been neglected or merely mentioned in passing. This scientific take on her novels, however, would be just as interesting and rewarding. For example, she freely adjusts the idea of the tesseract to suit her purpose:

‘And the fourth [dimension]?’

‘Well, I guess if you want to put it into mathematical terms you’d square the square. But you can’t take a pencil and draw it the way you can the first three. I know it’s got something to do with Einstein and time. I guess maybe you could call the fourth dimension Time.’

‘That’s right,’ Charles said. ‘Good girl. Okay, then, for the fifth dimension you’d square the fourth, wouldn’t you?’

‘I guess so.’

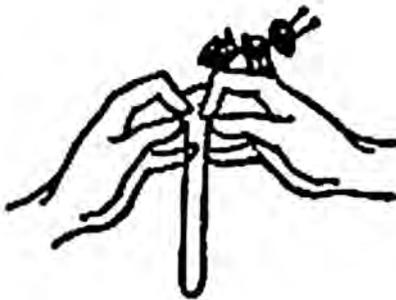
‘Well, the fifth dimension’s a tesseract. You add that to the other four dimensions and you can travel through space without having to go the long way around.’ (L’Engle 88)

Her descriptions of the fourth dimension in the story are in the tradition of Fechner, Hinton and other specialists of the fourth dimension. The assertion that time is the fourth dimension is also plausible, considering that since H.G. Wells this is the generally accepted interpretation in literature. In addition, the introduction of the fifth dimension for the purpose of travelling through space, although not necessary, is an understandable way to explain space travel within her novel:

Mrs Who took a portion of her white robe in her hands and held it tight. 'You see,' Mrs Whatsit said, 'if a very small insect were to move from the section of skirt in Mrs Who's right hand to that in her left, it would be quite a long walk for him if he had to walk straight across.'



Swiftly Mrs Who brought her hands, still holding the skirt, together. 'Now, you see,' Mrs Whatsit said, 'he would be there, without that long trip. That is how we travel.'



It can be argued that, as Kathy Piehl points out, L'Engle blends religion and science with the result that her books are not only "interesting and imaginative, they also create new possibilities in the minds of her readers" (Hughes and Piehl 17).

In conclusion, the examples of Philippa Pearce's *Tom's Midnight Garden*, Catherine Storr's *Marianne Dreams*, William Sleator's *The Boy Who Reversed Himself* and Madeleine L'Engle's *A Wrinkle in Time* show that authors of children's litera-

ture consciously or unconsciously exploit mathematical concepts in their works of fiction. Especially the fourth spatial dimension can function as an additional source for ghosts, mental connections or incredible happenings. Although it is rather difficult to classify these as ghost stories in the traditional sense since unimaginable, uncanny and mysterious elements are explainable, it nevertheless can be seen as a modern take on the ghost story which provides authors with a number of different possibilities to construct and strengthen their story with the use of unimaginable, uncanny and mysterious science.

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