The role of scientific language in Philip Pulman's 'His Dark Materials'

Annalisa Bonomo[1]

Philip Pullman's epic is a 'dark matter' made up of religious and scientific underpinnings which challenge his readers' knowledge of the world, making them 'intellectually adventurous'.
Although scientific language seems to sound uncomfortable to his younger readers, he builds on myth and physics a new dimension of « stark realism dealing with matters that might normally be encountered in works of realism, such as adolescence, sexuality, and so on; and they are the main subject matter of the story – the fantasy is there to support and embody them, not for its own sake ».
Pullman's heroes (Lyra, Lord Asriel, Mrs Coulter and Mary Malone) are all scientists involved in a new political opinion of the world and in the role to be played in a universe which seems to be 'probabilistic'.

1. Introduction

Unlike other literature, fantasy fiction and fairy tales require some concept of realism which is not based on credibility. They cover a spectacular range of possibilities and, as a matter of fact, « the current understanding of the history of fairy tales is not only built on a flimsy foundation; its very basis requires an absence of evidence »[2].

Nevertheless, they are so universal and ageless to become *symbolic acts* – quoting Jameson[3] – in parallel worlds which most of the times are not subjected to natural laws.

In the case of Philip Pullman's fantasy it's impossible to describe the use of scientific language in *His Dark Materials* within the boundaries of Propp's morphological approach or inside Greimas' semiotic study of fairy tales. On the contrary, as Zipes states about such schemes, « to be sure, Propp and Greimas are useful for comprehending textual structures and signs of the tales, but they provide no overall methodological framework for locating and grasping the essence

[1] KORE University of Enna
[2] Ruth B. BOTTINGHEIMER, *Fairy Tales : A New History*, New York, State University of New York Press, 2009, p. 2.
[3] See Fredric JAMESON, *The Political Unconscious : Narrative as a Socially Symbolic Act*, Ithaca, Cornell University Press, 1981, p. 35.

of the genre, the substance of the symbolic act as it took form to intervene in the institutionalized literary discourse of society »[4].

2. The language(s) of Fantasy

Humankind cannot bear very much with reality
Thomas S. Eliot

As Armitt argues, using a broad definition, fantasy may include – « utopia, allegory, fable, myth, science fiction, the ghost story, space opera, travelogue, the Gothic, cyberpunk, magic and realism »[5].

Inevitably some forms of fantasy appeal more than others depending on the cultural and historical frameworks which the reader belongs to.

But, despite such a wide and powerful perspective, fantasy as a mode of writing has been often considered unworthy of academic criticism or incapable of musing on real concerns and matters.

On the contrary, according to Jackson : « Fantasy re-combines and inverts the real, but it doesn't escape it : it exists in a parasitical or symbiotic relation to the real »[6].

Moreover, as Coyle pointed out in 1981 :

> […] the retreat from realism is too widespread and too varied to be encompassed satisfactory by a single term or definition. In fiction alone, surrealism, metarealism, anti-realism, non-novel, fabulation, paranoic fantasy, absurdism, homocentric humanism, and a dozen other captions have been proposed, but all seem inadequate. To signify the creation of an alternative world as opposed to a realistic transcription of the observable, the term fantasy is perhaps the most suitable[7].

[4] Jack ZIPES, *Fairy Tales and the Art of Subversion* (1983), New York, Routledge, 1991, p. 4.
[5] Lucie ARMITT, *Fantasy Fiction : an Introduction* (1962), London, Continuum, 2005, p. 1.
[6] Rosemary JACKSON, *Fantasy : The Literature of Subversion* (1981), London and New York, Routledge, 2003, p. 20.
[7] William COYLE, *Aspects of Fantasy. Selected Essays from the Second International Conference on the Fantastic in Literature and Film*, Westport/London, Greenwood Press, 1986, p. 1.

So, since its early experiences, fantasy fiction has risen lots of philosophical questions about how to build a new path towards the real through mythical representations of life and death. Moreover, as a matter of fact, the strong powers of fancy and myth usually stir more and more debates on the role to be played by fantasy in the modern technological society.

