

## Representations of Science and Technology in Cordel Literature / *Representações da ciência e da tecnologia na literatura de cordel*

Carla Almeida\*

Luisa Massarani\*\*

Ildeu de Castro Moreira\*\*\*

### ABSTRACT

In Brazilian cultural manifestations, science is not usually pictured prominently. Still, one can find references to it in some of the most popular forms of communication. Cordel literature is one of them. In this article, we try to understand how the scientific world is inserted and represented in this literary genre. We did a discourse analysis based on a *corpus* of 50 Cordel booklets on topics related to science. We note that the booklets present, as a whole, an ambivalent image of science, extolling the scientific achievements and their authors in some cases, whereas, in others, showing a critical view of technological development. Our study suggests that the mixing of science and Cordel literature has the potential to bring together scientific and popular cultures. This could also promote a critical thinking in the public about the relationship between science and society. Therefore, Cordel literature may be an interesting tool for education and popularization of science.

**KEYWORDS:** Science Representation; Popular Culture; Cordel Literature; Popularization of Science

### RESUMO

*A ciência não costuma figurar com destaque nas manifestações culturais brasileiras. Ainda assim, é possível encontrar referências a ela nas formas mais populares de comunicação, a exemplo da literatura de cordel. Neste artigo, a partir de um corpus de 50 cordéis sobre temas relacionados à ciência, buscamos compreender, por meio de uma análise discursiva, como o universo científico está inserido e é retratado nesse gênero literário. Observamos que os cordéis apresentam, em seu conjunto, uma imagem ambivalente da ciência, ora exaltando os feitos científicos e seus autores, ora oferecendo um olhar crítico sobre o desenvolvimento tecnológico. Nosso estudo sugere que a convergência da ciência e da literatura de cordel tem potencial para aproximar a cultura científica da cultura popular, além de fomentar um pensamento crítico sobre as relações entre ciência e sociedade, sendo, portanto, uma ferramenta interessante de educação e popularização da ciência.*

**PALAVRAS-CHAVE:** *Representação da ciência; Cultura popular; Literatura de Cordel; Popularização da ciência*

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\* Museu da Vida/ Casa de Oswaldo Cruz/ Fundação Oswaldo Cruz – Fiocruz, Rio de Janeiro, Rio de Janeiro, Brazil; [almeidacarla@gmail.com](mailto:almeidacarla@gmail.com)

\*\* Museu da Vida/ Casa de Oswaldo Cruz/ Fundação Oswaldo Cruz – Fiocruz, Rio de Janeiro, Rio de Janeiro, Brazil; [lumassa@coc.fiocruz.br](mailto:lumassa@coc.fiocruz.br)

\*\*\* Instituto de Física/ Universidade Federal do Rio de Janeiro – UFRJ, Rio de Janeiro, Rio de Janeiro, Brazil; [ildeucastro@gmail.com](mailto:ildeucastro@gmail.com)

## Introduction

In Brazil, topics related to science are not generally central ones in the expressions of popular culture. In most cases throughout history, the tenuous interactions between science and society have been restricted to the cultured sectors of society. Although it has been occurring in the country since, at least, the beginning of the 19th century, the popularization of science has almost always remained restricted to actions directed to the elite layers of the Brazilian society (MOREIRA et al., 2005). Even if not very frequently, however, it is possible to find references to science and related topics in the most popular forms of communication. Reports of scientific discoveries, alerts on health and environment, episodes from scientists' lives, descriptions of astronomical events or references to negative impacts of progress have some space in literature, in music and in popular sayings. Evidences that reflect a certain level of people's interest, concern and involvement with issues and facts related to science occasionally appear.

That is so in *Cordel* literature, a popular, traditional kind of poetry from Northeastern Brazil, which is currently present in other parts of the country as well. This type of cultural manifestation, which directly descends from minstrelsy, existed in the Iberian Peninsula in the Middle Ages, and it was brought to Brazil by the Portuguese in the 19th century. It acquired its unique characteristics here, which are: the accuracy of the metrics, the rhymes, the humor and the typically Northeastern Brazilian language (ASSIS et al., 2012), in addition to the booklets' size uniformity (11 x 15,5 cm), their number of pages (a multiple of 8), their type of printing (pretty simple) and their illustration (in general woodcut).<sup>1</sup> Such booklets became known as *cordéis*<sup>2</sup> [twines] because of the way they were exposed in Portugal, hanging from strings or cords (ÂNGELO, 1996; PAGLIUCA et al., 2007). The *cordéis* were established in the 20th century as sources of entertainment, as propagators of ancient myths and legends and as important news reports (CURRAN, 2001), within a context where other means of communication were unstable or even non-existent. In addition, *Cordel* literature had

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<sup>1</sup> To see some samples, access the website of the Brazilian Academy of *Cordel* literature (<http://ablcc.com.br>).

<sup>2</sup> TN. *Cordéis* is the plural form of *cordel*.

a relevant role in literacy and in promoting reading amongst the Northeastern population (VIANA, 2010a).

