

# *A Transdisciplinary Approach: The Picture of Dorian Gray from the Viewpoint of Physics*

*José A.O. Huguenin and  
Gisele G. Wolkoff*

**Abstract:** *As we wander around universal literature and some central ideas in Physics, we present a transdisciplinary reading of the novel The Picture of Dorian Gray, by Oscar Wilde, and Quantum Mechanics, thus, pointing out to the importance of inter and transdisciplinary looks into contemporary studies in diverse areas of knowledge.*

**Keywords:** *Transdisciplinarity, The Picture of Dorian Gray, Physics*

## **Initial considerations**

Humanity has constructed considerable knowledge along the centuries. Nowadays, global culture signals that science and arts are different fields of knowledge and there is no superposition between them, that is, each field corresponds to a way of looking at the world, a way of representing and interpreting human (and natural) existence. Moreover, it is worth mentioning that if on the one hand, art and science are human constructions, once they take shape as cultural productions, they also influence human beings in their actions and attitudes, thus, featuring a rather intriguing influential relation.

Modern science has changed humankind in fast and radical ways. Regarding Physics, we can say that Relativity (Einstein 1999) and Quantum Mechanics (Huguenin 2014) have transformed the way we think, as these theories have not only proposed new horizons of thought, destabilizing historical common grounds, but also, promoted technologies that have led our lives to be different. Certainly, scientific theories have influenced a broad spectrum of artists. For example, the Theory of Relativity, one of the most influential ones in the last century, has inspired painters as Salvador Dali and Marcel Duchamps, exponents of an artistic movement called Cubism (Vargish and Mook 1999). Music has also experimented the influence of Relativity. In 1909 Arnold Schoenberg

composed his *Opus 11 (1909)*, introducing atonal music, and Igor Stravinsky composed *The rite of Spring (1913)*, going much beyond regular compass. *The rite of Spring* well represents Music in Cubism (Vargish and Mook, 1999).

In Literature, the presence of scientific concepts can be verified in several important writers of fiction and poetry, such as seen in the works by the Irish writer John Banville, as approached by L.P Izarra (1995). Moreover, João Zanetic has conducted a study that constructs a bridge between these apparently divergent modes of culture: Physics and Literature (Zanetic, 2006). Zanetic mentions the presence of scientific concepts in the works by Edgar Allan Poe, Jorge Luis Borges, William Faulkner, Fiódor Dostoevsky, and others. In Brazilian literature, to the best of our knowledge, there is no such study of this kind of influence, yet we can cite the poet, member of the Brazilian Academy of Letters and Professor Marco Lucchesi, whose poem “Modo inaugural”, included in the book *Alma Venus*, transforms the big bang theory into poetry.

Furthermore, science is present in the works by Lucchesi, as in *Hinos Matemáticos*, in which he poetically describes mathematical theories and skills such as fractal geometry, Riemann theory and others. In the novel *O peso da luz* by Ana Maria Miranda, the scientific pursuit of the main character, Roselano Rolim, drives the readers to his adventures during the experiment that proved the General Theory of Relativity in Sobral, a city in the state of Cear’s, Brazil.

As briefly attested, many are the examples of the relation between the two different fields of knowledge, which make us reflect upon the dialogue between art and science. They may be different in form and “voice”, yet they seem to have very similar aims.

In this article, we display the relation between Literature and Physics in works that have been recently produced. We bring up two examples of the influence of Science in Literature, as we also discuss how Literature can influence Science. Finally, we present an analysis of the novel *The Picture of Dorian Gray* (Wilde, 1962) under the prism of Physics. This work is part of the interdisciplinary research developed at the Federal Fluminense University, in a partnership between individuals of both Institutes (Hard Sciences and Human and Social Sciences) that in order to establish connections between the teaching of Physics and Literature have collected data and analyzed how both discourses converge as to help teachers in formation create meaning through diverse knowledge.