Hence, as Mandala writes in her *Language in Science Fiction and Fantasy* :

> […] the critical work on science fiction and science that has been progressing since the early 1960s has, in large part, made the re-evaluation of these genres from laughable to laudable possible by overturning many of the questionable assumptions that had occurred around them. It has been argued, for example, that science fiction and fantasy are not to be dismissed as juvenile and escapist stuff[8].

Moreover, as Mendlesohn argues in her interesting musing on the rhetoric of fantasy :

> […] a consensus has emerged, accepting as a viable 'fuzzy set', a range of critical definitions of fantasy. It is now rare to find scholars who choose among Kathryn Hume, W. R. Irwin, Rosemary Jackson, or Tzevan Todorov : it is much more likely they will pick and choose among these and other 'definers' of the field according to the area of fantasy fiction, or the ideological filter, in which they are interested[9].

If such a taxonomical game doesn't give a unique definition of the genre, however, it succeeds in embodying all the categories of fantasy in which both children and adults are involved. Furthermore, since the legendary *Invasion from Mars* by Wells in 1938, the several connotations of fantasy have spoken volumes about the outcomes of science on the cosmopolitan society, telling new stories about how the scientific spreading can deal with the mythic representations of the human mind.

But, how to cope with the intriguing interrelationships between science, myth and fantasy ?

According to Hume, even with Pynchon's *Gravity Rainbow*, scientific writing has played with « an arsenal of fantasy techniques that allowed him (Pynchon) to create his fictive analogue to scientific reality – each one of those techniques flagrantly non-rational and nonrealistic ». She

[8] Susan MANDALA, *Language in Science Fiction and Fantasy*, London/New York, Continuum, 2010, p. 9.
[9] Farah MENDLESOHN, *Rhetoric of Fantasy*, Middletown, Welseyan University Press, 2008, p. xiii.

went on saying that : « Pynchon draws on science and contributes to science-fiction by creating a fictive analogue to the post-Newtonian universe, and he forces us to consider probabilistic and uncertain realities in a way that we normally avoid, even if we are aware of the implications of contemporary science »[10].

Arguably, science in fantasy asks demanding questions about the average mystery of the Apocalyptic quest of the future and science fiction scenarios face the challenge of the human responsibility asking humanity consciousness about it.

It is a matter of truth, as Le Guin writes in her essays on fantasy and science fiction :

> For Fantasy is true, of course. It isn't factual, but it is true. Children know that. Adults know it too, and that is precisely why many of them are afraid of fantasy. They know that its truth challenges, even threatens, all that is false, all that is phony, unnecessary, and trivial in the life they have let themselves be forced into living. They are afraid of dragons, because they are afraid of freedom[11].

According to such a perspective, all scientific imagination paves the way of a new myth, «the myth of technology and the magic of the future», as Sergio Solmi describes it[12]. With no doubts, Solmi thinks the Faustian curiosity as one of the most typical aspects of the world since the end of the XIX century onwards and quoting Zola he writes :

> La fine del secolo scorso vide il crollo dei miti romantici, e il positivismo, nell'universale messa in discussione dei valori del sentimento, della passione e della fede, salvò ed esaltò la scienza, imprimendo al suo slancio un ardore quasi religioso. Erano i tempi in cui Zola scriveva : « L'humanité glisse, prise de *vertige*, sur la pente raide de la science. Elle a mordu la pomme, et elle veut tout savoir. Ce qui nous tue, ce qui nous maigrit, c'est que les problèmes sociaux et divins vont recevoir leur solution l'un de ces jours […]. Nous sommes au seuil d'un

[10] Kathryn HUME, « Gravity's Rainbow : Science, Fiction, Fantasy, and Mythology », in George E. SLUSSER, Eric S. RABKIN dir., *Intersections : Fantasy and Science Fiction*, Carbondale, IL, Southern Illinois University Press, 1987, p. 190.

[11] Ursula K. LE GUIN, *The Language of the Night : Essays on Fantasy and Science Fiction*, Edited and with an Introduction by Susan WOOD, New York, Perigee, 1980, p. 44.