The *cordéis* were sung and sold in fairs, farms, squares and markets. They cover a wide range of issues that reflect the life style of the Northeastern people, propagating their values, imagery, and history (ARAÚJO, 2007; SILVA, 2008). They can tell one-sided love stories, fanciful narratives of princes and dragons as well as make political satires or social criticism. They can also deliver reports of heroic acts as well as moralistic and religious lessons. Hence, the reader is invited to reflect upon various aspects of his/her own reality (ASSIS et al., 2012; PEREIRA et al., 2014).

In recent decades, *cordéis* have had their original role limited by the new mass media and the various changes experienced by Brazilian society. However, the genre is also gaining increasing attention and space in and out of literary circles (ASSIS et al., 2012), within a collective cultural statement. The genre was recently the subject of a soap opera by Rede Globo (*Cordel encantado* [Enchanted Cordel], 2011) and it inspired the scenario of a great stage production (*Chacrinha, o musical* [Chacrinha, the Musical], 2014). It has also been used in classrooms as a pedagogical resource either to stimulate reading or to teach specific contents (VIANA, 2010b). Furthermore, it has succeeded in taking advantage of technological advances and it has inserted itself into the virtual world, thus creating new possibilities of interaction between poets and readers (DINIZ, 2007; AMORIM, 2009).

The objective of this article is to understand how science issues may have inspired the *cordelistas*,<sup>3</sup> how such poets face and address these themes and how they represent the scientific universe in their work. Furthermore, we seek to bring up for discussion the potential use of these booklets as tools for the popularization of science. Using the methodological tools that make up the semiolinguistic theory of Patrick Charaudeau (2008), we have analyzed a corpus of 50 *cordéis* on scientific topics and related subjects, especially the environment.

## **1 *Cordel* and Science in Academic Production**

Studies dealing with science-themed booklets are still rare in the recent and diverse academic production on *Cordel literature*. Certain authors indicate that some

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<sup>3</sup> TN. *Cordelista* is the name by which the authors of the *Cordel* literature are called.

*cordéis* - essentially informative and focused on specific contents - form the basis of the so-called “New cordel” form. Such *cordéis* would cover themes, including scientific ones, until then reserved to school, displaying an educational purpose (FARIAS; ALVES, 2009; MEDEIROS; AGRA, 2010). Farias and Alves (2009) classify a series of booklets by the poet Manoel Monteiro as representatives of this category, in a research that has examined the work of three profusely productive *cordelistas* from Paraíba.<sup>4</sup> Manoel Monteiro, who died in 2014, was one of them. He was an enthusiastic poet and a disseminator of the use of the *cordel* in classrooms. The authors also identify a connection between the category “New Cordel” and the traditional classification “Society, Science and Stories,” as they both release booklets on current issues.

We have identified some studies that looked at specific issues in *Cordel* literature. Pagliuca et al. (2007), for instance, analyzed the contents and messages from brochures that focus on the theme of Aids. They concluded that the *cordel* could be an important tool to promote health awareness. According to their evaluation, despite some conceptual errors, the *cordelistas* presented informational content that could be suitable for producing an alert in readers’ imaginations, in favor of taking preventative and controlling measures concerning Aids. The information and the language that were used in the *cordéis* were considered valid: they provided an overview of the disease and were accessible to the whole population.

Oliveira and Queiroz (2013), in turn, focused on booklets related to the environment by the poet João Batista Melo, from Sergipe.<sup>5</sup> The authors identified a critical appraisal of environmental education, since power issues are addressed and democracy and social participation in the discussion of the subject are emphasized in the poems. The use of these *cordéis* in science classes would encourage the formation of more critical and politicized students, committed to the socio-scientific issues that surround them.

In a study conducted by Mann and Agra (2010), the pedagogical potential of *Cordel Literature* was evaluated while analyzing the content of booklets that discuss the life and work of historically important astronomers. The authors identified in the booklets historical and conceptual errors that they considered serious. Therefore, they claim that a responsible use of this form of literature in the context of science education

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<sup>4</sup> TN. One of the 9 Brazilian Northeastern states.

<sup>5</sup> TN. One of the 9 Brazilian Northeastern states.

requires a greater care by the poets, regarding the accuracy of the disclosed information, or maybe better preparation for this type of work or even scientific guidance.

In the academic literature, there are also authors who report their experiences with the creation of scientific *cordéis* in the classroom. Pereira et al. (2014), for example, describe the production of *cordéis* related to microbiology by students in this discipline from the Biological Sciences Program at the State University of Ceará.<sup>6</sup> Based on this experience, the authors advocate the use of *Cordel Literature* in teaching, as a way to arise students' interest in science and to facilitate their learning of science-related topics. They stress the potential of *cordéis* to stimulate students' creativity and critical thinking, as well as their ability to observe the social, historical, political, and economic reality. The poems mostly describe the Northeastern Region, where this popular manifestation has found a great room for dissemination. "We conclude that the use of *cordel* in the teaching of Microbiology combines creativity, low cost and popular tradition, and it can provide playful and contextualized learning" (PEREIRA et al., 2014).<sup>7</sup>

Lima et al. (2011) reported conducting workshops in public schools in Campina Grande, Paraíba,<sup>8</sup> where *cordéis* on various physics-related themes were presented to students. The workshop included a joint analysis of the content of the booklets, an introduction to *Cordel* literature history and rules, and ended with the creation of a *cordel* on physics topics. The analysis showed that the poets write either in favor of the advancement of science and technology or against it. The authors point out that, regardless of the *cordelistas'* positions, in all the *cordéis* that were studied, in addition to informing their readers, poets instigate them to reflect upon the subject, stimulating a rich debate.