## **Physics and Literature**

Considering that science and the arts do influence themselves mutually, we can say that the most common evidence is the fact that scientific concepts ground artistic creations. Another indication is that works of art can also influence scientists, particularly, works of literary art. One always wonders how many future physicists will have been influenced by Julius Verne’s works. Nonetheless, the influence of the arts in science occurs in a more subjective way. In literature, both aspects can be observed: the use of

science, particularly Physics, as matter for literary creation and philosophical aspects of literary works, which influence scientists.

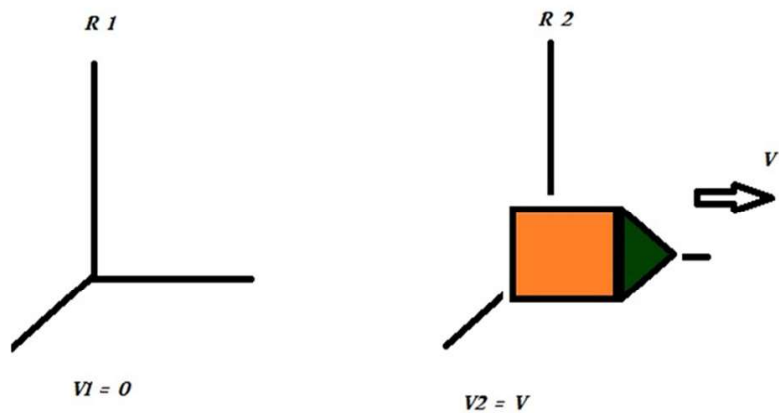


Figure 1: Frame R1 ( $V=0$ ) corresponds to an observer from the Earth and R2 corresponds to the frame associated to a rocket with speed  $V$ .

Taking into account the influence of Physics in literary works, we start by discussing one of the most influential theories in the last century: the theory of relativity developed by Albert Einstein (Einstein 1999). The core of the Theory of Relativity is that of the non-absoluteness of time. Time is not single. It depends on the reference frame. Let us look at the Special Relativity Theory, proposed by Albert Einstein in 1905, from a very well-known image, that of the twin paradox. This hypothetical situation is generally described by the trip of an astronaut that has a twin brother. The astronaut travels in a very fast rocket with a speed close to that of light. When the astronaut returns to Earth, he is younger than his twin brother!

Figure 1 is a pictorial representation of the two observation frames (referential frames in Physics language). R1 corresponds to the steady frame, the observation from the Earth, where the astronaut's twin brother stays. R2 represents the moving referential frame, the fast rocket in which the astronaut travels.

The paradox is explained if we agree with Einstein that time does not run in the same pace. Time elapses slower for the faster traveler (when his speed is closer to the speed of light). In fact, we can show that a time interval  $\Delta t_2$  in  $R_2$  can be written as  $\Delta t_2 = \Delta t_1 \sqrt{1 - \frac{v^2}{c^2}}$

Where  $\Delta t_1$  is the corresponding time interval in frame  $R_1$ ,  $V$  is the rocket speed and  $c$ , the light speed. According to this equation, in this referential frame ( $R_2$ ), the faster the rocket moves, the slower time elapses. This is known as time contraction. Note that the number under the root square is between 0 and 1 depending on the velocity

V of the rocket. For two stopped frames,  $V=0$ , we have the root square equal to 1 that leads us to  $\Delta t_1 = \Delta t_2$ , which means that time elapses in the same pace in both frames. On the other hand, for rocket speed V close to c, the root square is close to zero and,  $\Delta t_2 < \Delta t_1$ , which means that time passes slower in referential frame R2 (on the rocket) if compared to frame R1 (on Earth). It is worth mentioning that for a moving car, time goes by slower than for a person who is stopped on the street. However, the fraction  $v/c$  is very close to zero and the time contraction in this case is not measurable with our present technology. But it exists!

Regarding the General Theory of Relativity (Einstein 1999), spaces do not follow Euclidean geometry. Space curves itself in the presence of a great concentration of mass. Time is regarded as another dimension and scientists have attested to space-time deformation in the presence of a great mass concentration. It means that time elapses differently in the presence of a high gravitational field. Once again, for a different reason, time is not absolute.