[12] For further references to Solmi's ideas about the link between science and fantasy see Sergio SOLMI, *Della favola, del viaggio e di altre cose. Saggi sul fantastico*, Milano-Napoli, Riccardo Ricciardi, 1971.

> siècle de science et de réalité, et nous chancelons, par instants, comme des hommes ivres, devant la grande lueur qui se lève en face de nous »[13].

The outcome of such a *vertigo* is somewhat a Promethean attitude towards life as the one already proposed by H.G. Wells, Jules Verne, Mary Shelley, and Voltaire in their mythologies of the modern world.

Their remaking of standard fantastic settings has brought what Maria Teresa Chialant describes as a new frame for fantasy in which Christian religion is reversed, and Darwinian theories and all the Enlightenment principles play the most important role[14] (we may think about the *Island of Dr. Moreau* or to *The Time Traveller* by Wells). Enhancing the subversive qualities of such a new paradigm, science fiction may actually be read as a « thought-experiment »[15] which may be predictive ad descriptive as well. It tells new stories about the future and, as Judith Berman, writes, «Modernity carries a somewhat different concept of the future. Modernity is not a single thing but a complex of changes, and the term is usually applied in reference to transformations in the developing world like urbanization, industrialization, and the rise of mass communications»[16]. Whether dreamt or real, such complex changes are to be found in the fantastic heroes' thousand faces[17] and in their leap into the future too. That's why new scientists have taken the place of more traditional mythic heroes, especially with the evolution of physics coping with the improvement of fantastic and transcendental *stimuli* coming from the natural world.

In the context of these broad considerations, Slusser, Rabkin and Scholes wrote :

> We tend to think of scientists as the ultimate realists – we call them 'physicists' and 'naturalists'. Surely, we think, they have no truck with fiction or fantasy. Yet, like Maxwell in his allusion to an 'imaginary substance', many theoretical scientists themselves freely

[13] *Ivi*, p. 117.
[14] For further references to Chialant's analysis see Maria Teresa CHIALANT, « A proposito dell'Isola del Dottor Moreau », in Carlo PAGETTI dir., *Nel tempo del sogno. Le forme della narrativa fantastica dall'immaginario vittoriano all'utopia contemporanea*, Ravenna, Longo Editore, 1988, pp. 75-94.
[15] Ursula K. LE GUIN, *The Language of the Night : Essays on Fantasy and Science Fiction*, *op. cit.*, p. 156.
[16] Judith BERMAN, « Models of Time : Imagining the Future », in *The New York Review of Science Fiction*, vol. 15, No.1, 2002, p. 1.
[17] Cf. Joseph CAMPBELL, (1949), *The Hero With a Thousand Faces*, Novato, New York Library, 2008.

> acknowledge their indebtedness to fantasy. Their laboratories are fantasy worlds where electrons look like billiard balls […][18].

So, starting from our present state of knowledge of and wondering about the universe, a surprising number of novels involve new scientists eagerly feeling a new experience of limits as the one already theorized by Todorov, attempting to catch the ultimate meaning of the world they are in.

3. Philip Pullman's fantasy : the art of darkness.

I'm first and foremost a storyteller. In whatever form I write -
whether it's the novel , or the screenplay, or the stage play,
or even if I tell stories (as sometimes do) -
I am always the servant of the story that has chosen me
to tell it and I have to discover the best way doing that.
I believe there is a pure line that goes through every story
and the more closely telling approaches that pure line,
the better the story will be. The story must tell me.
Philip Pullman

His Dark Materials is a trilogy of electrifying power and it resists simple and coherent summary. It's a multilayered novel which spans from fantasy to science fiction; it's a *bildungsroman* which tells a particular spiritual journey of his young and adult characters.

Two of the central protagonists are Lyra Belacqua and Will Parry, children from two Oxford cities belonging to different worlds. They start an adventurous journey up to a far and blurred Northern country for different reasons. Lyra is a proud 12-year-old girl who holds a powerful object – the alethiometer or truth measurer – thanks to which she travels between different parallel worlds searching for the real nature of the Dust (a mystery which seems to attract Lord Asriel's attention, her puzzling father). Will, on the other hand, is a sadder young boy who has lost his father and who is the only responsible for his mentally ill mother. Through their adventures Will acquires a subtle knife which can cut more and more windows to other worlds.