According to Lima et al. (2011), the students positively evaluated the workshops: the *cordéis* increased their interest and motivation to learn physics and facilitated the understanding of the content of the discipline. Following this experience, the authors underline the diversity of themes and approaches as well as the accessible language that characterize *Cordel literature*. And, besides advocating for a broad use of

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<sup>6</sup> TN. One of the 9 Brazilian Northeastern states.

<sup>7</sup> Text in original: "Conclui-se que o uso do cordel no ensino da microbiologia alia criatividade, baixo custo e tradição popular, podendo propiciar aprendizado lúdico e contextualizado."

<sup>8</sup> TN. One of the 9 Brazilian Northeastern states.

*cordéis* for the dissemination of scientific information, they also advocate for the use of this literary genre in science classes.

## 2 Methods

More than 20 years ago, one of the authors of this study began to identify science-themed *cordéis* in fairs, markets and bookstores around the country and started a collection that now holds more than a hundred booklets (MOREIRA, 1994). Among them, we selected 50 that more directly relate to science to be analyzed in this study. They belong to two well-defined thematic groups: biographies of scientists and *cordéis* on the environment. Twenty-seven poets, most of them from Northeastern Brazil, wrote these 50 booklets between 1985 and 2014.

To analyze this *corpus*, we used the methodological instruments that make up Patrick Charaudeau's semiolinguistic theory, especially regarding discursive strategies and the speech pattern of organization. We began by identifying the main characteristics of each thematic group, including the number of *cordéis* in each one, their authors and dates, the sub-themes that are present and the different ways in which they are approached. In order to understand the *cordelista's* speech objectives and the way he/she seeks for them in his/her poetry, we examined the speech strategies. We looked at the way *cordelistas* practice legitimacy (to be able to say), credibility (to know how to say) and the way the public's attention is captured (persuade by reason or emotion). We also looked at the speech patterns that they use (allocutive, elocutive and delocutive ones). Finally, among the discursive components of *cordel* language, we searched for clues to identify the representations of science and its actors in each thematic group. This was done for both the descriptive mechanism (appointment, qualification and localization) and the narrative one (the acting subjects, their different roles and qualifications), looking for convergences and divergences between the groups. It is important to note that we did not, at any time, set out to check the correctness and accuracy of the (scientific) information contained in the *cordéis* of our corpus, even though we realize the importance of such analysis, especially for the educational use of these *cordéis*.

### 3 Results

#### 3.1 Scientists' Biographies

##### *General characteristics*

In the collection, a total of 22 *cordéis* written by four authors present the biography of different scientists. Gonçalo Ferreira da Silva, from Ceará, has written 18 of them. He is the President of the Brazilian Academy of *Cordel* Literature, located in Rio de Janeiro, where he lives. Since the 1980s, Gonçalo commits himself to writing booklets about philosophers and scientists, among other issues. Out of the 22 booklets, eight portray Brazilian personalities. Just one of them deals with the life and work of a female scientist, Marie Curie, who was awarded the Nobel Prize twice. It must be mentioned that the writing of *cordéis* about Brazilian scientists – and also more specifically the one about Curie – is the result of an interaction of the author with science communicators, which has been intensifying in recent years. Curie was honored with various initiatives throughout the International Year of Chemistry in 2011.

This group of *cordéis* narrates the life and main achievements of famous scientists. They provide the reader with information about the scientist's date and place of birth, family, education, published works and discoveries, among other typically encyclopedic data. They bring elements about the scientific and historical background from the time when the portrayed personalities lived. They present the scientific concepts related to the discoveries; they mention their benefits and their limitations. They also talk about clashes between diverging scientific courses and the relationship, sometimes peaceful, between science and religion.

##### *Discursive elements*

The *cordéis* in this group are very informative: they bring a significant amount of data about the portrayed scientists, in addition to a historical contextualization of the time in which they lived as well as explanations of complex scientific concepts, even if the latter are not deeply explained. Here is a series of verses, illustrative of the content of booklets on scientists' biographies. They were extracted from the *cordel Galileo Galilei*:

Son of Vicenzio and Giulia / Not only was he Italian / There, in the city of Pisa, / where this human being was born, / to catch up human kind / from a riotous mistake [...] He went to the University / of Pisa, where he studied / Medicine, but then/ he also taught there / as a Math Professor / In Pisa, he turned out [...] while watching the moon / he discovered its mountains / saw Jupiter's satellites / sent his eyes until/ the space's guts, seeing then/ its secrets, tricks and wiles (LUCENNA, no date, pp.1-4; our translation).<sup>9</sup>

