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The Fantastic in Disguise in Hard Science Fiction. A Case Study of Brian Stableford's "Snowball in Hell"

After having examined several attempts to define hard science fiction in *Cosmic Engineers*, his 1996 study on this subgenre, Gary Westfahl comes to the conclusion that all definitions basically agree on three points:

Hard science fiction is *scientifically accurate* according to the knowledge of its day; hard science fiction includes *explanations and presentations* of its scientific facts; and hard science fiction is based on *careful extrapolation*, or scientific thinking, from known facts to speculations. (1996, 26)

What is, strikingly, absent from this generic definition, however, is a reference to the fantastic in hard science fiction. Frank McConnell, in his contribution to *Hard Science Fiction*, edited by George E. Slusser and Eric S. Rabkin in 1986, mentions the fantastic in connection with hard science fiction, but he emphasises that it should best be avoided:

The hard SF writer, from Verne to Asimov to Larry Niven, has always made it a point of personal pride that his work is strict extrapolation from the known, with no – or as little as possible – adulterating admixture from the purely fantastic. (17)

Thus, it can be gathered that hard science fiction tries by all means to avoid looking fantastic – fantastic taken to mean that “which exist[s] only in imagination” (“Fantastic”, *OED*). Roughly, it can be said that the fantastic moment of hard science fiction lies in its presenting scientific innovations which are as yet impossible. By exploring one specific example of British hard science fiction I shall examine how these impossible, fantastic elements in hard science fiction are not presented as something that has sprung only from imagination, but strive to be closely based on what is scientifically possible and known. I shall thereby discuss the characteristic traits of this genre. The text which will serve as an illustration is Brian Stableford's “Snowball in Hell” (2004, 81–119), a short story first published in 2000.

In “Snowball in Hell”, Dr Hitchens, a geneticist working as a scientific advisor to the British Home Office, participates in a raid of an illegal laboratory, which is given the code-name “Animal Farm” by the investigators. The raiders are not told what kind of illegal research is supposed to be going on in the laboratory, but they know that it has something to do with transgenic animals and human genetic material – hence the name. During the raid the place catches fire, but while the other raiders manage to get out, Dr Hitchens is lost in the building and is saved by “Animal Farmers” – inhabitants of the laboratory – who decide to stay inside when they hear shooting going on outside. Dr Hitchens starts a discussion with one of his saviours, a teenage girl called Alice, who is very vague about her origins. She implies that she is of porcine parentage, though she looks perfectly human. Dr Hitchens finally gets out of the place, but his saviours manage to escape. He learns that DNA tests carried out on some of the Animal Farmers who were killed during the raid have shown that they actually had the genotype typical of pigs, though they looked indistinguishable from ordinary humans. During the rest of the story, Dr Hitchens tries to find out how it was possible to breed such creatures, and how such a dis-

crepancy between genotype (the "complete genetic makeup of an organism" [Russel, 12] and phenotype ("the measurable attributes that an organism has" [ibid.]) affects the question of what it means to be human.

Considering the ideas transported in "Snowball in Hell" it is fairly obvious why this story should be called fantastic: the assumption that a girl carries the genome of a pig and actually is the offspring of pigs is definitely far removed from the contemporary reader's world of experience and rings utterly impossible. What distinguishes science fiction, and hard science fiction in particular, from other fantastic genres, though, is that it strives to explain rationally that which is fantastic. In the following I shall examine the short story's relation to the reader's actual world, the scientific language and explanations it abounds in, and discuss the scientific attitude which is displayed in connection with narrative perspective and structural traits of "Snowball in Hell".