[18] George E. SLUSSER-Eric S. RABKIN-Robert SCHOLES, *Bridges to Fantasy*, Carbondale and Edwardsville, Southern Illinois University Press, 1982, p. 52 ; for Maxwell's theories see, James Klein MAXWELL, *The Scientific Papers of James Clerk Maxwell*, (edited by W. D. NIVEN), 2 vol., Cambridge, CUP, 1890.

The trilogy is richly populated and volume by volume it opens different allegorical layers which involve other important characters (Lyra's mother, Mrs Coulter, and Mary Malone, an ex-nun, now physicist, who will help Lyra to know everything about the dust and the dark matter she is searching for).

The novel encompasses a wide range of ideas which spans from theological reasoning, philosophical enquiry, and physical questions about the nature of the world and if we think that «children are more sophisticated in knowledge and reading interests than ever before », Pullman's «cross-age classic trilogy »[19] proves well such a statement.

Since the end of the XIX century the universe had been described according to traditional physics and by the Newtonian theories of the world. Thermodynamics had already told the story of thermal energy and was almost impossible to imagine what kind of revolution was going to happen.

But since Planck's 'quantum theory' and his electromagnetic camp, thanks to Einstein's use of it, till the more famous Schröedinger's equation in 1935, a new probabilistic universe had been developing. That's the framework of Philip Pullman's trilogy[20], which, as Lenz argues : « offers readers of all ages an adventure-packed story that speaks to some of the most urgent dilemmas of our time and suggests, for the thoughtful reader, not *answers* to the ills that presently beset us but rather ways of meeting them with courage and surviving them with grace »[21].

Since the beginning of his career, as Tucker notes : « his main players are no longer young children, and many of them have to cope with typical adult concerns »[22]. They grapple with scientific mysteries and they get on well with metaphysical questions about the real nature of the universe.

---

[19] Marlow EDIGER, « Challenge in Children's Literature », in Millicent LENZ-Carole SCOTT eds., *His Dark Materials Illuminated. Critical Essays on Philip Pullman's Trilogy*, Detroit, Wayne State University Press, 2005, p. 1.

[20] Philip PULLMAN, *Book One : Northern Lights*, London, Scholastic, 1995 (published in USA as *The Golden Compass*, New York, Knopf, 1996) ; *Book Two : The Subtle Knife*, London Scholastic, 1997 ; *Book Three : The Amber Spyglass*, London, Scholastic, 2000.

[21] Millicent LENZ-Carole SCOTT dir., *His Dark Materials Illuminated. Critical Essays on Philip Pullman's Trilogy, op. cit.*, p. 1.

[22] Nicolas TUCKER, *Inside the World of Philip Pullman*, Cambridge, Wizard Books, 2003, p. 51.

But what is very new with Pullman comes from his firm belief that « humans need multiple states of consciousness to see multiple realities »[23].

Thanks to her journey to the North searching for the Dark Matter, Lyra develops a multi-layered self which enables her to look at the dust both as the origin of sin and as the true nature of the atomic mass of the universe. The assumption of such a complex consciousness explains Pullman's atheism : religion is a natural instinct which, even asking for transcendence, will get lost in a space as big as the universe. For this reason its novel embodies an intriguing *coincidentia oppositorum* ; it is both a physical search for the Dust and a spiritual attainment of divine mercy.

All the three volumes are crossed by doubt, a doubt concerning a tangible proof of the original sin. In this way, imagination becomes paradoxically real allowing the coexistence of fantasy, science and religion through the whole trilogy.

Pullman's universes think science as an intriguing intellectual pattern, an analogical representation of real and observable phenomena. Only wonder, intuition and amazement tell the universe as full of excitement and discovery; and, only excitement and self-consciousness drive Lyra's alethiometer towards « aletheia »[24].