The use of a simple, straightforward language to address topics not always so user-friendly confers a didactic character to the booklets of this group; it also reveals the *cordelistas'* concern to reach a wide audience. In some *cordéis*, we noticed the author's intentions regarding these two aspects, as seen in the following examples, taken from the *cordéis Sabin* and *Einstein*, respectively:

Our literature / has been fundamental / as regards some help / to formal education / showing the basics / of official science (SILVA, 2005a, p.1; our translation).<sup>10</sup>

Gonçalian texts / carefully are / written in a way / that is easy to understand / by all strata / of our society (SILVA, 2010, p.1; our translation).<sup>11</sup>

The authors of these *cordéis* tend to adopt a tone of apparent neutrality to relate and describe the scientists' life and work, acting as if they were just relaying information, without issuing opinions. We can analyze this position as a strategy to reach credibility. The predominant use of the third person, in an essentially delocutive declaration, reinforces this effect, working as a way of erasing the author's point of view. Sometimes, however, the poets denote their views on the topics covered, as we will see below.

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<sup>9</sup> Text in original: Filho de Vicenzio e Giulia / Foi no solo italiano / Lá na cidade de Pisa / Nasceu esse ser humano / Pra tirar a humanidade / De um fragoroso engano [...] Foi na universidade / De Pisa, que ele estudou / Medicina, mas depois / Nela também lecionou / Professor de Matemática / Em Pisa ele se tornou [...] Ao observar a Lua / Descobriu suas montanhas / Viu os satélites de Júpiter / Pôs os olhos nas entranhas / Do espaço, vendo dele / Segredos, truques e manhas.

<sup>10</sup> Text in original: A nossa literatura / há sido fundamental / como auxiliar matéria / na educação formal / exibindo os fundamentos / da ciência oficial.

<sup>11</sup> Text in original: Os textos gonçalianos / cuidadosamente são / escritos numa linguagem / de fácil compreensão / para todas as camadas / da nossa população.

### *Representations of scientists and science*

While taking a tone of apparent neutrality to narrate and describe the scientists' life and work, as shown in the previous paragraph, the authors of *cordéis* about scientists also show great admiration and reverence for the portrayed subject, whose personality and achievements are extolled by an abundant use of adjectives, metaphors and analogies. Scientists are depicted as great “geniuses,” “bright,” “noble,” “notable,” “brilliant,” “phenomenal,” and as the most important representative of science and of their respective areas, being called “the greatest naturalist the world has ever known,” “the most distinguished inventor,” “the greatest female science representative.” Their achievements and discoveries would have revolutionized the world. The excerpts below, extracted from *Sir Isaac Newton* and *Santos Dumont* booklets, respectively, are illustrative of this form of representation:

Unparalleled talent / by his luminosity / (he) was one of the most advanced / geniuses of humankind / Professor at just / twenty-six years of age (SILVA, 1988, p.2; our translation).<sup>12</sup>

Alberto Santos-Dumont / wise, master, writer / poet, visionary / missionary, doctor... / with no equal as an engineer / a genius as an inventor (SILVA, 2002, p.2; our translation).<sup>13</sup>

We identified, beyond the praise and glorification, recurring features in the scientists' descriptions, as if such features were essential for the biographical subjects to become the brilliant figures they turned out to be. These characteristics include wisdom, intelligence, competence, talent, and a tenacious dedication to work. Creativity, inventiveness and ingenuity also appear as important – albeit less featured – attributes for the qualification of the expert. Here are some excerpts, taken out of *Oswaldo Cruz* and *Darwin cordéis*, respectively, which highlight the scientists' devotion to science and studies:

When he was studying, Oswaldo Cruz / adopted as a doctrine / a strict obedience / a rigid discipline / even after receiving / his medical doctorate (SILVA, 2008, p.1; our translation).<sup>14</sup>

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<sup>12</sup> Text in original: Talento sem paralelo / pela luminosidade / foi um dos mais avançados / gênios da humanidade / catedrático com apenas / vinte e seis anos de idade.

<sup>13</sup> Text in original: Alberto Santos-Dumont / sábio, mestre, escritor / poeta, visionário / missionário, doutor... / Sem igual como engenheiro / um gênio como inventor.

After much study, / careful observation, / questions that gave rise / to deep concerns / then was established / the law of evolution (SILVA, 2006, p.5; our translation).<sup>15</sup>

Cases that reveal the emotional side of scientists, traces of their personalities, and personal characteristics are rare. When this occurs, it often reinforces the status of superior beings that the poets give to scientists, as in *Albert Einstein* and *Santos-Dumont* booklets, from which the following excerpts were taken:

Then putting the scientist apart / let's look at the thinker / Einstein excelled / as a peacemaker / winning persecutions / without hate, bitterness or rancor (SILVA, 2003, p.6; our translation).<sup>16</sup>

Santos-Dumont however / as a Father of Aviation / was with his invention / deeply disappointed / seeing it as a tool / of war and destruction (SILVA, 2002, p.5; our translation).<sup>17</sup>

In dissonance with the general tone of biographical narratives, the author of *Santos-Dumont* talks about the evil use of an invention, showing that the “brilliant” and “hard” scientist’s work does not always bear a noble fruit. Nevertheless, in this case, the responsibility is not the scientist’s, since his feat simply escaped from his control. In general, scientists are benefactors, good-natured and moral people, full of qualities and virtues.