It is not difficult to imagine how this idea destabilized the minds of artists in the moment of history it came out, when the press had already allowed scientific news to be widespread amongst the people, notably among intellectuals, artists and opinion-makers. Relativity has promoted time liberation. The most unbelievable idea has been that time is not absolute and that it goes by differently, depending on the context – speed or mass concentration. This principle has changed the way not only artists, but the human mind has understood the Universe. Therefore, let us look into how this theory has possibly influenced literary works.

To start with, in the short-story “O jardim de veredas que se bifurcam” by Jorge Luis Borges (Borges 1999), a Chinese professor of English Yu Tsun living in the United Kingdom is a German spy during World War II. An MI5 agent, the Irishman Captain Richard Madden, was pursuing Yu Tsun very closely, as his only alternative to inform the German army in the city in which the allied troops stored armaments, Yu Tsun decided to kill someone whose name is associated to the city. By widespreading the news about the murder, the press would lead Germany to recognize this information. The chosen victim had been the eminent Sinologist Stephen Albert, in order to signal the city of “Albert”. Yu Tsun meets Prof. Albert in the much searched, forked garden, and they talk. By coincidence, Stephen has studied and solved the enigmatic novel “The garden of forking paths” (which provides the title of Borges’ short story, “O Jardim de veredas que se bifurcam”) written by the Chinese author Ts’ui Pen, Yu Tsun’s grandfather. Albert explains to Yu Tsun the mystery of the novel, until then, unknown to Yu Tsun’s family. Albert talks to him about the “invisible labyrinth of time” that the novel is, pointing out that “(...) endless series of times, a growing and spellbound net of divergent, convergent and parallel times. This web of times that approach, bisect, cut or secularly ignore themselves, concerns all possibilities” (our translation from the Brazilian edition, 1999). At a certain moment, Prof. Albert says to his own potential killer: “in one possible time-line Doctor Tsun has come to his house as an enemy, in another, as a friend.”

The references to the Theory of Relativity are very clear. The expressions “*time labyrinth*”, “*possible time-line*” refer to the non-absoluteness of time. In addition, the city where the artillery was stored had not been chosen by chance. This is a clear reference to Albert Einstein’s ideas once time is regarded in the perspective of (relative) time. It is important to note that Borges does not explain the Theory of Relativity, but he is influenced by it, which is displayed in the composition of his short story.

Another important work that belongs to universal literature and that can well be read at the light of relativity is *The Sound and the Fury* by William Faulkner (Faulkner 2012) which, according to the physicist and historian Gerald Hoton, is a very good example of the presence of relativity in artistic productions. As Sartre pointed out in his critique of *The Sound and the Fury*, Faulkner’s metaphysics regards time. Indeed, time is the master of Faulkner’s story, whether by Quentin Compson’s fixation with clocks, or by the dilation of time in Benjamin (Benjy) Compson’s narrative.

Concerning Benjy’s narrative, at the beginning of the novel, the slow passing of time, and the narrative shifts, well translate the non-absoluteness of time. However, in several moments, Quentin says “*be again in time*”, as if it were possible to be out of present time. In another part he says “... *I picked up the clock... and, twisting the pointers, I put them on the ashtray.*” Twisting the clock’s pointers means distorting time. The structure of the fourth part of the novel itself represents a time revolution in the narrative and justifies the weight of the novel to world literature.

As we move towards the question of how literature influences science, one cannot say that there is any scientific theory originated directly from a literary work. Yet, literature influences the intellectual upbringing of scientists. To illustrate this point, let us contemplate the proposition by the Russian historian of science Boris Kuznetsov who pointed out Einstein’s assertion that Fiódor Dostoevsky had influenced him more than other scientists. The novels by one of the most important Russian writers would have formulated philosophical questions that would have later been explained by Einstein’s theories (Kuznetsov 1972). For instance, as depicted in Zanetic (2006), Ivan Karamazov’s vision on the rebellion of non-Euclidean geometry against Euclidean geometry used by Gog, the creator. Ivan talks to his young brother Alyocha that he has a three-dimensional mind and the harmony of creation seems to need more than three dimensions. We can imagine how Ivan Karamazov’s anxiety touches the young Einstein.