Lyra's visiting of parallel universes seems to realize the probabilistic model which serves – as Carter, Tenenbaum and Yuille argue – « both as a *normative* theory for 'correct' reasoning about chance events, but also as a *descriptive* theory of how people reason about uncertainty »[25].

But, no matter how Pullman's fancy asks physics to explain his characters' doubts about dark matter, what's the truth behind it ? Or, as Mary and John Gribbin ask in their *The Science of Philip Pullman's His Dark Materials*, is the golden compass actually based in science ? How does the subtle knife cut through anything ? Does a bomb like the one made with Lyra's hair really exist ? Can Lord Asriel's detectors used to photograph the Dust particles be compared to astronomers special detectors used to measure light from distant galaxies ? And, how the amber spyglass may refer to the real properties of the Iceland Spar also called 'calcite' ? [26].

---

[23] M. LENZ-C. SCOTT (eds.), *His Dark Materials Illuminated. Critical Essays on Philip Pullman's Trilogy, op. cit.*, p. 7.

[24] From the Greek αλήτεια meaning 'truth' but also 'loyalty' and 'reality'.

[25] Nick CARTER-Joshua B. TENENBAUM-Alan TUILLE, « Probabilistic models of cognition : Conceptual foundations », in *TRENDS in Cognitive Sciences*, vol. 10, No. 7, July 2006, p. 287.
URL: http://web.mit.edu/cocosci/Papers/ChaterTenenbaumYuille-TICS06.pdf

[26] Cf. Mary and John GRIBBIN, *The Science of Philip Pullman's His Dark Materials*, London, Hodder, 2003 (with an introduction by Ph. Pullman).

Intriguingly, the award-winning science writers are strongly convinced that the trilogy is deeply steeped in string theory and space-time, quantum physics and chaos. According to them *The Science of Philip Pullman's His Dark Materials*, Lyra and Will seem to know quantum physics by Heisenberg, Bohr and Shröedinger and Pullman wants them to embody what Gary Kern says about the role played by fantasy in the XX century. According to Kern, indeed : « […] fantasy may claim its place in the XX century of Einstein, Heisenberg and Gödel, not by packing topical materials into dead forms, but by admitting that the gods did not give us immortality, nor did they give us omniscience – they did not even give us certainty. A severe limitation, yet with ample room for imagination and the search for new forms »[27].

Moreover, as Robert Naeye argued in 2003 : « […] it's embarrassing enough not knowing 73% of the Energy content of the Universe. […] Attempts to explain away dark matter invariably fail, and there is much independent, consistent observational evidence for dark matter that is almost certainly real »[28]. Such a great deal of unknown creates several new goals to our « technologically-extended senses – to quote Wolf – preventing from narrow scientific horizons »[29].

In other words, Pullman's narrative tries to make darkness visible, refusing the Christian rejection of Darwinian evolution and asserting, on the contrary, the never-ending future possibilities of science. Lyra and Will's awareness of quantum theory becomes, indeed, a significant plot device. As Tucker writes : « Lyra and Will live in parallel worlds, resembling each other in some ways but different in others. (…) Pullman takes his cue here from modern quantum theory, which replaces former truths once held to be standard with the idea of uncertainty as a built-in factor to all science »[30].

[27] Gary KERN, « The Search for Fantasy : From Primitive Man to Pornography », in G. E. SLUSSER-E. S. RABKIN-R. SCHOLES, *Bridges to Fantasy, op. cit.*, p. 194.
[28] Robert NAEYE, « What is Dark matter ? » , in *Mercury*, 32:5, 2003.
[29] Cf. Fred Alan WOLF, *Parallel Universes : The Search for Other Worlds*, New York, Simon and Schuster, 1990.
[30] N. TUCKER, *Inside the World of Philip Pullman , op. cit*., p. 131.

4. On Pullman's fantastic language: the enigma of the dust

Any sufficiently advanced science is indistinguishable from magic.
Arthur C. Clarke

There is no question that there is an unseen world.
The problem is how far is it from midtown and how late is it open.
Woody Allen

Pullman's heroes are all asked to decide about the role to be played in a political view of the world. Even the youngest ones are forced to choose between free will and faith, between body and soul. Wyrd, fate or destiny build up the bridge for surpassing science to meet possibility, indetermination and freedom.