In *cordéis* about scientists, science is steadily portrayed as a noble activity and as a venture in search of an objective and unquestionable truth, committed to the common good. Its applications are generally presented as being beneficial to society, as it is shown in the following fragment from the *César Lattes cordel*:

It is clear that science / its credibility / is reached by exercising / exclusively the truth / and comes from viewing the progress / for the good of mankind (SILVA, 2014, p.3; our translation).<sup>18</sup>

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<sup>14</sup> Text in original: No estudo Oswaldo Cruz / adotou como doutrina / rigorosa obediência / à mais rígida disciplina / até mesmo depois de / doutorado e medicina.

<sup>15</sup> Text in original: Ao cabo de muito estudo, / de atenta observação, / de perguntas que causavam / profunda inquietação / estava estabelecida / a lei da evolução.

<sup>16</sup> Text in original: Mas deixando o cientista / passemos ao pensador / Einstein se sobressaiu / como pacificador / vencendo perseguições / sem ódio, mágoa ou rancor.

<sup>17</sup> Text in original: Santos-Dumont no entanto / como Pai da Aviação / teve com o seu invento / profunda decepção / de vê-lo como instrumento / de guerra e destruição.

We also identified some references to the limitations of science, some passages suggest indeed that science is not able to solve everything; neither can it elucidate all questions about the universe nor about our existence. For example, in his *cordel Kepler*, Gonzalo Ferreira da Silva (2005) reveals that, at the time the astronomer lived, there were attempts to understand the movements of the moons around Jupiter. Some representatives of the group of biographical *cordéis* also display a controversial side of science. They show, for example, how, at certain times, new ideas and theories may have taken long to be accepted and may have upset the scientific establishment. By way of illustration, we present the following excerpt taken from the *Darwin* booklet:

Since the book defended / the Law of Evolution / attacking frontally / the thesis of Creation / defended by the Bible / it generated great discussion (SILVA, 2006, p.8; our translation).<sup>19</sup>

As we see in the example above, it is common in this context that religion emerges as a rival of science. It is not uncommon, however, that religion arises in *cordéis*, not necessarily conflicting with scientific knowledge.

### 3.2 Environment

#### *General characteristics*

Within the environmental theme, we analyzed a total of 28 *cordéis*, written by 23 authors. In this group, no author stands out. This could mean that the environment as a theme might be more widely disseminated in *Cordel literature* and more ingrained in the reality of the poets than scientists are.

The destruction of nature and the need to preserve it are the main topics of these texts. Environmental degradation, including bush burning, tree felling, oil extraction and spill in the sea, predatory fishing and hunting, capture of wild birds, water waste, overuse of fossil fuels, air, water and noise pollution, all these topics win large diffusion.

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<sup>18</sup> Text in original: É claro que a ciência / sua credibilidade / se faz pelo exercício / exclusivo da verdade / ao exhibir seus avanços / para o bem da humanidade.

<sup>19</sup> Text in original: Como o livro defendia / a lei da evolução / agredindo frontalmente / a tese da criação / defendida pela Bíblia / gerou grande discussão.

Across themes and dates, we note that the authors of *cordéis* on the environment follow the evolution of the national and global debates concerning the matter. In the 1980s and 1990s, the poets that we identified, in general, used to talk about burned bushes, pollution, the hole in the ozone layer and deforestation. As of the year 2000, when the discussions around climate change gained evidence, they began to use concepts and expressions related to the topic, such as global warming, glacier melting, and the Kyoto Protocol.

### *Discursive elements*

With self-proclaimed educational intentions and an alarmist tone, the authors of this group of *cordéis* make a plea for the preservation of the environment, pointing out the serious, current threats to the planet. They often claim a catastrophic future for mankind. Here are some excerpts that exemplify the above-mentioned characteristics:

What future awaits us / with that we're planting / the natural resources  
/ that man is draining / in the future our grandchildren / will be  
fighting for water (HERVAL, 2007, p.6; our translation).<sup>20</sup>

All the water from Timbaúba / water from the foothills and all the  
rest/ will dry out as the one from Horto did/ like in final times / only  
drought and famine will be seen / death, pestilence to couples will  
come around (BATISTA, 1996, p.10; our translation).<sup>21</sup>

To avoid the worst, they highlight the necessity and urgency for action, they call for citizenship and civic behavior, and they claim for a committed attitude by human beings to fight against environmental degradation. These discursive strategies give strength and credibility to the cause they defend. In general, the *cordelistas* are engaged in interchanging allocutive and elocutives enunciations and highlighting the importance of a joint civic action of a huge dimension. The excerpts posted below demonstrate this:

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<sup>20</sup> Text in original: Que futuro nos aguarda / com o que estamos plantando / os recursos naturais / o homem está esgotando / no futuro nossos netos / por água estarão brigando.

<sup>21</sup> Text in original: Toda a água da Timbaúba / pés de serra e tudo mais / secarão como a do Horto / como nos tempos finais / só se verão seca e fome / morte, peste aos casais.