It is relevant, however, to point out to the gap between Karamazov’s ideas translated in his characters and Einstein’s later proposed theory, in spite of all convergences. Dostoevsky was probably himself influenced by non-Euclidean geometry developed by his fellow countryman Nikolai Lobachevsky and also by Riemann (Kanapp 1987). At this point we need to evoke the science philosopher Gaston Bachelard and his conception of scientific spirit and poetic spirit. Bachelard proposed some antagonisms for both human spirits: diurnal and nocturnal, rational and emotional, respectively (Bachelard 1972). But he also recognizes that we can express scientific conscience by means of the poetic spirit. The expression of the poetic universe is full of life, nature, physics.



Then, we can say that the poetic spirit in Dostoevsky has revealed some philosophical polemics about the non-Euclidean geometry of the physical universe, that as pointed out in Zanetti (2006). The answer to this query can be regarded as the General Theory of Relativity: the space curves next to a great concentration of mass.

One of the features that differs literary art and science is linguistic expression and its multiple levels of belonging – locally, nationally and universally. We have so far referred to universal literature, as it gets translated into several languages, particularly, into the English language, which is the most widespread one in the globe these days and how its universal feature is reinforced by its points of convergence with science. It is relevant, though, to remember that even amongst literature produced in English, scholars have focused either on the specificities of geographic productions or on authors' places of origins as starting points for the study of their literary productions. Many Irish-born writers have ended up more famous outside Ireland initially than in the land of Kathleen Ni Houlihan – a mythical symbol and emblem of Irish nationalism found in literature and art. The personification of all women of the country, Kathleen, also known as Cathleen Ní Houlihan is the title of William Butler Yeats and Lady Gregory's famous one-act play, first performed in 1902. Along the years, particularly, from the 1970's on, a few writers, such as Eavan Boland, the "mother figure" of all contemporary women poets, have referred to Cathleen as a symbol of all Irish women.

Oscar Wilde is one of the many authors who having been born in Ireland, immigrated and have become well-known first outside Ireland. Yet, for the philosophical vision depicted in his works, his are writings that can be read universally. Wilde as one of the most influential XIX century critics, due to his essays entitled *Intentions*, reveal his ideas on Art, Life and Nature, as well as his ideas on literature, painting and masks, also, in his literary works, particularly in the novel here commented. For Wilde – and for his autobiographical character Dorian Gray – Art is more supreme than Life. Many are the passages in Wilde's 1911 novel that depict his view on Life and Life's representation, Art. *The Picture of Dorian Gray* discusses passion, the senses, the role of life's depiction by means of art, the relations between our lives and the lives that the Arts represent. One of the two clear examples is Harry's lines to his friend Gray rather towards the end of the narrative, during a dialogue they establish regarding life and Gray's way of living. Harry says:

Life is not governed by will or intention. Life is a question of nerves, and fibres, and slowly built-up cells in which thought hides itself and passion has its dreams. (...) The world has cried out against us both, but it has always worshipped you. It always will worship you. You are the type of what the age is searching for, and what it is afraid it has found. (...) Life has been your art. You have set yourself to music. Your days are your sonnets. (1962. 227)

The other example is in some of the narrator's considerations on

the curious hard logic of passion, and the emotional coloured life of the intellect – to observe where they met, and where they separated (...) Soul and body, body and soul – how mysterious they were! There was animalism in the soul and the body had its moments of spirituality. The senses could refine, and the intellect could degrade. (...) Was the soul a shadow seated in the house of sin? Or was the body really in the soul, as Giordano Bruno thought? The separation of spirit from matter was a mystery, and the union of spirit with matter was a mystery also. (*apud* 72, 73).

The above passages can well lead one into the connections between Philosophy and the Arts, as well as on how the contemporary fields of Neuroscience, Biology and Psychology relate to what Wilde extensively discussed in the XIX century.

Following a transdisciplinary approach towards a reading of Wilde's *The Picture of Dorian Gray*, one can ask how Wilde's poetic spirit expressed his philosophical ideas about the physical universe. In other words, how could *The Picture of Dorian Gray* be related with a few concepts drawn from Physics? We will attempt to respond to this question.