Lord Asriel, the Byronic hero of the trilogy, tries to teach his young daughter the secrets of the universe he wants to destroy and rebuild.

« Cold and rejecting towards his daughter »[31] he is not interested in his fatherhood but in challenging the Authority of the Universe he thinks to know.

Here, as follows, one of the most intriguing passages from the *Book One* in which Lyra asks her father about the Dust :

> "I want to go to the source of Dust itself".
> "The source ? Where is it come from, then ?"
> "From the other universe we can see through the Aurora" […]
> "What is that other universe ?", she said.
> "One of the uncountable billions of parallel worlds. […]But no one thought it would ever be possible to cross from one universe to another. That would violate fundamental laws, we thought. Well, we were wrong ; we learned to see the world up there. If light can cross, so can we. And we had to *learn* to see it, Lyra, just as you learned to use the alethiometer. Now that world, and every other universe, came about as a result of possibility. Take the example of tossing a coin : it can come down heads or tails, and we don't know before it lands which way it's going to fall. If it comes down heads, that means that the possibility of its coming down tails has collapsed. Until that moment the two possibilities were equal.

[31] N. TUCKER, *Inside the World of Philip Pullman, op. cit.*, p. 147.

> But on another world, it does come down tails. And when that happens, the two worlds split apart. I'm using the example of tossing a coin to make it clearer. In fact, these possibility–collapses happen in just the same way : one moment several things are possible, the next moment only one happens, and the rest doesn't exist. Except that other worlds have sprung into being, on which they did happen".
> "And I'm going to that world beyond the Aurora", he said : "because I think that's where all the Dust in this universe comes from. […] If light can cross the barrier between the universes, if Dust can, if we can see that city, then we can build a bridge and cross. […] But I can do it. Somewhere out there is the origin of all the Dust, all the death, the sin, the misery, the destructiveness in the world. Human beings can't see anything without wanting to destroy it, Lyra. That's original sin. And I'm going to destroy it. Death is going to die"[32].

Asriel's tossing coin clearly refers to the Shröedinger's cat hypothesis : everything seems to be uncertain but everything seems to follow paradoxical rules at the same time. The attempt of interpreting such new rules is what is very new with Pullman's fantasy.

The existence of the Dark Matter is told by a skillful storytelling and disciplined by a creative writing which present Lyra and Will as two different open minded personalities as opposed to the « highly focused, predatory, obsessive mentality depicted in Lord Asriel and his counterpart, Marisa Coulter »[33].

Moreover, another interesting aspect of Pullman's narrative is that he makes women the heart of this open-minded scientific researching : Lyra is a young *girl* interested in the existence of multiple worlds as predicted by quantum theories and Mrs Coulter, her manipulative, scheming, insincere and ruthless mother, wants absolutely a place in the new worlds she is going to discover ; finally, Mary Malone, the scholar Lyra meets in *The Subtle Knife*, is an ex-nun on a knife-edge between spiritual faith and scientific representation of life.

Mary comes from Will's Oxford and *she is* the scientist with a capital S of the story. She is the new Adam in the mysterious *mulefa*'s world and she struggles between faith and science, love and religion ; but she embodies the new beginning for humankind only when she begins to feel how narrow her traditional scientific horizons had been : « No botany, no geology, no biology of any sort – she was as ignorant as a baby »[34].

---

[32] Ph. PULLMAN, *Northern Lights, op. cit.*, pp. 376-377.
[33] M. LENZ, *His Dark Materials Illuminated. Critical Essays on Philip Pullman's Trilogy, op. cit.*, p. 8.
[34] Ph. PULLMAN, *The Amber Spyglass, op. cit.*, p. 91.