People from planet Earth / please listen to me / let's save and preserve/ Nature as now / It is hurt, / persecuted, and helpless (ALVES, 2004, p.1; our translation).<sup>22</sup>

Let's all go to the street / to shout out for the planet / and if action goes on / on the strength of a comet / we all shall be happy / with no committed crime (SOUZA, 2013, p.7; our translation).<sup>23</sup>

We notice that the *cordéis* about the environment usually have a more critical and political tone than others do. This is the case not only about the predatory action of man over nature, but also in relation to social injustices, impunity, the use of public power, including the use of science and technology.

#### *Representations of science, of technology and of the actors involved*

The view of science that predominates in the *cordéis* on the environment is negative, as opposed to what we saw in the *cordéis* about scientists. Such view does not exactly apply to basic science, but to technological development. Technological development is referred to as “progress”; it is represented by “powerful industries” and “sophisticated machines” while it is linked to pollution, deforestation and destruction. We have identified this view, for example, in the *cordéis* *Pela vida do planeta* [For the Life of the Planet] and *Salvem a Fauna! Salvem a flora! Salvem as águas do Brasil* [Save the Fauna! Save the Flora! Save the Waters of Brazil], from which we extracted the following excerpts:

There are industries offensive / to nations' health / either we control the factories / that generate pollution, / or the air that we breath / will stain our lungs (ALVES, 2004, p.6; our translation).<sup>24</sup>

The carbon monoxide / that is generated by the heavy industry / stays in the air / to take off my rest / since it shows how abandoned / the environment has been left / where the pollutant cloud / imposes so many sacrifices / that negates the benefits / of the emerging power (MONTEIRO, 2004, p.15; our translation).<sup>25</sup>

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<sup>22</sup> Text in original: Povos do planeta terra, / Ouçam-me por gentileza. / Salvemos e preservemos / Desde já a natureza / Que se encontra ferida, / Perseguida e indefesa.

<sup>23</sup> Text in original: Vamos todos para a rua / Gritar pelo planeta / E se a ação continua / Na força de um cometa / Seremos todos felizes / Sem que crime se cometa.

<sup>24</sup> Text in original: Tem indústrias ofensivas / À saúde das nações / Ou controlamos as fábricas / Que geram poluições, / Ou o ar que respiramos / Manchará nossos pulmões.

<sup>25</sup> Text in original: O monóxido de carbono / Que a indústria pesada gera / Fica na atmosfera / Para me tirar o sono / Já que mostra o abandono / Dispensado ao ambiente / Onde a nuvem poluente / Impõe tantos sacrifícios / Que anula os benefícios / Desse progresso emergente.

In *Ciência, natureza e poesia* [*Science, Nature and Poetry*], Elias A. de Carvalho opposes science to beauty and poetry, exposing another view of science, also negative:

When there is no poetry / there will be no more love / Natural beauties  
/ will lose their perfection / and the robot, a human's work / becomes  
their successor (1985, p.3; our translation).<sup>26</sup>

The uncertainties and contradictions inherent to scientific activity are seen in a negative way in *Aquecimento global* [*Global Warming*], by Abdias Campos. In this *cordel*, Campos criticizes the scientists' effort to make long-term predictions that he qualifies as "digressions." Furthermore, the poet speaks ironically of the lack of consensus in the scientific world about the causes of global warming and climate change.

We found positive views of science in two *cordéis* of this group: in *Terra, nosso planeta pede socorro* [*Earth, our Planet Cries for Help*], by Gonçalo Ferreira da Silva, and in *Água* [*Water*], by Abdias Campos. In the first one, Silva thinks that science is part of the solution to the environmental issue, depositing hope on it and on the scientific community:

Scientific community / from our beloved Ship, / inspired by science /  
take the celestial steps / to use intelligence / to preserve life (2005b,  
p.4; our translation).<sup>27</sup>

Abdias Campos also believes in technological advancement. For him, the problem of excessive water spent in industrial processes and agriculture – with irrigation – should have a technological solution:

For industry and for agriculture / action should be technology / First  
there should be the awareness / that just one's gain is not wealth /  
Produce while polluting, this is crazy / our rivers need to breathe / our  
waters have thirst to kill / Reduce your spending by discovering /

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<sup>26</sup> Text in original: Não havendo poesia / não haverá mais amor. / As belezas naturais / perderão o seu primor. / E o robô, obra do homem, / passa a ser seu sucessor.

<sup>27</sup> Text in original: Comunidade científica / da nossa Nave querida, / inspirada na ciência / tome celeste medida / de usar inteligência / para preservar a vida.

other ways to be productive / but without so much water use (CAMPOS, 2008, p.5; our translation).<sup>28</sup>

In the *cordel* on the environment, “men,” are broadly presented as protagonists. Unlike scientists, who emerged as heroes in the former group, men hereby appear as the villains, harming the environment. They are regarded as inhumanly greedy, destroyers, harmful, wicked, ungrateful, ignorant, inconsequential, soulless, insane, executioners, fools, stupid, deplorable predators. They are mainly moved by greed, but also by animosity, anger, evil, consumerism, evil, and ignorance.