"Snowball in Hell" and its Relation to the Reader's World of Experience

Ulrich Suerbaum, Ulrich Broich and Raimund Borgmeier argue that the reader's willing suspension of disbelief when reading science fiction is only possible when the text, in addition to presenting new and strange things (that which Darko Suvin has called the "novum" [7–8 and 64]), contains enough familiar facts and knowledge to which the reader can readily relate to (see Suerbaum, Broich and Borgmeier, 17). Colin Manlove has put this precondition of well-functioning science fiction as follows: "The science-fiction writer throws a rope of the conceivable (how remotely so does not matter) from our world to his" (17), which, according to him, distinguishes science fiction from fantasy. Peter Stockwell argues in the same vein when he says that "[t]he reader's judgement of how close and accessible the fictional world is to the actual world will determine whether the fiction is plausible or implausible" (166). In "Snowball in Hell", many ropes from the fictional future world to the actual world are thrown, and the fantastic ideas and new scientific findings are embedded into a world that is familiar to the early twenty-first-century reader.

Relating to the story world is made easy by its being set in the twenty-first century and in England. Thus, even though it is set in the future, it is not entirely removed from the reader's own space and time, so that links to the reader's present and knowledge can be easily established. It becomes clear throughout the narrative that the reader and the protagonist share background and cultural knowledge. The world at large still seems to function in a way that is familiar to the reader. This is true for the foundations of society – e.g., there are still governments that can set up laws, there is a police to enforce these laws, there are hospitals for the ill or injured – as well as for its particulars: people shoot with guns, preserve data on storage disks or publish their scientific findings. Apart from these and other general familiarities, the text refers to specific facts of the turn of the century that will make the reader get a grasp of the story, e.g., the Human Genome Project is referred to (though in the past): "When I'd first met Hemans, way back in '06, he'd been working in the public sector himself, helping to tidy up the loose ends of the Human Genome Project" (Stableford, 101). From this passage it also becomes clear that the story is not set at the beginning of the twenty-first century, but the time span that has elapsed between 2006 and the present of the story is somewhat confined by the fact that both Dr Hitchens, the first-person narrator, and his fellow geneticist Dr Hemans already worked as scientists at that time, and are still working at the time the story is set.

There are also numerous intertextual references any reader (not only the ones well-read in science fiction) will most probably recognise: already the title of the story is an allusion to George Orwell's *Animal Farm*, which is then taken up again by calling the laboratory where the experiments are conducted "Animal Farm". Further, Dr Hitchens discusses both H.G. Wells's *Island of Dr Moreau* and Lewis Carroll's *Alice's Adventures in Wonderland* and *Through the Looking Glass* with Alice's name being inspired by the latter book.

Scientific Explanations

Against the background of these familiarities, the reader is introduced to the hard science kernel on which the idea that humans can be grown from pig embryos is based. Though these ideas from the realm of science fiction might be partly new and not totally comprehensible to the average reader, who is not trained in genetics, they are still based on the standard of knowledge of the late-twentieth century. State-of-the-art genetics is used as a basis for extrapolation, and, in order to achieve plausibility, expository stretches of scientific jargon are inserted into the characters' conversations, thus fitting perfectly Westfahl's idea about hard science fiction, according to which "[t]he form's characteristics include long scientific explanations and a creative process of scientific extrapolation" (160–1). In "Snowball in Hell", these explanations do not stay on the surface but go into great detail, as can be seen from the following passage in which the protagonist tries to communicate his insights into the basic biotechnological idea of this story to a policeman and an undersecretary of the Home Office:

"If Hemans is telling the truth," I went on [...], "he and his colleagues didn't need to transplant any genes to make her human. DNA-analysis of the dead bodies supports that contention. The difference between a human being and a chimpanzee, as Alice pointed out, is very small. The most important differences are in the homeotic genes – the genes that control the expression of other genes, thus determining which cells in a developing embryo are going to specialise as liver cells or as neurons, and how the structures built out of specialised cells are going to be laid out within an anatomical frame. If you have an alternative control mechanism which can take over the work of those controlling genes, they become redundant – and as long as the embryo you're working with has the stock of genes required to make all the specialized kinds of cells you need, you can make *any* kind of an embryo grow into any form you required. You could make human beings out of pigs and cows, tigers and elephants, exactly as Alice said – and *vice versa*." (111–12)

