

PRESENTED DISCOURSE ANALYSIS IN POPULAR SCIENCE  
NARRATIVES OF DISCOVERY

by

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## **Abstract**

This thesis reports a study of presented discourse in popular science narratives of discovery in English. It focuses on the fictionalizing role of presented discourse. The thesis proposes minor adjustments to the existing models of presented discourse analysis, dividing discourse presentation into Public Discourse (speech/writing) and Private Discourse (thought). After exploring the forms and functions of discourse presentation in the narratives, the thesis concludes that Private Discourse prefers the forms commonly associated with non-fiction while assigning to them the functions most often observed in fiction. All the forms of discourse presentation in the narratives contain dramatizing properties, yet Public Discourse possesses the highest degree of dramatization. Private Discourse in the narratives possesses communicative properties generally assigned to speech/writing presentation exclusively. Private Discourse is more likely to communicate scientific hypotheses than reveal the inner worlds of actants. The thesis concludes with an examination of presented discourse outside the narratives of discovery. This analysis confirms the phenomena observed in the narratives and reveals a unique feature of presented discourse outside the narratives—the fictionalized reader—a fictional actant created using discourse presentation. The findings of the thesis present a strong argument in favour of fictionality in popular science.

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## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1. Research Questions and Outline of the Thesis**

The present module continues the linguistic analysis of popular science books that was initiated in Modules One and Two. The three modules address the issues of science presentation to the public, the authors' influence on the reader, and how it shapes the reader's perception of science and scientists. Module One focused on the definitions of scientific terminology in popular science texts. It explored the structure and functions of the definitions, concluding that they constitute a point of interaction between the author and the reader and suggesting a new classification based on the types of definitions identified. At the conclusion of Module One, I did not feel that this was a topic that would reward more extensive investigation, so I turned to a new aspect of the books. Module Two analyzed larger text samples—narratives of discovery. It demonstrated that the narratives fit the general structural patterns proposed by Hoey (2001) and also could be examined using the Labov (1972) and the Labov and Waletzky (1967) schemes for narratives of personal experience. I determined that the narratives of discovery present science as a process that follows a defined and consistent series of steps similar to those of the scientific method. Module Two briefly outlined the importance of narrative technique to popular science. I continue to use this information as a guideline for Module Three.

Working on Module Two, I noted the presentation of discourse as a feature that I felt was crucial both to the narratives themselves (contributing to narrative

progression) and to the theme that became increasingly interesting to me (the public's awareness of scientists as people and the emotional connection between the lay reader and scientists). As a result, I decided to focus on the presentation of discourse for the thesis.

In the thesis, I continue working with the narratives of discovery, and I continue to investigate the general trend of science presentation to the public, but this time I look at presented discourse of scientists and its role in the narratives. I will argue that presented discourse is a likely location for fictionality in popular science. I will show that the narratives of discovery are a combination of fiction and non-fiction. The purpose of the present work is threefold: Firstly, I would like to examine *the suitability of the existing models* for presented discourse analysis as they apply to popular science. Secondly, based on the implications of presented discourse analysis in the popular science narratives of discovery, I wish to *address, and perhaps redefine, the notion of fictionality*. Thirdly, I would like to initiate *a comparison between presented discourse in the narratives and presented discourse in other parts of the popular science books* in order to determine whether or not the phenomena observed in the narratives are unique and perhaps dependent on the narrative structure of these text segments.

As a result of this analysis of presented discourse and fictionality, I will suggest that the popular science narratives of discovery represent a type of narrative that can be positioned alongside the narrative types proposed by Myers (1990). Myers (1990: 141-142) identifies two kinds of scientific narratives: narratives of science and narratives of nature. A narrative of science is a story that focuses on “the conceptual structure of the discipline” that produced it (Myers 1990: 142). A narrative of science mimics the research steps undertaken to produce a discovery. A narrative of nature, on the other

hand, emphasizes the “object of study” at the expense of the “disciplinary procedures” (Myers 1990: 141).

According to the analysis undertaken in Module Two, it appears that the narratives of discovery fall under the category of the narrative of nature. However, the investigation of presented discourse suggests another possible classification: a narrative of people. Similarly to a narrative of science or a narrative of nature, a narrative of people chooses to highlight one aspect of a discovery. In the case of the narratives I analyzed, the scientists, not the disciplinary procedure or the object of discovery, become the foci. In a sense, speech and thought presentation are only possible because the narratives are about people. The fictionalization introduced through presented discourse of scientists defines the narratives as a forum where science is equated with the individuals who practice it. The notion of science as fictionalized for the lay reader is not entirely new. Myers (1992, 1997) develops the idea of a fictionalized space within which science is introduced to a lay audience. The concept as developed in this thesis has some similarities with Myers’ (1997) analysis of Jane Marcet’s *Conversations on Chemistry*.

My study combines elements of a quantitative approach with a qualitative analysis. The approach is similar to that of Short et al. (2002), who first undertook a corpus-based study of presented discourse and then used qualitative analysis for comparison and verification of the results.

The first category of inquiry for this thesis (the suitability of the existing models) will focus on the following research questions, which will be addressed primarily in chapter 2:

- Can the existing framework of presented discourse analysis (Leech and Short 1981, Semino and Short 2004, Short 2007, 2012) be applied to popular science?
- Do the categories of presented discourse established by previous studies account for the types of presented discourse in the narratives of discovery?

The original analytical model on which the later approaches are based—by Leech and Short (1981)—was developed for literary fiction, and while Semino and Short (2004) demonstrated its general applicability to non-fiction as well, their sample of non-fiction did not include popular science. The most common non-fiction genre to be analyzed for forms and function of presented discourse appears to be printed news reports (see, for example, Waugh 1995, Calsamiglia and Ferrero 2003, Moirand 2003, Smirnova 2009, Semino and Short 2004, Urbanova 2012).

- If the existing framework applies to the narratives of discovery as well and makes it possible to compare presented discourse of scientists with other presented discourses in fiction and non-fiction, how does this comparison inform the understanding of popular science as a genre?
- On the other hand, if the existing model of discourse presentation needs to be amended, what do the changes reveal about the conventions of the narratives of discovery?

The primary comparison of my data will be against the findings of Semino and Short (2004) since theirs is a comprehensive study of presented discourse in non-fiction. I am interested in whether or not the categories of presented discourse that Semino and Short (2004) found most/least frequent are also the most/least frequent in my popular science corpus. Chapter 3 supplies the quantitative analysis necessary to address these issues and focuses on the following questions:

- Does the frequency information from Semino and Short (2004) demonstrate a general pattern of presented discourse distribution in non-fiction, or are their findings genre-specific?
- Does the discourse presentation in the narratives of discovery fit within the pattern for non-fiction suggested by Semino and Short (2004)?

Along with identifying the categories of presented discourse used in the narratives of discovery, I will also consider their functions. In the process, in chapters 4 and 5, I will investigate the following:

- Whether or not the discourse presentation types perform the same functions in popular science as they do in other non-fiction and fiction texts.
- Whether the function scale initially developed by Leech and Short (1981) and more recently explicated by Short (2007) applies to popular science narratives of discovery.
- If it does not, what would be an alternative?

The second area of inquiry for the thesis—the notion of fictionality—is also addressed throughout chapters 4 and 5 with additional insights supplied in chapter 6. In the present work, fictionality is explored through the lens of presented discourse. As some researchers have suggested (see, for example, Cohn, 1990, Rimmon-Kenan 2002, Short 2007, Dawson 2015), certain forms of presented discourse, dialogic presentation of speech and the presentation of thought, for example, may automatically signal fictionality outside of literary fiction. For instance, in his 1992 analysis, Myers identifies dialogue as a “fictional form” that can be employed in popular science “for presentation of facts” (Myers 1992: 221).