In these *cordéis*, it is interesting to note the outstanding presence of references to God. God is opposed to man. God is the character who created nature out of love and gave it to man so that he can enjoy it and take care of it. In an act of ingratitude, man, instead of caring for it, destroys it.

In a few *cordéis* from this group, scientists are mentioned and, in general, are positively portrayed as holders of expertise. With science, intelligence and competence, they will take reasonable measures not to allow for life on the planet to end. In these cases, of which some have already been mentioned, science also comes as a beneficial activity that will bring solutions to the preservation of the environment.

#### 4 Discussion

Science and the environment were central themes of the 50 *cordéis* analyzed in this study, written by 27 - mostly Northeastern - poets. A poll on public perception of science and technology made in Brazil in 2015 has shown that these are issues of great interest to Brazilians. According to this research, Brazilians are more interested in these topics than in economics, sports, art, culture, and fashion (CGEE, 2015). This suggests that the authors of the respective *cordéis* are tuned with national interests and that their *cordéis* have a large potential audience.

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<sup>28</sup> Text in original: Para a indústria e para a agricultura / A ação tem que ser tecnológica / Em primeiro lugar a lógica / De que ganho de um só não é fartura / Produzir poluindo, isto é loucura / Nossos rios precisam respirar / Nossas águas têm sede pra matar / Diminua seus gastos descobrindo / Outras formas de estarem produzindo / Porém sem tanta água utilizar.

The same poll indicates that approximately 60% of Brazilians are interested in science and technology. However, only a small percentage of them, around 10%, can remember the name of any important Brazilian scientist or scientific research institution (CGEE, 2015). On the one hand, this reflects the fact that, in general, in Brazil, contents related to the history of science are discussed neither at school nor in the media. On the other hand, this stresses the importance for popular culture to address the topic and to give more space to national scientific personalities. The poet Gonçalves Ferreira da Silva, among other *cordelistas*, has done so.

Over and above formal questions of structure, rhyme and metrics, when we examined the *cordéis* of our *corpus*, we observed that they present the features of the traditional *Cordel Literature*: they use language that is simple and easy to understand; they are rich in similes and metaphors; criticism of political and social nature is detected, as well as religiosity and moral lessons; acclamation of heroes and reports of important facts. More than representing a specific series of themes, the set of *cordéis* on science and the environment that we analyzed naturally falls into classical patterns of *Cordel Literature*, properly embedded in some of its classical categories. Some of the booklets could, for example, be part of the “Science and society” category of *cordéis*, which covers topics of today, directed to the general public (FARIAS; ALVES, 2009).

Considering some features that were identified in the more focused analysis, we could equally consider our *corpus* representative of the “New Cordel” line, as Faiz and Alves (2009) and Mann and Agra (2010) describe it, which represents this latest strand of *cordéis*. These features include the informative character of the *cordéis*, the current and scientific issues that are addressed and the educational purposes that are explained in some booklets. In addition to these classifications, a characteristic of the series that draws our attention is the fact that almost all of our *cordéis* are non-fiction narratives, rich in descriptions. We identified very few fictional stories. When we did so, they followed *Cordel* literature regular patterns, infused with scientific questions. On the one hand, the descriptive character strengthens the educational and informative power of *cordéis* about science; on the other, it instigates us to search for more fictional stories with scientific motif. It is possible that science representations other than the ones already identified could arise from such fictional narratives.

When examining the specific characteristics of our two main studied themes, we identified different discourses and approaches. They varied more or less intensively, depending on the addressed issue. At first, the *cordéis* about scientists focus on the geniality, wit and importance of those personalities. As a whole, they display real odes to the heroes of science, lending themselves to the reverent and uplifting dissemination of their lives and achievements. The booklets on environment sometimes serve as environmental manifestos, condemning man for devastating nature, emphasizing the necessity to preserve it, and presenting a dystopian future for the planet if this preservation does not occur.

When we compared the two groups, we observed that in the *cordéis* about scientists, marked by the large amount of information and descriptions, a greater distance exists between the author and the reader. It is as if, in such cases, the author spoke in the name of science, assuming a position of authority, which gives him credibility in relation to the information that is forwarded. The *cordéis* on the environment largely show the author's greater involvement with the cause. When he claims for action and engagement, he also engages himself in the fight for the preservation of nature. This way of positioning himself demonstrates the author's conviction about the power of a collaborative action and it gives credibility to the cause.

We saw very different representations of science between the group of *cordéis* about scientists and the ones about the environment. The first group tended to present science positively and categorized it as a noble, objective and indisputable activity, which brings particular benefits to society. Scientists are portrayed as geniuses, owners of a formidable intelligence. In some cases, the emotional side of the scientist is also considered, but then the narrative about this side tends to reinforce the fantastic character of the scientist rather than to break this image.

This representation of science and scientists is not exclusive to that group of *cordéis*; it is widely present in the society. The above-mentioned poll, about the public perception of science and technology (ST) in Brazil, shows that the vast majority (73%) of Brazilians declare to believe that ST brings "every benefit" or "more benefits than harm" to humanity. This positive view also embraces scientists. According to the poll (CGEE, 2015), half of Brazilians consider them intelligent people, who do useful things for humanity; in addition, they rely on scientists. There are studies that show that this

optimism regarding science and scientists is reflected and reinforced by different segments of the media, among which is Science Journalism (MASSARANI et al., 2005; RAMALHO et al., 2012). This should be true not only in Brazil (NELKIN, 1987).