### **Global, local and universal: *The Picture of Dorian Gray* in transdisciplinary pictures**

The novel was first published in 1891 and its protagonist, Dorian Gray, is the portrait of a XIX century English dandy. Introduced to the aristocrat Henry Wotton, also known as Harry, by the painter Basil Hallward, Gray falls in love with his own portrait – "...though I am a little jealous of the picture for being a whole month younger than I am, I must admit that I delight in it." says the protagonist (*apud* 71). As a consequence, he decides to dwell with time, by imprinting in the painting all lifeline's passages while he, himself, remains (almost) forever young. The painting is kept hidden as it represents Gray's "dark side", so that the character can go on playing the dandy as long as it suits him. Later, in the narrative, in chapter 9, Dorian does not allow Basil to see the portrait again, even though the artist insists upon the fact that as the creator of the art piece, he must be allowed to see it: "*Not look at my own work! You are not serious. Why shouldn't I look at it?*", exclaimed Hallward, laughing." (125). And Gray's reply is: "I can't explain it to you, Basil, but I must never sit to you again. There is something fatal about a portrait." (130). The fatality of it is well-understood in photograph shooting along the XX century: catching an instant that no longer exists as it is depicted. In Wilde's XIX century England and France, the discussion on Estheticism led the author to display his own comprehension of Beauty and of Beauty's importance in Art as a way of salvation. In a dialogue between Harry and Gray, while the latter expresses that "*an artist should create beautiful things...*", the former counterarguments that "*there is no doubt that genius lasts longer than beauty*" (29). In all cases, the narrative is about Time and the passages of Time, as well as their implications in human life.

In spite of the fact that Oscar Wilde was Irish-born, he soon moved to Oxford, in England, for his studies, at the age of sixteen, thus, becoming much more of an Englishman in his lifestyle. Much of his writing is autobiographical, such as *The Picture of Dorian Gray*, and reflects his viewpoints on Life, Art and the role of existence. For these reasons, his writings have reached a universal importance, having been extensively translated into other languages and becoming part of the English, literary cannon.

Many are the historical and contextual implications of the portrait (as attested in Munira Mutran's work (Mutran, 2002) for the England of the XIX century, as well as for our XXI century re-readings of the novel. These re-readings have to do with transdisciplinary views on classical works, in such a way that these views can privilege contemporary examinations into the literary cannon, in what they provide us with more thorough understandings of humankind, after notions such as globalization, localism and universalism. Indeed, the need of identity construction on the basis of that which the Irish writer Colm Tóibín has called "spiritual heritage" alludes to the fact that national literatures have traditionally been the object of comparative studies and they end up being classified as national literature in the sense that they localize nations in the world, global system, thus, reinventing the global from their own localizations (Wolkoff 2012).

### **The novel and Physics – some ideas**

What kind of ideas on Physics can be present in the inventiveness of Oscar Wilde in the aforementioned narrative?

Oscar Wilde portrays science by means of allowing his characters to talk about the issue. For example, when Dorian Gray tries to understand the situation of the portrait modifications he asks himself "*Might there not be some curious scientific reason for it all?*" (Wilde 2018. 123). Science is evoked to demystify the strange and inexplicable events. Dorian risks an atomistic explanation for the case in an apparent anticipation of the interpretation of the undulatory behavior of matter when he says "[...] *might not things external to ourselves vibrate in unison with our moods and passions, atom calling to atom, in secret love or strange affinity?*" (*idem* 124). Scientific method is evoked as analogy such as contemplation of Lord Wotton by respect Dorian Gray, or when Dorian regards his portrait with "*a feeling of almost scientific interest*" (*ibid idem* 106).

Nonetheless, scientific practice is directly mentioned when Dorian persuade an old friend, Alan Campbell, to destroy Basil Hallward's body: "*All I ask of you is to perform a certain scientific experiment*" (*idem* 224). Curiously enough, in the process of analyzing the teaching of Physics with other Arts, namely, Literature, these passages work as a metalanguage to all those who reflect upon the convergences of areas, thus, contributing to the processes of teachers' continuing education.