I would like to see if the narratives of discovery provide evidence for this argument. Thus chapter 4 will address dramatization in the narratives achieved through presented discourse, and chapter 5 will look beyond dramatization to explicate the introduction of scientific hypotheses and discoveries. These two chapters attempt to answer the following questions:

- What is the role of dialogue and thought presentation in the narratives of discovery?
- What forms of presented discourse are used most often to create dialogue and thought presentation?
- Are these forms of discourse presentation more likely to carry fictionality?
- Is fictionality limited to literary fiction only?
- Or can popular science—generally assumed a non-fiction genre—have elements of fictionality?
- If so, how do these elements manifest?

The third area of inquiry—the comparison of presented discourse in the narratives with that in the other parts of the books—is addressed in chapter 6. The chapter ventures beyond the boundaries of the narratives of discovery to test the propositions made on the basis of the analysis of the narratives. The material in this chapter is an attempt to widen the scope of the thesis and presents a response to the following research questions:

- How does the data from the narratives compare with presented discourse found outside the narratives?
- Does presented discourse outside the narratives of discovery offer any new insights on the creative potential of presented discourse in popular science?

In chapter 1, I also wish to provide some background information on the idea of fictionality in fiction and non-fiction. The sections that follow are designed to do that. However, as the present outline suggests, fictionality (and its component parts) is discussed throughout the thesis in connection with presented discourse. Since the information below is intended to supply theoretical underpinnings for the correlations between fictionality and presented discourse (rather than analyze them in detail), I consider it introductory and include it in this chapter.

## **1.2. Fictionality**

In this section, I shall outline the parameters of fictionality and provide a brief overview of this phenomenon in literary fiction and scientific non-fiction. My own observations on the elements of fictionality in the popular science narratives of discovery owe the descriptions offered below but, at the same time, do not strictly conform to what is generally regarded as fictionality in literary fiction nor in professional scientific writing. In fact, when I selected the narratives to be analyzed for this study, the primary selection criterion was the narrative structure not the presence of fictionality. Having analyzed the narratives for presented discourse, I noticed that in the majority of the cases where presented discourse was introduced, there were elements that could be ascribed to fictionality even if they did not correspond exactly with the existing definitions proposed for this phenomenon.

Firstly, there are two ways of looking at fictionality. One (and this is perhaps the most common way) is to regard it from the point of view of literary fiction. Fludernik's (1996) definition of fictionality exemplifies this approach: literary fictionality is understood as "*the subjective experience of imaginary human beings in*



*an imaginary human space*” (Fludernik 1996: 39). Fludernik (1996) emphasizes “the subjective experience”, saying that literary fictions “set out to represent” the human experience and create an “evocation of ‘real-life’ experience” (Fludernik 1996: 41, 12). To be considered fiction, a text must project the emotional experiences of its characters since emotional reactions are more unique and subjective than physical responses. Dramatization not only of external events but also of inner states is therefore essential to literary fiction.

This understanding of fictionality has become synonymous with literary narrative, and the experiential aspect of it has become a well-recognized feature of narrativity in general (see, for example, Toolan 2001 and Herman 2009). Toolan (2001: 8-9) uses the criterion of “the subjective experience” alone (in the absence of structural conventions) to establish a text as a narrative. Toolan (2001: 8) employs the term “experiencers” to refer to the characters in his definition of a narrative. It is the experiences of the characters and their interpretations of these experiences that connect events in a meaningful way thus constructing a narrative (Toolan 2001: 7-9). Herman (2009: 139-140) also lists the characters’ experiences and consciousness as some of the most notable features of narrativity in either fiction or non-fiction, though he chooses to illustrate them with fictional literary narratives primarily.

Even those researchers who do not explicitly incorporate Fludernik’s (1996) approach to fictionality can be seen as being influenced by it. For example, the idea of the transfer of an experience from a character to a reader is a key feature of a literary narrative according to Caracciolo (2013). His study examines phenomenological metaphors—a specific way that “the subjective experience of imaginary human beings” of Fludernik’s (1996) definition can be transferred to the reader.

An important aspect of Fludernik’s (1996) definition—the qualification “imaginary” assigned to the characters and their surroundings—is taken for granted when literary fictions are discussed. However, it comes to the forefront when non-fiction is considered. How can “imaginary human beings” or “imaginary human space” fit into a non-fiction narrative, especially one concerned with science? The immediate answer is they cannot; this is, essentially, what separates non-fiction from fiction. If Fludernik’s (1996) definition is applied to popular science narratives of discovery, there would not be any narratives that align with its parameters. Those that focus on the experiences of the characters would still lack the “imaginary” aspect. This is why I have chosen to illustrate this definition of fictionality with an example not from my corpus but from a scientifically-themed novel *Intuition* by Allegra Goodman (2006). The novel belongs to the genre of Laboratory Literature or lab lit. Rohn (2005, 2010) defines lab lit as realistic fiction about scientists set in a world identifiable as cognate with our own (as opposed to the speculative settings found within science fiction). Goodman’s (2006) work deals with a group of scientists working in a cancer research laboratory who come to experience the exaltation of discovery and the consequences of fraud. In the process, they reexamine the nature of their personal and professional relationships.

Example 1.1. uses the presentation of thought of two scientists to transmit their experiences in the laboratory to the reader:

1.1. Marion and Feng looked at each other. After repeated failure, could one of Cliff’s viral variations actually have some effect? What had changed here? What had Cliff done? The variation of the virus was R-7, Cliff had scrawled a note on the blue index card labeling this cage of mice. But he’s never gotten R-7 to work effectively in live animals before. Were these three mice significant? Or were they outliers of some kind—tainted by some other condition? This was the difficulty with animal research: so many different things could go wrong.  
(Goodman 2006: 27)

This example contains Free Indirect Thought of scientists (The use of the past tense suggests Indirect rather than Direct thought.). The author uses FIT to express the emotions of puzzlement and hesitation. Goodman (2006: 27) never indicates that these questions are voiced, and the reader is to presume that he/she is given access to the inner worlds of the characters. The choice of FIT in this passage is very likely not accidental since, as Semino and Short (2004: 123-124) show, this is the most frequently used form of thought presentation in fiction. FIT is considered to present thoughts in a “dramatic and immediate way” that allows the reader access to “the consciousness of characters” and creates “closeness and empathy towards characters” (Semino and Short 2004: 123-124). The reader is allowed to share in these unspoken emotions which reflect the subjective experience of the scientists.

Thought presentation is a common way to allow the reader to co-experience what Fludernik calls “an imaginary human space”, which is inhabited by the characters. Because it is only in fiction that a reader *knows* what other people are thinking and because it is only in fiction that thoughts are presented as well-constructed linguistic units, Cohn (1990), Short (2007), and Dawson (2015) are able to suggest that this form of presented discourse immediately signals fictionality. However, my data suggests that the relationship between thought presentation and fictionality is more complex in the narratives of discovery. Even if the qualification “imaginary” is disregarded, and the narratives are assessed on the basis of the presentation of subjective experiences alone, not all instances of thought presentation that I observed would qualify as carriers of fictionality because they do not necessarily evoke subjective experiences. In fact, as I will demonstrate in chapter 3 and explicate in chapter 5, thought presentation in the narratives of discovery is rarely used in the way demonstrated by example 1.1., and the

category of FIT—the most dramatic and immediate of all the forms of thought presentation—is entirely absent from the narratives in my corpus. The reader of popular science is much more likely to encounter thought presentation similar to the instance in example 1.2.

1.2. Alvarez, a brilliant physicist with a penchant for puzzles, hit on an idea:  
Use muons coming from the skies in the form of cosmic rays to peek inside the  
rock of Khafre’s pyramid. (Carroll 2012: 106)

This is Direct Thought (DT) expressing a scientific hypothesis. The choice of the form is not accidental but aligns closely with the purpose of the narrative. Semino and Short (2004: 118) note in contrasting DT with FIT that the former presents “highly conscious, deliberate thought” while the latter is more emotional. Deliberate and well-articulated thought expressed in 1.2. is fit to present a scientific hypothesis that is expected to be tested. The reporting clause, “Alvarez...hit on an idea” contains an element of surprise, yet it also establishes the DT that follows as a product of previous deliberation on the subject.