This is just an extract from an explanation which takes up more than four pages all in all, thus "Snowball in Hell" also qualifies as a real hard science fiction story by Isaac Asimov's standards:

By hard science fiction, I mean those stories in which the details of science play an important role and in which the author is accurate about those details, too, and takes the trouble to explain them clearly. (in Westfahl 1996, 21)

That scientific detail plays an important role in Stableford's narrative cannot be denied, however, the question after scientific accuracy, still remains: how is the average reader to know whether what is presented in a science fiction story is actually accurate and true science?

It might be helpful at this point to consider science fiction writer Alastair Reynolds' view. Reynolds, a scientist himself, claims the following for hard science fiction texts:

What exactly do I mean when I say hard SF aims at plausibility? By this I mean that good hard SF stories should try not to contain glaring errors of fact, and by fact I mean the kind of detail which

is easily checked using standard reference material – popular science books, for instance. (quoted by Cramer and Hartwell, 620–1)

Gregory Benford argues towards a similar direction, though conceding a bit more freedom to the hard science fiction writer when he says that “one should not make errors which are visible to the lay reader” (84). What is certainly true of “Snowball in Hell” is that the scientific terminology that is used can be readily looked up in science books. In some cases, the reader is even aided by additional explanations given in the text itself. This is the case with some terms from the field of biotechnology which even an interested reader is rather unlikely to be familiar with. (The necessity to give such additional information is created by conversations in which one interlocutor is not a scientist, and thus needs plausibly more detailed information than fellow scientists.) The definition of “homeotic genes”, quoted in the passage above, sounds as if taken straight out of a textbook on genetics,¹ as does the explanation of “phylotopic stage”:

If I could also figure out a way to delay an embryo's phylotopic stage – that's the moment at which the control of an embryo's development is transferred from the maternal environment to the embryo's own genes – I might be able to stop the homeotic genes kicking in at all. (Stableford, 113)

A description of the *exact* technique how these homeotic genes were stopped from 'kicking in' by the scientists who created the children that look like humans from pig embryos is, however, left out. The protagonist comes close to understanding how it was achieved, but the process is not described in detail. Leaving out the ultimate explanation might, on the one hand, be seen as a flaw; on the other hand it prevents the science fiction writer from having to invent a new procedure which he might not be able to explain with the existing knowledge about biotechnology. To put it more bluntly: it saves Brian Stableford from having to 'lie' about the technique with which such a being could be created. Staying thus in the realm of speculation – how such a procedure *could* be explained on the basis of current biotechnological knowledge – also prevents the story from the danger of becoming dated too quickly, which is a general drawback of hard science fiction texts that are very specific. Daniel Samuelson compares this dilemma of hard science fiction – namely that speculations of science in science fiction texts are liable to becoming obsolete due to new scientific discoveries – to Tzvetan Todorov's hesitation between the fantastic and the marvellous (see Todorov 1975):

The cutting edge is always somewhere between the known and the unknown, the proven and the unproven, like the 'fantastic' in Tzvetan Todorov's conception, always threatening to resolve into the mundane or the marvelous. Scientific and technological progress make mere reportage out of SF 'hypotheticals'. Short-lived theories make once bright ideas only 'alternate history.' (Samuelson 1993a, 149)

This describes very well the basic 'danger' – or rather, possibility – of hard science fiction ceasing to be fantastic in the course of time, when the actual innovations overtake the ones imagined in fictional texts. From this it also follows that readers of different time periods will not necessarily perceive the same things as fantastic in hard science fiction texts.