Let us go beyond the direct references of Science in the novel. The physicist Michio Kaku has drawn attention to the concept of entropy in *The picture of Dorian*



Gray in his book *Physics of the Future* (Kaku 2011). Entropy is a concept originated in thermodynamics and it is related to the organization of thermodynamic systems. Regarding life, the famous physicist and Nobel Prize winner Richard Feynman has said that “there is nothing in biology yet found that indicates the inevitability of death”. In other words, death is the loss of organization of a living being. Entropy always grows. This is in accordance with the second law of thermodynamics that states that for a given isolated system, entropy always increases regardless of state changes. Entropy can decrease for a non-isolated system, i.e., in contact with an additional system. As a consequence, this additional system has increased its entropy in such a way that the ensemble of two systems has the total entropy augmented. Well, if Dorian Gray remains young, he violates the second law of thermodynamics. We need a second system where entropy grows. What is the second system? Exactly, the picture! Note that his portrait ages in a shocking way. The picture ages more than Dorian Gray would naturally age. The second law is, thus, observed.

Going back to an original discussion on the subject: would there be any discussion on the issue of quantum subject in Oscar Wilde’s novel? Not directly, but we can, as an artistic exercise, make a comparison between Dorian Gray’s parallel aging and his portrait with the Many Worlds Interpretation (MWI), by Hugh Everett (Everet, 1957). This is an alternative interpretation of the principle of superposition in the theory of Quantum Mechanics. This principle is strange for our daily understanding. Objectively, if a radiative atom, Uranium 238 (its atomic number  $Z=92$ ) for example decays by emitting an alpha particle, an atom of Uranium transforms itself in a Thorin one ( $Z = 90$ ). Well the decaying occurs within a given probability as described by Quantum Mechanics. If now we put an atom of Uranium in a box, as time elapses, the chance of decaying increases. However, Quantum Mechanics reveals that the state of Uranium is a superposition between the two possibilities. Here, superposition means that the state of the atom is simultaneously excited (U-92) and decayed (Th-90). After a measurement, the state of the atom collapses for one of the two possibilities. This gives rise to the famous Schroedinger’s cat paradox (Huguenin 2014). A cat is placed in a box with an apparatus attached to a bottle with a mortal gas. The apparatus is governed by an atom of Uranium in the superposition state. If the atom decays (becomes Th-90), the emitted alpha particle breaks the bottle and the cat dies. If the atom does not emit any particle (remains as U-92), the cat remains alive. Then, if the atom is in a superposition state, is simultaneously U-92 (cat alive) and Th-90 (cat dead). Then, the cat is both alive and dead at same time. In the MWI, there is a world where the cat remains alive and a parallel world where the cat is dead. When the box is opened, one actually performs a measurement in the scientific point of view to observe whether the cat is alive or dead. The Quantum Mechanic’s measurement postulate tells us that the state of a given system collapses into the measured corresponding result. Parallel worlds, then, collapse into a single world. How can the MWI be seen in the novel? Dorian Gray lives in two parallel worlds: the one in which Dorian Gray remains young and the world where the picture

ages. When Dorian Gray destroys the picture, the two parallel worlds collapse into one where Dorian Gray is old. The superposition between the two worlds (Dorian Gray young/ picture aging), therefore, gets destroyed.

## **Towards Transdisciplinarity**

As it has been shown, the poetic, literary world does relate with the scientific one. Science and literature do originate from the same human need of imagination. Scientific knowledge also needs to be imagined, as well as it needs to look into imagined models to describe Nature. On the other hand, novels and poems are imagined based on emotions, whereas science is imagined based on rational consensus. Therefore, imagination is the common ground for both science and arts, according to Bachelard. Scientists can be influenced by philosophical questions present in literary works. And Art can be inspired by Science. In the case of readings that take into considerations areas of knowledge that are more central nowadays, such as Physics (as here signaled), Neuroscience, Biology, Psychology and others, they allow for contemporary cultures to better understand our world(s), making room for transdisciplinarity and, thus, continuing to enrich literature, in spite of the liquid era in which we live today.