Example 1.2. shows that in the narratives of discovery thought presentation is used for very different purposes than it is in fiction. Even though the author shares with the reader the thoughts of the scientist, they are not intended to evoke in the reader the emotional experience of coming up with a hypothesis and thus reveal an inner world. In fact, the author gives no indications of how Alvarez felt about his idea, whether, for example, he was excited or concerned that it might not work.

Even though no subjective experience is transferred to the reader via thought presentation in example 1.2., some researchers (see, for example, Skov Nielsen et al. 2015 a, b) would still regard it as an instance of fictionality. However, this kind of

fictionality is different from the one identified by Fludernik (1996). This is fictionality as it has come to be recognized in non-fiction.

Based on my literature review into the issue of fictionality outside of literary fiction, I conclude that the attention to fictionality in non-fiction and the subsequent definition of the phenomenon is strongly connected with the idea of fictionality in science. Studies in the philosophy of science have been advocating for a non-literary kind of fictionality as early as the beginning of the 20<sup>th</sup> century (see, for example, Vaihinger 1924). More recently, Fine (1993) has revived these ideas, which inspired a number of further explorations (see, for example, Suarez 2009, Toon 2012, Barwich 2013). Fictionality, from this scientific point of view, is usually understood as “the role played by particular methods of model building such as abstractions, idealisations, and the employment of highly hypothetical entities” (Barwich 2013: 357-358). This view of fictionality focuses on an important aspect of the scientific process—hypothesizing. The aspects of imagination and experientiality present in Fludernik’s (1996) definition are replaced with the discussion of the possibilities and probabilities.

Narratologists Skov Nielsen, Walsh, and Phelan (2015 a, b) spelled out what such an approach might mean in terms of textual representation of fictionality in non-fiction. It should be noted, however, that Skov Nielsen et al. (2015 a, b) do not credit philosophy of science for this approach even though the similarity of their parameters for fictionality and those presented by the philosophers of science is clear. Skov Nielsen et al. (2015 a: 62) suggest that fictionality can be expressed through “what-if projections, if-only regrets, thought experiments, and hypotheses of all kinds”. In other words, any kind of hypothetical expression can be classed as fictionality if found in

non-fiction. The experiential aspect is no longer vital; thus dramatization of either external events or internal states has no place in this view of fictionality.

Skov Nielsen et al. (2015a, b) stress that fictionality is “ubiquitous” (2015a: 62) and “extremely pervasive” (2015b: 110), yet at the same time it remains a phenomenon associated primarily with fiction. They assert that “apart from the work by literary critics on generic fiction, fictionality is almost completely unstudied and often unacknowledged” (Skov Nielsen et al. 2015a: 62). The point of Skov Nielsen’s et al. (2015 a, b) approach is to enable scholars and researchers to recognize and examine fictionality and its functions outside of the domain of fiction (Skov Nielsen et al. 2015a: 70). The desire to separate fictionality from fiction could explain the renunciation of the dramatizing and the emotional aspects from the definition.

On the other hand, by using a narrow definition of fictionality—the one that includes primarily hypothetical scenarios—Skov Nielsen et al. (2015 a, b) limit the kinds of fictionality that could be observed in non-fiction. Such an approach, in my opinion, cuts out an important aspect of fictionality—that of recreation of reality through dramatization and emotion. I think this is an especially valuable aspect of fictionality for popular science because multiple linguistic studies as well as studies in public perception of science and studies in the communication of science to the public suggest that lay readers rely heavily on an emotional connection with science and scientists that is introduced through popular science texts (see, for example, Calsamiglia 2003, Moirand 2003, Myers 2010, Laslo et al. 2011, Luzon 2013, Sackler 2014, Supper 2014). Therefore, I find it more productive not to exclude the emotional aspect of fictionality from non-fiction.

Research into fiction and non-fiction suggests that there are similarities between fictionality as it is expressed in both genres. Philosophers of science (see, for example, Cartwright 1983, Toon 2012) have circulated the idea that fictionality in science is “analogous to literary...fiction” (Rouse 2009: 37). Semino and Short (2004) in their exploration of presented discourse in fiction and non-fiction concluded that the genre divides are less rigid than generally perceived. At the same time, the definition of fictionality proposed for one genre does not necessarily recognize the manifestations of the same phenomenon in the other. Thus the two separate definitions as they stand do not supply an explication for the elements of fictionality I observed in the narratives of discovery.

The kind of fictionality connected with presented discourse is grounded in real events that are dramatized by the authors in order to introduce the experiences of the scientists. These are often conferences, debates, and conversations that took place in real life, but which are being presented to the reader from the point of view of one character or another so that the reader can catch a glimpse of what it is like to be a scientist and to negotiate professional relationships. These events are not imaginary but reimagined to present science and scientists as emotionally relatable. Even the hypotheses introduced in the narratives are usually expressed as thoughts, which suggests an attempt to make these inherently scientific portions of the narratives more personal.

To examine the narratives for fictionality, a different approach should be considered, one that is willing to regard imagination not in direct opposition to reality but as a mechanism that can enhance the reader’s experience with an unfamiliar world.

At this point, I shall introduce the working definition of fictionality for the thesis. I shall define fictionality as *reimagining and reconstructing of real-life events in such a way that brings out subjective experiences of human actants*. I further propose that dramatization by means of the emotionally-charged presented discourse is the way that the popular science narratives of discovery fictionalize their subjects. The actants-scientists in these narratives shift the focus from the impersonal descriptions of science to the understanding of its human participants.

### **1.3. The Importance of Emotionality in Popular Science**

It is common to associate emotionality and evocation of human experience with literary fiction. For example, Fludernik's (1996) definition of fictionality is tied to these concepts, yet they are not often observed in non-fiction. Even though Lamarque (2000) and Skov Nielsen et al. (2015 a, b) argue, and Barwich (2013) demonstrates that fictionality is not limited to a set of features that are present in literary fictions only, it is still somewhat unusual to regard emotionality as a key feature of non-fiction. After all, as Toolan (2011: 1) suggests, "emotional experience...and the close connections, too, between emotional, ethical, and intellectual responses" that literary fiction provides are "a main" reason why we read fiction. At the same time, all of the features that Toolan (2011) lists are present in popular science as well, and as research shows (see, for example, Calsamiglia 2003, Laslo et al. 2011, Luzon 2013, Moirand 2003, Myers 2010, Supper 2014) account for the popularity of this non-fiction genre. In fact, the research points out that the emotional engagement of the public with science has become the major means of connection between scientists and lay people. For instance, Sackler (2014: 10) proposes that scientists would be better received by the public if



they focus on such personal and emotional aspects “as letting people know why someone went into science”.

Emotional engagement, I propose, has come to replace the active, hands-on involvement of the public common in the 18<sup>th</sup> and 19<sup>th</sup> centuries. Historians of science (see, for example, Lightman 2000, Topham 2000, Bensaude-Vincent 2001) argue that in the 18<sup>th</sup> and the first half of the 19<sup>th</sup> centuries, science was open to those whom Bensaude-Vincent (2001: 102) calls “enlightened amateurs”. From the second half of the 19<sup>th</sup> century, however, science became separated from the public as part of a power move (possibly aided by the increasing complexity of the scientific procedures) by professional scientists (see, for example, Lightman 2000, Topham 2000, Stanley 2011). These actions came to be known as boundary work intended to separate the ignorant public from the expert scientists.

My research into the history of science popularization makes me believe that this situation remained stable and endured well into the 20<sup>th</sup> century. The separation of the scientists and the public resulted in a popularization model that acknowledged only a one-way communication process: from the enlightened experts to the ignorant public. This view of popularization became known as a “canonical view” (Bucchi 1998) or a “dominant view” (Myers 2003). Such a perception of popularizations was eventually overcome. The works of Myers (1990, 2003) and Bucchi (1998) played an important role in changing how popular science was regarded and how it should be written. Myers’s (2003) contribution is especially notable since he outlined the specific elements that a successful popular science text should include. Among them was the establishing of an emotional connection and trust between the public and the scientists (Myers 2003: 273-274); these elements have been independently identified as vital to

communication of science (see, for example, Fiske et al. 2002) and became exemplary points in later research (see, for example, Sackler 2014).