¹ Compare the definition of “homeotic genes” with the one given in Russel's *Genetics*: “a major class of genes called the *homeotic* (structure-determining) genes specifies the identity of each segment with respect to the body part that will develop at metamorphosis. Homeotic mutants cause a segment to develop into a different body part from that normally specified.” (Russel, 571)

The Scientific Attitude

Apart from employing scientific language and being absolutely accurate about facts, it also seems to be crucial that a rigid scientific attitude is displayed in hard science fiction. Benford states that “[m]ore important than the factwork, though, is an understanding of science, its methods and worldview” (Benford, 84).

In “Snowball in Hell”, this attitude is evident especially in the protagonist's behaviour. Dr Hitchens, the genetic engineer, is very intent on not letting himself be carried away by speculations and unproven possibilities that he is confronted with. He is careful not to draw premature conclusions, as can be seen from the following passage:

And who the hell were they, anyway? I couldn't help jumping to the obvious conclusion, but I refused to entertain it. I was supposed to be a scientist, not some sucker who'd swallow up any urban legend that happened along. (85–6)

Dr Hitchens is also constantly reminding himself of the possibility that he might be the victim of some terrible hoax:

If she wasn't the child of someone of the staff, she had to be one of the experimental subjects – or, I reminded myself, someone *pretending* to be one of the experimental subjects. (88)

Or:

Dr. Moreau had remade beasts in his own image by means of surgery, but modern scientists had much cleverer means at their disposal – and the degree of success they might be expected to achieve was far greater. I had to remind myself again that all of this could be a bluff run by a thoroughly human child, and that I was only playing along to see how the story would go. (90)

The latter quote shows a certain optimism and faith in the possibilities of science – a traditional trait of hard science fiction (see e.g. Roberts, 82), which is shared by Stableford (especially as far as biotechnology is concerned),² but not by all hard science fiction writers of the younger generation. This optimistic and science-friendly attitude also becomes obvious in the following passage, when Dr Hitchens tries to convince government officials of the benefits of legalising the techniques Dr Hemans and his colleagues have developed: “... For once in our lives, let's not stand in the way of progress. I know that you're not going to be grateful for the advice, but my vote is that we simply let them all go and let them get on with it” (116).

The underlying scientific attitude of this short story is also evident in a discussion about publishing the results of one's experiments: publishing is presented as the right thing to do for a scientist who wants to be respected by the scientific community and Dr Hitchens blames Dr Hemans for not making his sensational findings public, but Dr Hemans counters this attack by appealing to the scientific practice that he did not want to publish incomplete work for which some corroborative evidence was still lacking:

² In the introduction to *Designer Genes* Stableford says: “I have spent a great deal of time during the last twenty years in the production of essays and stories which attempt to construct hypothetical societies in which biotechnologies are boldly and promiscuously deployed to the benefit of human individuals and societies. [...] The stories in this collection [...] are exercises in the same spirit [...]. I suppose that it would be wildly optimistic to hope that they might be capable of changing the way that anyone might think about the potential of biotechnology – but what kind of world would we be living in if it did not have room for a few wild optimists alongside the legion of pessimists who are steadfastly convinced that discovery can have no product but disaster?” in *Designer Genes*, 13–14.

"But you haven't published any of your work," I pointed out. "You haven't applied for any patents. Even by private sector standards, that's unusually secretive."

"We haven't published because the work wasn't complete," Hemans retorted, "and now, thanks to your murderous interference, it never will be. We haven't applied for any patents because we aren't ready." (104)

Here, also the scientific practice of patenting is referred to.