When Lyra asks Mary about the real nature of the Dust she tells the young girl the enigma of dark matter as follows :

> "I want you to tell me about Dust," said Lyra, having looked around to make sure they were alone. "I know you know about it. I can prove it. You got to tell me".
> "Dust ? What are you talking about ?"
> "You might not call it that. It's elementary particles. In my world the scholars call it Rusakov Particles, but normally they call it Dust. They don't show up easily, but they come out of space and fix on people. Not children so much, through. Mostly on grown-ups. […]".
> The woman was looking at her wide-eyes. […]
> "Who are you ?" the woman said at last.
> "Lyra Silver – "
> "No, where d'you come from ? What are you ? How do you know things like this ? […]"
> "I come from another world," she began. "And in that world there is an Oxford like this, only different, and that's where I come from. And – […]".
> "What's dark matter ?" said Lyra. "That's what it says on the notice, isn't it ?"
> Dr. Malone sat down again, and hooked another chair out with her ankle for Lyra.
> She said, "Dark matter is what my research team is looking for. No one knows what it is. There is more stuff out there in the universe than we can see, that's the point. We can see the galaxies and the things that shine, but for it all to hang together and not fly apart, there needs to be a lot more of it – to make gravity you see. But no one can detect it. […] We think it's some kind of elementary particle. Something quite different from anything discovered so far. […]".
> "Well..." she went on, and she yawned for so long that Lyra thought she'd never stop… "our particles are strange little devils and no mistake. We call them shadow-particles. […] They're conscious. That's right. Shadows are particles of consciousness. […].
> "Yes," Dr. Malone went on, "they know we're here. They answer back. And here goes the crazy part : you can't see them unless you expect to. Unless you put your mind in a certain state […].
> She read :
> "(you have to be) capable of being in uncertainties, mysteries, doubts, without any irritable reaching after fact and reason – You have to get into that state of mind. That's from the poet Keats, by the way. I found it other day. So you get yourself in the right state of mind, and then look at the Cave – ".

> "The Cave ?" said Lyra. "Oh sorry. The computer. We call it the Cave. Shadows on the walls of the Cave, you see, from Plato […][35].

With such allusion to Plato's myth of the Cave, Pullman wants all the people to search an intellectual knowledge and humanistic awareness of their lives. If compared with Tolkien's or C. S. Lewis' narratives, what is very new with Pullman is that he even wants his younger readers to develop a *dialogic perspective* of the world made up of leaving away shadows (as it happened in Plato's cave) to find out what the real nature of human beings and knowledge is (Plato's fire).

So, the computer-cave metaphor and all the other plays upon words which Pullman is a master of, defy the hermeneutic skills of his readers even altering very common referential meanings.

That's why we find *atomcraft* (to indicate a specific field of studies about the particles of dust the heroes are searching for) and the Chtonic Railway Station (probably reminding of the Greek word χθονιος, α, ον, with the meaning of 'underground, deep, hidden') ; that's why we get several references to the word *anbaric* (as in the *Anbaromagnetism* and *Anbaric Park*) and in this case the pun is quite evident in the use of the exotic root of the word *anbar/ambra* here used as a synonym of the more western and traditional adjective 'electric' ; and that's why even searching for the ultimate truth, the name of the young Lyra puts her in the eternal position of a liar. She is the most interesting pun ever created by Pullman and the assonance of the verb 'to lie' with the young girl's name mirrors the ghost of falsehood and insincerity.

5. Conclusion

Given the fact that Pullman's narrative scenario shows influences of Heisenberg's *Uncertainty Principle*, Bohr's complementarity of waves and particles, together with Feynman's development of quantum physics, the role played by the language of science of his characters remains riddled with paradoxes. As Watkins writes « he struggles with mathematics so he could never be a scientist, but he loves science for the stories that are told about it »[36].

For this reason he takes one of the greatest mysteries of modern science – dark matter – making it operate *ideologically* ; he asks science to become a dynamical partner of the individual

[35] Ph. PULLMAN, *The Subtle Knife, op. cit*., pp. 88-92.
[36] Tony WATKINS, *Dark Matter. A Thinking Fan's Guide to Philip Pullman*, Southampton, Damaris, 2004, p. 269.

evolution of his characters, wanting them to feel – as he writes – « not a logical conviction but a sense of wonder. The purpose is different, you see »[37].

[37] M. & J. GRIBBIN, *The Science of Philip Pullman's His Dark Materials, op. cit.*, p. XVIII.