As a result of the changed attitude, the role of a lay person in connection to professional science has also changed. If in the 18<sup>th</sup> and 19<sup>th</sup> centuries the public was allowed to participate in professional science, and if in the second half of the 19<sup>th</sup> and first half of the 20<sup>th</sup> century it was seen as an ignorant mass that needed to be kept out of the laboratory, today lay people have found a way back into the scientific fold. However, they participate in science not by producing it but by experiencing it, evaluating it, and engaging with it emotionally.

Linguistic studies of popularization undertaken in the early 21<sup>st</sup> century show a clear shift in popular science towards the establishment of an emotional connection between the readers and the scientists. For example, Turney (2004a) and Caracciolo (2013) suggest certain metaphors can help the reader engage with science on an emotional level. Moirand (2003) suggests a more direct way to establish an emotional connection between the public and the scientific community—the use of presented discourse of scientists. Moirand (2003: 181) shows that expert voices and the way they are framed in a text create “a representation of the different attitudes, emotions and reactions of the speakers”. Multiple voices can be used to express emotions within the scientific community and by doing so present scientists as more relatable to the public. Moirand (2003: 197) also suggests that in some cases presented discourse “Rather than ‘explaining’ science...sets out to explain the social meaning” of the scientific issues and concerns more with emotions than with the scientific facts. Moirand’s (2003) research establishes the connection between the reader and the presented voices of scientists as a basis for her cyclical model of popularization where the scientists and the

public influence each other. Fu and Hyland (2014: 141) as well stress the importance of creating a connection between a lay reader and a professional scientist when they say that one of the roles of popular science is to allow “non-specialists to recover the voice of the scientist” (141). Moirand’s (2003) findings suggest that this voice could be more emotional than expected of a non-fiction text.

I interpret Moirand’s (2003) observation as evidence of dramatization and emotionality in popular science and so do Calsamiglia and Ferrero (2003: 169), who write, referring to Moirand (2000)—an earlier study of the same issue—that “...the very many voices involved in the problem....dramatize the conflict”. In other words, presented voices can contribute to the emotional aspect of fictionality. In the chapters that follow, I will examine how presented discourse of scientists is used to dramatize their professional experiences and in doing so establishes an emotional connection with the reader, not unlike a connection between fictional characters and the readers of literary fiction.

#### **1.4. Fictionality and Professional Scientific Discourse: Implications for Popular Science**

The use of dramatization and emotional connection between the scientific community and the reader may make the accuracy of the information introduced in a popular science narrative questionable. At the same time, dramatization and emotionality are part of the scientific research and discovery process. The fact that the narratives include these aspects makes them, on some level, more accurate in representing the work of the scientific community, mimicking the experiences involved.

Philosophers and sociologists of science agree that science is not all about facts; there is plenty of room for emotion (see, for example Gilbert and Mulkay 1984, Harre

1994). The focus on the results and facts prevalent in professional scientific publications, Harre (1994: 87) argues, is nothing more than “a smiling face” of science and has little to do with the actual process of discovery. Harre (1994: 90) suggests that “the harsh life of the scientific jungle reveal[s] itself” in “the microsociology of science”, that is the intermediate stage between “polished presentations” and “nascent research programmes”.

Gilbert and Mulkay (1984) made a similar observation earlier when analyzing the language of the scientific community. What they describe as “empiricist discourse” corresponds to Harre’s (1994) “polished presentations stage” and focuses on science exclusively. The intermediate stage, Gilbert and Mulkay (1984) suggest, manifests in “contingent discourse”, which adds personal perspectives and incorporates issues that lie beyond the realm of science and sometimes conflict with the discussion of science. They stress that luck, chance, and interpersonal relationships are prominent contributors to scientific progress and label them “contingent factors” (Gilbert and Mulkay 1984: 92-95).

Popular science narratives of discovery seize these somewhat unscientific features of the discovery process and amplify them in order to make scientists into relatable characters. In a way, the authors of the narratives use fictionality to reintroduce the part of a discovery process that does not always extend beyond the laboratory. The authors accomplish this by using presented discourse. Consider example 1.3., which introduces the final part of a narrative describing the discovery of the double helix structure of DNA:

**1.3. Chagraff tried to relay this finding to Linus Pauling—Watson and Crick’s main rival—while on a cruise, but Pauling, annoyed at having his holiday interrupted, blew Chagraff off. The cagier Watson and Crick heeded**

Chagraff (even though he thought them young fools), and from his insight they determined finally, that A pairs with T, C with G. (Kean 2012: 100-101)

As discussed in chapter 4, Kean (2012) uses dialogue expressed primarily via Narrator's Presentation of Speech Acts (bolded), and he also uses Thought Presentation (underlined) to create this exchange. The interaction presented points to the importance of interpersonal relationships and chance encounters in discoveries. Kean (2012: 100-101) implies that had Pauling listened to Chagraff, he would have been the one to discover the structure of DNA. This is a suggestion that scientific truths are sometimes revealed by those who possess a kind of interpersonal cleverness rather than superior scientific intelligence. Professional scientific publications, according to Harre (1994) explicitly deny this path to discovery; popular science, on the other hand, brings it to the forefront.

Gilbert and Mulkay (1984: 91-95) suggest that even when scientists acknowledge and rely on contingent factors, in the end "the truth will out"—that is, in the words of Gilbert and Mulkay (1984: 94), "Social factors, personal judgements, intuition, charisma and so on are all allowed to play a part in science. But only in the short run. In the long run, it is scientific *facts* which are important". However, the popular science narratives of discovery do not always focus on facts alone. By using presented discourse to showcase the contingent factors, they sometimes draw the focus away from the discoveries to the discoverers. Even though dialogue included in the narratives tends to show scientists engaged in discussions related to discoveries, the narratives remain people-centered. So while they do not necessarily distort the information, they present it in a subjective way. I suggest this is a result of fictionalization through presented discourse.

As I have pointed out in 1.2., fictionality does not have to stand in opposition to science and scientific inquiry. As Barberousse and Ludwig (2009) and Toon (2012) suggest, fictionality is an inevitable part of doing science. Gilbert and Mulkay (1984) and Harre (1994) show that there is a place for emotionality in professional science. Suarez (2009: 6) acknowledges that imagination is also an important aspect. Rouse (2009: 52) and Barberousse and Ludwig (2009: 57) point out that fictionality in professional science aids in establishing relations between phenomena and allows scientists to present new knowledge more easily. The function of knowledge presentation is essential to popular science. By fictionalizing the narratives, the authors help the readers process abstract scientific issues since the stories now are not solely about science but also about scientists. The face of professional science is no longer emotionless; science and fiction cross paths. These connections become evident in the analyses of fictionality in professional and popular science.

## **1.5. Conclusion**

This study addresses the issue of the presented discourse of scientists in the narratives of discovery and discusses it in light of fictionality. I approach fictionality as not necessarily dealing with imaginary entities and spaces or with hypothetical scenarios exclusively but as an expression of dramatization and emotionality that helps create subjective personal experiences associated with real-life events. I argue that presented discourse of scientists is used to introduce these aspects into the narratives of discovery and by doing so makes the narratives resemble literary fiction while retaining the scientific subject matter.

## CHAPTER TWO

### PRESENTED DISCOURSE: A BRIEF OVERVIEW

#### 2.1. Introduction

In this chapter I look at presented discourse in fiction and non-fiction, provide an overview of the existing models, and introduce several adjustments that I have incorporated to evaluate the types of presented discourse found in the popular science narratives of discovery.

Fu and Hyland (2014: 127, 141) assert that authors of popular science rely heavily on outside voices to make their arguments. Popular science, Fu and Hyland (2014: 141) argue, delivers its message not so much through narration but through the voices of the scientific community. As Fu and Hyland (2014: 141) declare, “scientists become real actors” in popular science stories of discoveries. While the general conclusion that Fu and Hyland (2014) as well as de Oliveira and Pagano (2006) propose states that popular science, for the most part, borrows the rhetorical resources available to professional scientific writing and “shapes these for a lay audience” (Fu and Hyland 2014), I argue that the use of presented discourse has a markedly different role in popular science from the one it performs in professional writing. Fictionality introduced in presented discourse makes it resemble presented discourse in fiction.