The scientific attitude is not only emphasised by Dr Hitchens' circumspect behaviour and by his discussing common scientific standards and practices, but also made explicit by the fact that Dr Hitchens repeatedly refers to himself as a scientist, as for example in the following passage:

As a *scientist*, of course, I wasn't at all sure of that – engineered organisms hardly ever breed true, and it was perfectly possible that even if the ersatz girls could produce offspring, the offspring in question might have snouts and tails – but we had to consider the worst possible case. Bringing human-seeming babies out of a sow's womb might sound no more likely than making silk purses out of sows' ears, but we had moved into unknown territory, *scientifically* speaking. (100, *emphasis mine*)

In this move into unknown territory, the moment of extrapolation is inherent. As has already been stated, this technique is central to science fiction, and especially to hard science fiction, as e.g. Samuelson has put it:

Depending mainly on what is verifiable, or at least that which is consistent with what is thought to be known, hard SF predominantly bridges the gap [between the known and the unknown] with extrapolation, extending trends or tendencies from one time frame (or domain of knowledge) into another. (1993b, 199)

The scientific explanations given in "Snowball in Hell" are based on what is already known, and they serve to move the reader, along with the protagonist, from ignorance to knowledge. The reader is able to follow Dr Hitchens' change of attitude towards what he is confronted with by having access to the first-person narrator's thoughts (which also makes it easy for the reader to get an insight into the geneticist's scientific attitude and scientific way of thinking, as has been shown above).

According to Suerbaum, Broich and Borgmeier the first-person narrative is not the favourite narrative situation in science fiction, as it often involves a certain emphasis on the character's reflections, which used to be of marginal importance in many traditional modes of science fiction (see 42). In "Snowball in Hell", however, the first-person narrator is cleverly employed to advance the plausibility of the fantastic assumption that is put forward. This is achieved in the following way: the first-person narrator who is presented as a respectable scientist with a rigorous attitude towards science, is sceptical about the new possibilities that he is confronted with and is, over long stretches of the short story, unwilling to believe what is suggested first by the rumours about the 'Animal Farm' and then by Alice's hints at her origin. The reader is very likely to identify with the first-person narrator of the story who refuses to believe what he is told. The reader thus shares the scientist's initial doubts, but these doubts might then also be shed along with the scientist's, as Dr Hitchens grows to believe what he is told when it is supported by evidence (the DNA tests which prove that the Animal Farmers really have the genome of pigs) and hints by fellow scientist Dr Hemans. Still, some readers might be more difficult to convince than the scientist, and when Dr Hitchens no longer doubts that Alice and her fellow 'Animal Farmers' are the offspring of pigs, other characters, such as an interrogating policeman, take over the disbelieving part.

"That's bullshit," the policeman said. "You've said all along that they had to make up the difference. We have to have the extra genes that make us human."

"That's true," I agreed, wondering how simple I could make it, and how simple I'd need to make it before he could understand. "And until today I'd assumed, just as you had, that the extra genes would have to be transplanted [...]" (112)

From this passage it can be seen how explaining anew what has already been said before is justified by introducing characters who need as much information as lay readers are supposed to need in order to understand the relevant facts ("wondering how simple I could make it, and how simple I'd need to make it before he could understand").

Structural Characteristics

In "Snowball in Hell", the fantastic is thus made plausible partly because the protagonist, who is built up as a respected scientist throughout the story, sheds his doubts as to the possibility of a human-shaped creature featuring the genome of a pig in the end, but this fantastic possibility is not taken for granted right from the beginning. The entire story is structured around the central idea of trying to find an answer, solving a puzzle, and thus shares characteristics with the genre of romance (the quest motif) (see e.g. Rose 1981), but also with detective fiction. As Peter Stockwell has stated, "[I]n science fiction stories (and in the related genre of detective fiction), the objective and end-point is often a conceptual resolution and explanation of a puzzle or anomaly" (163). This is definitely true of "Snowball in Hell": the desire to find out what the secret experiments in the Animal Farm are all about, to know how they were conducted is the driving force behind the entire short story, as can e.g. be seen from the following dialogue, taken from the beginning of the short story:

"But what are they actually supposed to have done, exactly?" one of my juniors was reckless to ask. "If we knew exactly," came the inevitable withering reply, "we wouldn't need to include you [i.e. a geneticist] in the operation, would we?" (81)