In the *cordéis* about the environment, technological science gives way to technological development. It is called the “progress,” but it is presented as something essentially negative. Technology is an enemy of nature. Such negative representation of technology is also common outside *Cordel Literature*; it is heavily present in literature and in movies, as well as in real life. Since environmental issues have arisen much attention from the public, there is a question about the role that technology development might have had on environmental devastation. This question gained momentum in the context of climate change. Currently, this subject arouses great concern in Brazil and half of Brazilians see ST as responsible for most environmental problems (CGEE, 2015).

As a whole, we can say that the *cordéis* analyzed in this study present a multifaceted and ambivalent view of science, sometimes extolling the scientific achievements and their authors, some other times showing a critical view of technological development. Likewise, when we assess the various representations of science in society – in the media, in the arts, at school and in other contexts, we face a multifaceted, contradictory and complex image of science, with positive and negative aspects. This image reflects and reinforces the social perception of it. In the same poll in which Brazil stands out as one of the most optimistic countries in the world in relation to science, Brazilians show that they do not bypass the limitations of ST and they collectively express their concern about the risks of scientific and technological development.

We are aligned with other authors (SIQUEIRA, 1998; JEFFERSON, 2006) who share the idea that the social imaginary is built by various texts, which cover different – and not always convergent – discourses. This proved to be the case for the science imagery that emanates from the *Cordel literature* we analyzed. It has been built by several – convergent and divergent – texts and discourses on science and technology. Thus, it is not possible to speak of a single representation of science within the *cordel* universe, which is as opulent, complex, and multifaceted as our own society is.

Finally, our study corroborates others that see *Cordel Literature* as a potential means for purposes of education and popularization of science (PEREIRA et al., 2014; LIMA et al., 2011; OLIVEIRA; QUEIROZ, 2013). We have reasons to believe that classroom activities with the *cordéis* that we analyzed would be able to arouse students' interests in scientific themes, making learning more fun and enjoyable. In this context, as was stated by Mann and Agra (2010), the correctness of the information contained in the booklets is important and deserves attention. It is difficult, however, to guarantee it. From one perspective, the *cordelistas* dominate the technique of poetry, but most tend to have low education and little knowledge about scientific content. From the scientists' perspective, the problem is usually reverse. Besides, we tend to consider the potential of *Cordel* literature with a less didactic gaze.

Queiroz (2013), Pereira et al. (2014), and Lima et al. (2011) already demonstrated that inside and outside school, *cordéis* about science could stimulate reflection and debate on scientific issues. They also encourage the formation of more critical and politicized citizens, who would be committed to the socio-technical issues that surround them. This is an important flag for people working on popularization of science (CASTELFRANCHI; FERNANDES, 2015; VOGT, 2008). As suggested by Pagliuca et al. (2007), *cordéis* about science could also contribute to a change of behavior and to the adoption of healthy habits. Then, it seems neither appropriate nor feasible to us to impose too stringent criteria that may hinder or limit the creative activity of the *cordelistas* when producing widely used *cordéis*.

We emphasize the potential of assembling science and the *cordel* genre to create closer ties between popular and scientific cultures. In addition to that, *cordel* also has potential for educational, critical training and change of habit purposes. We think that such merge could contribute to the construction of a social perception in which seemingly distant worlds are more naturally integrated, without one mischaracterizing the other. On the one hand, the poet who decides to write about science approaches this world to gather support for his poetry. During the process, he is led to reflect upon different aspects of the topic and to register his views on it. In some cases, he may approach the scientific community and become more sensitive to the movement of science communication, as with Gonçalo Ferreira da Silva. On the other hand, the audience is offered scientific – sometimes impenetrable – themes in a tasty way,

through an accessible language and at a contagious rhythm. In this process, the reader then navigates between the universes of science and of *cordéis* without having to cross bridges.

## Final Considerations

Based on our results, which are compatible with other studies about science and popular poetry, our analysis suggests that, even with *Cordel Literature* having lost part of its vigor with the growth of cities and with the technological advances in the past decades, losing part of its role as prime communication media within the Northeastern community, it has succeeded in reinventing itself and has gained new spaces and roles throughout Brazil, maintaining itself as a source of information and reflection on science, history, and culture. This is true not only in the Northeast Region, from where *Cordel* comes, but also across the country, reflecting and reinforcing the imagery and representations circulating in all parts of its territory.

We need a broader set of studies, with goals in accordance with ours, to better understand what led the *cordelistas* to address science-related themes in their work, what their intentions in doing so are, what their sources are, who their potential and actual readers are, and what images of science and scientists are present in this literary field. These are some – among other – issues relating to the integration of science with *Cordel Literature*. To better understand the potential of *Cordel Literature* for the popularization of science, we need to promote more frequent initiatives that mix the two cultures. We also need to conduct research that would seek to understand the impact of such mixing initiatives from the perspective of the audience.

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