## **2.2. General Role of Discourse Presentation in Fiction and Non-Fiction**

It is important, I suggest, to look at the differences of discourse presentation in fiction and non-fiction even though Lamarque (2000) and Skov Nielsen et al. (2015 a) caution against separating non-fiction from fiction solely on the basis of linguistic features.

With this warning in mind, I will briefly outline how discourse presentation is used in each text type.

Firstly, discourse presentation in fiction aids in the creation of experientiality, while in non-fiction presented discourse serves to boost accuracy and truthfulness. As Toolan (2001: 129) notes, presentation of speech in literary texts contributes to the authenticity of the story world, and Herman (2009: 147) points out that in fiction, “a rich context of felt experience emerges” as a result of “character’s conversation”. Semino (2004: 436-437) regards character voices as vital to the development of an emotional attachment between the reader and the characters. In fiction, presented discourse can easily project consciousness and help the reader see the events through the eyes of the characters, evoking empathy and sympathy—vital features of emotional engagement according to Toolan (2011). Discourse presentation contributes to what Fludernik (1996) identifies as a key feature of fictionality for literary texts—evocation of human experience.

In non-fiction (that is writing that excludes novels, short stories, and other works that are predominately imaginative), including the discourse of others serves a purpose different from that of presented discourse in fiction. Semino and Short (2004: 226), having analyzed a corpus of fiction and non-fiction twentieth-century texts, conclude that fiction relies more on those properties of discourse presentation that emphasize dramatization of the events and inner worlds of the characters. In contrast,



non-fiction makes greater use of information-carrying properties of presented discourse such as the ability to summarize.

Semino and Short (2004) do not make it their primary goal to explain why this difference occurs. However, other researchers who looked into genre-specific corpora supply possible explanations. For instance, Livnat (2012) shows that the voices which are introduced into an academic text are entirely subject to the needs of the author and do not contribute to the creation or representation of the identities of those who originated them. Livnat (2012: 64-66) suggests the following functions performed by the references to, and presentation of, multiple voices in academic writing: Firstly, it is the establishing of a research context; secondly, an acknowledgement of the connection with the existing claims/knowledge; and thirdly, the construction of the author's research identity. In other words, presented discourse could be used as a background for the author's ideas.

What is a valued feature of presented discourse in fiction—invitation to the reader to engage with and to interpret the presented voices—is to be approached with caution in non-fiction. As Livnat (2012: 59) notes, “In scientific writing, the act of handling other speaker's utterances is less free than in other genres”. As a result, when a new voice is introduced, the author, according to Livnat (2012: 59) is obligated to include his/her own interpretation which is to be adhered to by the reader as well. As de Oliveira and Pagano (2006: 641) note, the interpretation of presented discourse supplied by the author contributes to the dialogue between the author and the reader of non-fiction.

The focus on the author as the interpreter of the presented voices can be found outside the professional scientific publications, in newspaper reports, for example (see

Calsamiglia and Ferrero 2003, de Oliveira and Pagano 2006, Smirnova 2009).

Presented discourse in such texts is seen as a vehicle for the author's opinions and interpretations not primarily as the means of characterization; it is used to facilitate a dialogue between the author and the reader.

Sometimes, this dialogue is directed at explaining complex information to the reader. Quite often, non-fiction (in an attempt to explain the world) has to introduce multiple voices in such a way that their messages are coherent to a wide audience who might not be well-versed in a particular issue. This is the case with science popularization. In this situation relying on the information-carrying and summarizing properties of discourse presentation accomplishes what Ciapuscio (2003: 210) calls "recontextualizing and reformulating one's source in such a way that it is comprehensible and relevant for a different kind of addressee". It becomes clear that in non-fiction, discourse presentation is used primarily to convey factual information. This function, it appears, dictates the form presented discourse is likely to take. For example, as Semino and Short (2004) have found, presented discourse in non-fiction is more likely to be indirect.

To summarize briefly, presented discourse in fiction is directed towards an expression of emotion and dramatization of the described events. Its main goal is to create an emotional response in the reader. Presented discourse in non-fiction is used to boost the accuracy of the account and is directed to the incorporation of facts. In light of this, presented discourse in fiction becomes the means for character creation (see, for example, Toolan 2001), while in non-fiction it is more likely to be the means of constructing the author's professional identity (see, for example Livnat 2012). Popular science narratives of discovery, I argue, combine the function of presented discourse in

fiction with the preference for the form most often associated with non-fiction. That is the narratives rely more heavily on indirect types of presented discourse but use their summarizing properties to create dialogue and portray scientists as emotionally relatable characters.

### **2.3. Existing Models of Discourse Presentation Analysis**

This section is organized chronologically and starts with an overview of Leech and Short's (1981) influential model that has become the standard for analyses of presented discourse and serves as the basis for the subsequent models addressed here. Next, I turn to a discussion of Semino and Short's (2004) corpus study that examined presented discourse in fiction and non-fiction. It is followed with Short's two more recent works—Short (2007) and Short (2012)—in which he offers additional insight into the earlier models as well as proposes some changes in terminology. I spend more time on the Semino and Short (2004) model since it is the most comprehensive recent approach to presented discourse analysis, and because it addresses presented discourse in non-fiction as well as in fiction. The section concludes with a list of the discourse presentation categories I chose to conduct my analysis followed by the rationale for my choices.

#### **2.3.1. Leech and Short's (1981) Model**

The study by Leech and Short (1981) and the subsequent revised edition of it (Leech and Short 2007), introduced a model of speech and thought presentation for fiction. Below are the categories of speech and thought presentation found in Leech and Short 2007: 255-281):

- **Direct Speech/Thought [DS/DT]**—The original utterance/thought presented as if it were verbatim and introduced by a reporting clause. *Effects produced:* Focus on the original speech/thought situation and faithfulness of representation. Emphasis on the originator of the speech/thought (Leech and Short 2007: 256-257).
- **Free Direct Speech/Thought [FDS/FDT]**—Original discourse presented as if it were verbatim but without the reporting clause and often without the quotation marks. *Effects produced:* Focus on the character’s voice without “the narrator as an intermediary” (Leech and Short 2007: 258).
- **Indirect Speech/Thought [IS/IT]**—Reformulation of an original utterance/thought that contains a reporting clause. *Effects produced:* More complete integration into a narrative compared with DS/DT; focus on the message rather than on the exact words (Leech and Short 2007: 256-257).
- **Free Indirect Speech/Thought [FIS/FIT]**—IS/IT that is presented without a reporting clause. Free discourse reflects the narrative’s perspective from the point of view of the character, which sometimes results in tense shifts. *Effects produced:* While not a faithful reproduction of the original utterance/thought, it still has more power to refer to the feel of the original than IS/IT (Leech and Short 2007: 261).
- **Narrative Report of Speech Acts/Thought Acts [NRSA/NRTA]**—Summaries of utterances/thoughts. *Effects produced:* Deemphasizing of the importance of the original utterance/thought in the new context. Emphasis on the fact that a speech/thought act took place not on the words nor on the message (Leech and Short 2007: 259-260).

The value of Leech and Short's (1981/2007: 276) model is that it presents clear analytical categories for both speech and thought. As Short (2007: 226) observes, "It was the first attempt to distinguish systematically between speech and thought presentation". In this overview, I discuss the categories of speech and thought presentation together to highlight the fact that each category of speech has a counterpart in the presentation of thought and vice versa.