Throughout the entire story, the characters constantly 'ask' questions and want to 'find out' what was happening, Dr Hitchens is, e.g. almost exhilarated when, though in the unfortunate situation of being locked inside the raided building, it occurs to him that this circumstance might have put him "in a uniquely good position to find out exactly what the Animal Farmers were really up to." (87) In his ensuing conversation with Alice he asks her numerous questions in his attempt to be told the truth about her origins, and the same pattern is repeated when he discusses the matter with Dr Hemans. In the end, he arrives at a relatively satisfying answer, and, as has been shown, the reader accompanies the protagonist in this process. The seemingly fantastic is thus (more or less) explained for both characters and readers at the same time. Something which was definitely new and fantastic for the reader at the outset of the story was so as well for at least some of the characters in the story. In hard science fiction stories, solutions and answers are usually given; when something is unclear or appears to be fantastic to the characters in science fiction it is usually – as in Stableford's story – plausibly and rationally explained in the course of the story or at its ending (this is especially the case with short stories). This basic epistemological attitude goes hand in hand with the scientific attitude of wanting to find accurate answers.

That the characters themselves have to search for an explanation step by step is, however, only one possibility for presenting the fantastic in hard science fiction. Another common strategy is trying to win the reader's acceptance or willing suspension of disbelief by presenting the fantastic as something which is perfectly normal for the characters in the story. This is the case in the following passage from Paul McAuley's "Gene Wars" (first published in 1991), where only the readers perceive something as fantastic and try to find out how it can be explained.

Evan lived with his aunt, in the capital. He was fifteen. He had a street bike, a plug-in-computer, and a pet microsauro, a cat-sized triceratops in purple funfur. Buying the special porridge which was all the microsauro could eat took half of Evan's weekly allowance; that was why he let his best friend inject the pet with a bootleg virus to edit out its dietary dependence. It was only a partial success: the triceratops no longer needed its porridge, but it developed epilepsy triggered by sunlight. (36-7)

Here, the obviously fantastic pet microsauro is embedded into an enumeration of perfectly familiar objects, whose handling belongs among everyday activities.

While in some stories readers have to pick information from clues and hints; in others they are explicitly informed by expository stretches, which are only inserted for the reader's sake, but not for the characters', who are already used to and thus no longer disturbed by the changed conditions or scientific inventions. In the following passage, taken from Geoff Ryman's novel *The Child Garden* (1989), the readers are told the reasons and consequences of the changed colour of humans' skin:

People were purple. Their skins were flooded with a protein called Rhodopsin. It had once been found only in the eye. In light, Rhodopsin broke down into sodium, and combined carbon and water.

People photosynthesised. It was a way of feeding them all. There were twenty-three million of them in the Pit. In summer they baked in tropical heat, stretching out in the parks in early morning, to breakfast on light. In the raw and bitter winters, they would lean against sheltered walls and open up their clothing in gratitude. Milena would see them from her bus. Their rippled flesh would be exposed, their swaddlings of black winter clothing would be drawn back. They would look like carvings in baroque churches. (3)

For Milena, the protagonist of Ryman's novel, purple, photosynthesising people are the norm, while for the reader, of course, such a condition is far from normal.

Conclusion

In order to sum up what constitutes the fantastic in hard science fiction it does not suffice to consider fantastic to mean "existing only in imagination" or "proceeding merely from imagination," ("Fantastic", *OED*) as hard science fiction writers try very hard to base their innovations firmly on what is scientifically known and accepted. It might thus be necessary to revert to the original sense of the Greek verb "fantäzein", meaning "to make visible", (*ibid.*) to approach the fantastic in hard science fiction: this subgenre of science fiction tries to make visible that which is not (yet) possible in our actual world of experience, but what could possibly come into existence in the future. It presents the 'not yet possible' as a continuation of what *is* already possible and tries to achieve plausibility not only by an abundance of scientific detail, but also by employing a scientific attitude and a solution-oriented structure.

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