At last, the most relevant reason that has motivated the ongoing research originated at the Institute of Exact Sciences, particularly, the Department of Physics, and spread amongst colleagues at the Institute of Social and Human Sciences regarding confluences between Literature and Physics or, more broadly, Sciences and Arts relates to the need to make more sense of our world in what the philosopher Lipovetsky refers to the liquid era. In particular, we aim at helping teachers in continuing Education raise consciousness as regards relevance. Once we establish connections between areas of knowledge, we make more sense of theories, at the same time that we signal the need to transfer to daily lives (in all their areas) the relevance of teaching topics.

Therefore, by initially collecting, selecting and analyzing works of literature and other arts and reading them along scientific theories, we intend to create a basis of future reference for students who are also teachers of Physics (and other Sciences) of both materials analyzed and exercises of reflection that encompass areas that are only apparently different and distant, but which, in truth, relate fundamentally – *The Picture of Dorian Gray* and the theories here mentioned have been a profitable start.

## **Works Cited**

- Bachelard, Gaston. “*Filosofia do novo espírito científico (A filosofia do não)*”. Lisboa: Ed.Presença, 1972.
- Borges, Jorge Luis. “*O jardim de veredas que se bifurcam*” in *Ficções*. São Paulo: Editora Globo, 1999.
- Einstein, A. “*A Teoria da Relatividade Especial e Geral*”, Rio de Janeiro: Contraponto, 1999.

- Everett, H. “*Relative State Formulation of Quantum Mechanics*”, *Reviews of Modern Physics*.vol29, 1957. 454-462.
- Faulkner, William. “*O som e a fúria*”, São Paulo: Cosac Naify, 2012.
- Huguenin, J.A.O. *Estranhezas e mitos da Mecânica Quântica*. Rio de Janeiro: Vieira & Lent, 2014.
- Izarra, L.P.Z.de. “*Espelhos e labirintos holográficos. O processo de uma “nova” síntese estética na obra de John Banville*”, São Paulo: USP, 1995.
- Kaku, M. “*The physics of the future*”, New York: Doubleday, 2011.
- Kanapp, Liza. “*The Fourth Dimension of the Non-Euclidean Mind: Time in Brothers Karamazov or Why Ivan Karamazov’s Devil Does not Carry a Watch*”, *Dostoevsky Studies*, v. 8,105, 1987. Available at: <http://sites.utoronto.ca/tsq/DS/08/105.shtml>
- Kuznetsov, Boris. “*Einstein and Dostoievski. A study of the relation of modern physics to the main ethical and aesthetic problems of the nineteenth century*”.London: Hutchinson Educational, 1972.
- Mutran, M. H. *Álbum de retratos: George Moore, Oscar Wilde e William Butler Yeats no fim do século XIX: um momento cultural*.São Paulo: Humanitas/FFLCH/USP: Fapesp, 2002.
- Vargish, T. and Mook, D.E. *Inside Modernism – RelativityTheory, Cubism,Narrative*. New Haven: Yale University Press, 1999.
- Wilde, Oscar. *The Picture of Dorian Gray and Selected Stories*. Available at: [http://www.planetpublish.com/wp-content/uploads/2011/11/The\\_Picture\\_of\\_Dorian\\_Gray\\_NT.pdf](http://www.planetpublish.com/wp-content/uploads/2011/11/The_Picture_of_Dorian_Gray_NT.pdf) (last accessed on 29th January, 2018).
- Wilde, Oscar. *The Picture of Dorian Gray and Selected Stories*. New York, Penguin Books, 1962.
- Wolkoff, G.G. “*Identidades diaspóricas no feminine plural: poesia e poéticas entre dois Estados*” in *Vestígios de memória: diálogos entre literature e história*. Curitiba: CRV, 2012.
- Zanetic,J. “*Física e literatura: construindo uma ponte entre as duas culturas*” in *História, Ciências, Saúde–Manguinhos*,v.13(suplemento), 2006. 55-70.