Leech and Short (1981) are also known for the introduction of the speech/thought presentation scales that arrange the categories of discourse presentation according to the degree of authorial control from the most controlled to the least controlled. The combined scale for speech and thought is shown below with the NRSA/NRTA being the categories most controlled by the author and FDS/FDT being the least controlled:

NRSA/NRTA—IS/IT—FIS/FIT—DS/DT—FDS/FDT

Leech and Short (1981/2007: 276) use this scale to demonstrate that the modes of speech/thought presentation represent a continuum, with each category responsible for different effects on the reader depending on the involvement of the author. Leech and Short also mark what they call "the norm" for speech and thought presentation. Thus the norm for speech presentation in fiction is DS, and the norm for thought presentation is IT. Leech and Short (1981/2007: 276) explain that these categories are chosen as the norms because each of them reflects presented discourse in the form it is directly expressed to the addressee. In other words, speech is directly expressed as DS, and thought, being an internal process, is accessible to others only via its indirect form. The norms, therefore, reflect the reality of typical interactions.

### **2.3.2. Semino and Short's (2004) Model**

Semino and Short (2004) apply the Leech and Short (1981) model to a corpus of fiction and non-fiction texts. In the process, they demonstrate the need to expand the model by supplementing it with several new categories of speech/thought presentation and a whole new category of presented discourse—Presentation of Writing.

The contribution of this study is that it utilizes a corpus approach to test the Leech and Short (1981) model as it applies to written narratives outside of literary fiction, for which the Leech and Short (1981) model was designed to account (Semino and Short 2004: 42). The new categories of discourse presentation introduced by Semino and Short (2004) demonstrate the authors' focus on creating a model that would account for all the possible instances of discourse presentation in their data (Semino and Short 2004: 43). This is one of the strengths of their approach. With accuracy being the primary concern, Semino and Short (2004) pay less attention to the possible rhetorical effects associated with each of the categories they introduce compared to Leech and Short (1981), Semino (2004) and Short (2007, 2012).

The complete list of the categories used by Semino and Short (2004) is presented below. I am now going to demonstrate how the Semino and Short (2004) model applies to the data from my corpus; I will provide a critical analysis and suggest adaptations for the model afterwards in section 2.4. Where possible, I will introduce examples from my corpus; however, for the categories where my data does not supply clear illustrations, I will quote from the Semino and Short (2004) corpus.

- **Narrator’s Report of Speech/Thought/Writing [NRS/NRT/NRW]**— clausal (as in reporting clause) or non-clausal “reporting signals” that introduce presented discourse (Semino and Short 2004: 35-39).

This category is broader than the traditional Reported Clause, as it covers all possible ways of the discourse introduction including passive constructions, noun phrases, etc.

*Example from my corpus* (NRS bolded, IS that it introduces underlined): “**To prove that there must be an infinite number of primes**, Euclid started by asking whether, on the contrary, it was possible that there were in fact a finite number of primes” (du Sautoy 2011: 32-33). This example includes a type of NRS that Semino and Short (2004: 37) identify as ““complex preposition””—“To prove that there must be an infinite number of primes”. NRS/NRT/NRW are not themselves part of presented discourse but are used as introductory elements only.

- **Narrator’s Representation of Voice/Internal Narration/Narrator’s Representation of Writing [NV/NI/NW]**. Minimal indications of verbal/thought/writing activity without describing specific speech acts in any kind of detail (Semino and Short 2004: 43-45).

The functions assigned to this category by Semino and Short (2004: 44) are very close to those Leech and Short (1981/2007) attribute to Narrator’s Representation of Speech/Thought Acts. In fact, according to Semino and Short (2004: 43-48), categories of NV, NI, and NW differ from NRSA/NRTA/NRWA only by the absence of message that is summarized by NRSA/NRTA/NRWA. In other words, they are minimalist versions of NRSA/NRTA/NRWA. There is no clear example of NV or NW in my corpus; the closest phenomena I observed would be classified as reporting clauses, for which Semino and Short (2004) have a separate category (see above). An example of

NV from the Semino and Short (2004: 43) corpus is “She talked on”. The example closest to this one from my corpus might be, “Robert Oppenheimer, **who was chairing the proceedings**, coaxed him into resuming his talk...” (Carroll 2012: 156). The bolded relative clause, I suggest, approximates the category of NV. For Internal Narration (NI)—the equivalent of NV in the presentation of thought— Semino and Short (2004: 46), propose the following definition: “the presentation of [a] character’s internal states” in the absence of a “specific thought act”. Again, the example from my corpus can only approximate these requirements: “But all his training also told Rous the idea was ridiculous” (Kean 2012: 139). Semino and Short (2004: 46) supply the following example: “For a moment she didn’t know where she was”.

The difference between NRS/NRT/NRW and NV/IN/NW, as I interpret it, is that the first categories serve as introductory elements only and do not necessarily contain explicit indication of speech/thought/writing acts within themselves (as long prepositions demonstrate). Their purpose is to frame not to name the stretch of presented discourse that follows. The second categories are more concerned with an indication of a speech/thought/writing activity while they do not focus on the details of presented discourse.

- **Narrator’s Report of Speech/Thought/Writing Acts**

[NRSA/NRTA/NRWA]. Summaries of utterances/thoughts/writing.

Semino and Short (2004) follow Leech and Short’s (1981) definition and description of the functions for these types of presented discourse, emphasizing the summarizing properties. However, Semino and Short (2004) seem to have abandoned Leech and Short’s (1981/2007: 26) notion that NRSA is used “for summarizing relatively unimportant stretches of conversation”. Semino and Short (2004), in general, devote



more attention to NRSA/NRTA-like categories (see NV/IN/NW and some NRS/NRT/NRW) and even introduce a subcategory—Narrator’s Representation of Speech/Thought/Writing Acts with Topic (NRSAp). This new category covers NRSA/NRTA/NRWA that include more detail than NRSA/NRTA from Leech and Short (1981). Semino and Short (2004: 52-53) define NRSAp as the type of NRSA that “spells out the speech act that the original speaker is supposed to have performed..., and then goes on to provide details of the content of the utterance”. Effectively, there are two parts in such NRSA/NRTA/NRWA: one that “spells out the speech [thought/writing] act” and another one that introduces details. Semino and Short (2004: 53) acknowledge the similarity of NRSAp with IS and refer to other analysts who have classified such occurrences as “condensed” IS (see, for example, Waugh 1995 cited in Semino and Short (2004: 53)). At the same time, Semino and Short insist on the NRSAp category. The following two examples represent NRSA and NRSAp. NRSA: “Penzias and Wilson called Dicke, who quickly confirmed that they had unintentionally tapped into the reverberation of the big bang” (Greene 2011: 40). NRSAp (the part that “spells out the speech act” is bolded; the details are underlined): “By that May, when Wheeler visited Bohr in Copenhagen and **discussed Everett’s ideas, the reception was icy.** Bohr and his followers had spent decades refining their view of quantum mechanics. (To them, the questions Everett raised, and the outlandish ways in which he thought they should be addressed were of little merit.)” (Greene 2011: 190). The Semino and Short (2004) examples of NRSAp do not include those instances where the topic is detailed in a separate sentence, as in my example. I explain the difference by the fact that the NRSAp that Semino and Short (2004) observed were mostly found in the press section of their corpus and were used primarily, as Semino and Short (2004:

76-77) note, for their space-saving properties. I suggest that in my popular science corpus, the NRSA both dramatize and summarize, so the length of NRSAp is not surprising.

- **Indirect Speech/Thought/Writing [IS/IT/IW]**. Presenting “the contents of utterances [thoughts/writing] without normally claiming to reproduce the original wording” (Semino and Short 2004: 79).

Semino and Short (2004: 81) note that “IS always involves a reported clause, which is typically introduced by a reporting clause containing a verb indicating speech activity”. The same is true for IT; however, the reporting verb is more likely to be a verb of cognition. At the same time, “the NRTs introducing IT sometimes contain reporting verbs of speech, which are used to indicate silent self-address” (Semino and Short 2004: 129). Consider the following example of IS from my corpus: (reporting clause is underlined, IS bolded): “Two thousand years later, the physiologist Leonard Hill argued in the 1920s that **they [colds] were caused by walking outside in the morning, from warm to cold air**” (Zimmer 2011: 10). This is a prototypical example of IS, where the reporting clause precedes the reported utterance. In my corpus, there are some utterances (but not thoughts) that are interrupted by a reporting clause. For example, “**If something like water is heated, so that it evaporates and turns into a gas, the same corpuscles would still be there,** said Boyle, **but the gas occupies more space than the liquid had done**” (Bynum 2012: 85). Such examples, though formally IS, create an effect similar to that of DS, where authorial control is minimal. This effect I suggest, is different from the one produced by the prototypical variety of IS. Semino and Short (2004) do not analyze examples of this kind. It is possible that their focus on

reporting the types, not functions, prevented them from devoting attention to this slight variation.

- **Free Indirect Speech/Thought/Writing [FIS/FIT/FIW]**. IS/IT/IW that is presented without a reporting clause or any other marker of “narratorial control” (Semino and Short 2004: 86).

In this definition, Semino and Short (2004) admit that they follow Leech and Short (1981) and that other analysts regard FIS/FIT in slightly different terms, requiring only that there be no reporting clause (that is no grammatical dependence) but allowing for other markers of a narrator’s presence, for example, quotation marks. Even though FIS/FIT/FIW appear free of the narrator’s control, these are still indirect forms of discourse, and their freeness, as Semino and Short (2004: 83) argue, may produce confusion, as it obscures the identity of the speaker and requires the reader to pay extra attention to determine to whom the discourse belongs. Here is an example of FIS from my corpus (FIS bolded):

Far from rejoicing, the older scientist screwed up his brow and expressed his doubts that the nucleus contained any sort of special, non-proteinaceous substance. **Miescher had made a mistake, surely**. Miescher protested, but Hoppe-Seyler insisted on repeating the young man’s experiments—**step by step, bandage by bandage**—before allowing him to publish.

(Kean 2012: 20-21)

The tense shift from the simple past to the past perfect indicates a change in the narrative focus and introduces some degree of immediacy and surprise that the reader is to associate with Hoppe-Seyler. In this example, the identity of the speaker is less obscured as in some; however, it is still possible to confuse the FIS with narration especially the second bolded selection (Semino and Short (2004: 83) also note a similar

problem); however, the tense shift helps to distinguish FIS from the other forms of discourse presentation and narration.

- **(Free) Direct Speech/Thought/Writing [(F)DS/(F)DT/(F)DW].**

Original discourse presented as if it were verbatim. Quotation marks and reporting clauses may be present but are not required. The focus is on the fidelity of the presentation of the original discourse.

Semino and Short (2004: 88) express their preference for not separating the free forms from their direct counterparts (In this they admit they contradict Leech and Short (1981).). However, Semino and Short (2004: 88) also admit that they used the two separate tags (one for free and one for direct forms) when the distinction was functionally significant. Such instances are not given much attention, and Semino and Short (2004) clearly prefer the combined category, to which they assign the functions usually associated with DS. Dramatization and character creation are the main roles of (F)DS/T/W. For Semino and Short (2004), the presence or absence of quotation marks and/or reporting clauses does not affect how the reader perceives the discourse presented. They argue that most instances of dialogue omit the formal marks of direct discourse, yet do not aim at a different effect by doing so. Here is an example of DS from my corpus (it includes the reporting clause—underlined): “Rous himself later admitted, ‘I used to quake in the night for fear that I had made an error’” (Kean 2012: 141). Most of (F)DS in my corpus includes quotation marks but does not use reporting clauses—thus representing a mixture of DS and FDS—which tends to argue for Semino and Short’s (2004) combined category.

As a result of the additions that Semino and Short (2004) introduce, the scales of discourse presentation proposed by Leech and Short (1981) now look as follows:

[N] NV—NRSA—IS—FIS—DS(FDS)

[N] NW—NRWA—IW—FIW—DW(FDW)

[N] NI—NRTA—IT—FIT—DT(FDT)

Semino and Short (2004) use [N] to represent narration—a mode of writing that involves no discourse presentation. Technically, it is outside the discourse presentation scales just as are NRS, NRT, and NRW. Even though Narrator's Representation of Speech/Thought/Writing are connected more closely to discourse presentation than narration, these categories themselves only introduce presented discourse, and Semino and Short (2004) do not include them into their frequency counts.

Overall, Semino and Short's (2004) contribution is the introduction of the Writing Presentation as a category of presented discourse alongside speech/thought presentation. They also apply a more detail-oriented approach to the analysis of the already existing categories, which leads them to the distinction between NV/NW/NI on the one side and NRSA/NRTA/NRWA on the other. In general, however, the attempt to account for all the possible forms of discourse presentation in fiction and non-fiction forced Semino and Short (2004) to spend less time analyzing the functions of the discourse presentation categories. This is something that Short (2007, 2012) takes upon himself to remedy. In the following subsection, I will discuss his commentary on the Semino and Short (2004) model.

### **2.3.3. Short's (2007, 2012) Commentary on the Semino and Short (2004) and Leech and Short (1981) Models**

Firstly, if Semino and Short (2004) focused primarily on the frequency information, Short (2007) devotes more attention to the functions of speech/thought/writing presentation. In my opinion, that strengthens the 2004 model. On the other hand, if the

2004 study analyzed a corpus of both fiction and non-fiction, Short (2007) reverts to giving examples of, and drawing conclusions from, fiction texts alone, which, to me, undermines the goals set by Semino and Short (2004).

Short (2007: 230) ascribes the following functions to the presentation of speech and writing: *Faithfulness* (with FIS/FIW and (F)DS/(F)DW being the best options for its fulfillment), *Summarizing* (with IS/IW and NRSA/NRWA representing prototypical examples), *Distancing* (best fulfilled by NRSA/NRWA and NV/NW), *Telling* (with NV being the only prototypical option), and *Vividness, Drama, and Showing* (best achieved by the use of FIS/FIW and (F)DS/(F)DW).

Short (2007: 230-231) notes that thought presentation is markedly different from the speech/writing category in its functions. Short (2007: 230-231) suggests removing from thought presentation the functions of summarizing and faithfulness. Short (2007: 230) argues that “there is something of an issue, of course, concerning to what extent, outside fiction, our thoughts come to us in linguistic form at all”. Therefore, thought presentation cannot be assessed for accuracy. His argument about excluding the summarizing function from the effects of thought presentation is as follows, “There is no possibility of assuming a fictional ‘original’ which can be approximated to, more, or less, in the presentation of thought” (Short 2007: 231). Instead, Short (2007: 321) proposes to focus on the “effects relating to the extent of narrator ‘interference’” when it comes to thought presentation.

The effects that could be achieved via thought presentation, as Short (2007: 231) suggests, can be combined into two opposing groups. The first functional group is a result of more intensive interference from a narrator and consists of *Distancing* and *Telling* (achieved through the use of NRTA and IT). The second functional group

depends of the lesser degree of a narrator's involvement and consists of *Vividness*, *Drama*, and *Showing* (to be achieved via FIT, DT, and FDT).

Another important contribution of Short (2007) is the reevaluation of the Internal Narration (NI) category. If Semino and Short (2004) placed it inside the discourse presentation scale, Short (2007: 234), following Toolan's (2001) suggestion, argues for placing it outside the scale. Short (2007: 234) explains that "cases of NI are the statements that the narrator makes about the inner world of his or her characters" not statement made by the characters themselves.

Short (2007: 234) suggests a new category of Narrator's Presentation of Thought [NT]. NT is used to create the effect of telling; it is an example of a narrator's interference and control. As Short (2007: 235) notes, "NT is used infrequently in novels" because the authors usually prefer to rely on discourse presentation that shows how the characters feel rather than telling the readers about it. Short (2007: 235) also suggests that the contrast between FIT and NT can be used by authors for strategic purposes. For example Short (2007: 235) finds that NT is often employed in detective stories to give the reader clues as to who might be the murderer. NT, according to Short (2007: 234-235), can also be used to place the reader inside the mind of a character but without triggering an emotional attachment. Short (2007: 234-235) argues that NT produces this effect because unlike FIS it does not let the reader be "privy to what [the character] is thinking"; NT alerts the reader only to the fact that the character is thinking of a specific subject. Here is Short's (2007: 234-235) example of NT from a novel by Iain Banks, which uses second-person narration for the part of the story:

The reader is positioned in the mind of a serial murderer as he kills one of his victims....it soon becomes clear by inference that he is experimenting with ways of making his victim suffer before he finally dies.

You let him slump back again so that he's sitting against the chicken-wire gate and when his eyes start to open you pull his head forward by the hair and cosh him again. He falls to the side. You put the plastic ties in your pocket. **You're thinking.** The foxhounds continue barking and yelping. (Banks 56-7, Short's emphasis)

On the thought presentation scale, NT replaces NI, which is now included in Narration.

Thus NT becomes the most narrator-controlled form of thought presentation (Short 2007: 235).

Short (2012) is a continuation of, and a comment on, both Leech and Short (1981) and Semino and Short (2004). In this study, Short (2012) brings up two important aspects that, as he demonstrates, he has missed or misinterpreted in earlier works. Both of the issues are connected with the idea of faithfulness in discourse presentation, which Short (2012) defends against the claims of other researchers. To make his argument, Short (2012: 19) proposes a clear distinction between report, and representation of discourse, where report assumes absolute accuracy, and representation implies “a *mismatch* between the lexis, deixis and grammar of the anterior and posterior discourses” (Short 2012: 19). Presentation, in this framework, may refer to any kind of posterior discourse, either report or representation (Short 2012: 19). This distinction leads Short (2012) to reconsider some of the terminology used in earlier studies. Thus he suggests replacing the term “Representation” and the acronym “R” found in the earlier category names (NRSA, for example) with “Presentation” (to form NPSA, for example). The substitution, Short (2012) suggests, will reflect the nature of the discourse presented more accurately.

Another suggestion that Short (2012) makes is that the idea of faithfulness does not always apply even to such prototypically “faithful” categories of presented discourse as DS. As Short (2012: 23-24) proposes, this is because DS (and other forms



of direct as well as indirect discourse) can be used to create summaries. In his earlier works, for example, Leech and Short (1981) and Semino and Short (2004), he argued that only indirect discourse fulfills the summarizing function. In Short (2007) he allows the possibility that direct discourse too may have summarizing properties (Short 2007: 230); however, the idea is expressed rather tentatively, and the summarizing functions are described as “prototypically associated with NRSA” (Short 2007: 230). Later, Short (2012) fully develops the idea that any discourse category can be used to summarize. Short (2012: 23-24, 29) proposes two types and one subtype of summaries created through discourse presentation: proposition-domain summaries and discourse-domain summaries (with quotative summaries as a subtype).

A proposition-domain summary is a kind of summary that deals with one proposition. This is what was understood as summary in Leech and Short (1981) and Semino and Short (2004). A proposition-domain summary is represented by NPSA and NPWA (Short 2012: 23-24). A discourse-domain summary deals with a large piece of discourse that contains several propositions. Any category of discourse presentation can produce a discourse-domain summary. A quotative summary is a summary “which quotes representative parts” of discourse to create a discourse-domain summary (Short 2012: 29).

As a result of the new approach to the summarizing functions of presented discourse, Short (2012) introduces new scales for speech and writing presentation of discourse-domain summaries. These scales are similar to the discourse presentation scales for speech and writing except that each category receives a subscript “s” to indicate the summarizing properties. Below is a representation of the scales from Short (2012: 28):

NPVs[Narrator's Presentation of Voice, formally NV]—NPSAs—ISs—FISs—DSs

NPWs[Narrator's Presentation of Writing, formally NW]—NPWAs—IWs—FIWs—DWs

As I have demonstrated, Short (2007) makes an important addition to the Semino and Short (2004) study by focusing on the functions of presented discourse and supplying clear prototypical categories associated with each possible effect. The functional distinction between speech/writing and thought presentation, in my opinion, becomes more prominent in this later work than it was in Semino and Short (2004). Short (2012: 22) makes this difference even clearer when he writes that “Thought presentation is *not* the presentation of communication between people but the presentation of someone's inner world” (emphasis in the original). The implication of this conclusion is significant and is prominent in Short (2012) where thought presentation is excluded from the discussion of summaries more explicitly than it is in Short (2007). Functional approach to discourse presentation also makes it possible for Short (2012) to suggest changes in terminology, which reflect the roles of discourse presentation categories more accurately.

If the three discourse presentation models discussed here were combined, the scales originally proposed by Leech and Short (1981) would look as follows (square brackets indicate categories outside the scales but related to discourse presentation—Narrator's Report of Speech/Writing/Thought— or contrasted with them—Narration and Internal Narration):

#### **Speech Presentation Scale**

[N] [NRS] NPV—NPSA—IS—FIS—(F)DS

#### **Writing Presentation Scale**

[N] [NRW] NPW—NPWA—IW—FIW—(F)DW

### **Thought Presentation Scale**

[N, including NI] [NRT] NPT—NPTA—IT—FIT—(F)DT

I will now discuss the final discourse presentation scales as the analytical framework for the thesis and will introduce my modifications.

## **2.4. The Framework for Presented Discourse Analysis of the Popular Science Corpus**

Firstly, I should make clear that the focus of my study is more similar to that of Short (2007, 2012) than to Semino and Short (2004), in that I would like to pay more attention to function. That is not to say that I am not concerned with the forms presented discourse takes in the narratives of discovery but to indicate that it is not my primary goal to introduce any new categories. Rather, I will examine the interaction and the effects of the already existing categories as they were defined and discussed above. With that in mind, I propose a simplified analytical model that is more suitable for my needs.

I should also mention that I will follow the nomenclature suggested by Short (2012) and use the term “Presentation” [P] rather than “Representation” [R] in the names of the categories. The scales I will use therefore are as follows:

### **Speech(Writing) Presentation Scale**

NPS(W)A—IS(W)—FIS(W)—[F]DS(W)

### **Thought Presentation Scale**

NPTA—IT—FIT—(F)DT

The first major alteration that I propose is the combination of the Writing Presentation category with the Speech Presentation category and labeling the joint category Public Discourse. The idea behind the creation of writing presentation was accuracy—Semino and Short (2004: 48) note, for example, that Direct Writing may create a more “accurate word-by-word representation” than Direct Speech. However, Semino and Short (2004: 50) point out that “The writing presentation scale is very like the speech presentation scale in relation to the effects associated with particular categories. This is...because in both cases the original is...a piece of discourse, even though the medium is different”. Short (2007: 230 and 2012) endorses that view of the two categories.

While I see the potential usefulness of the distinction, in my popular science corpus, it is sometimes impossible to distinguish between these two categories, as the authors may present writing in the form of speech by using the scientists’ diaries, papers, or even secondary publications as sources for presented discourse, not to mention that often no specific source for a particular instance of discourse is identified. For example, Greene’s (2011: 11-12) narrative of Lemaitre’s discovery of the Big Bang, introduced here as example 2.1., includes several instances of speech presentation from Lemaitre and Einstein. Underlined fragments identify the utterances as speech since they introduce locations and situations where exchange of information is most often achieved orally, and in the case of the last underlined fragment, the combination of the physical action and the reporting verb suggests speech rather than writing:

2.1 “*Your mathematics is correct, but your physics is abominable.*” The 1927 Solvay Conference on Physics was in full swing, and this was Albert Einstein’s reaction when the Belgian Georges Lemaitre informed him that the equations of general relativity...entailed a dramatic rewriting of the story of creation....The

universe, Einstein admonished Lemaitre, is not now expanding and never was....Six years later, in a seminar room at Mount Wilson Observatory in California, Einstein focused intently as Lemaitre laid out a more detailed version of his theory....When the seminar concluded, Einstein stood up and declared Lemaitre's theory to be **“the most beautiful and satisfactory explanation of creation to which I have ever listened.”**

Note that all the indications of speech presentation (rather than writing) come from the author. They either set the scene (conference, a seminar room) or are reporting devices (“stood up and declared”). Presented discourse itself contains no indications of being either speech or writing. Only one instance of direct speech (bolded) is attributed to a source (a secondary one) in the chapter end notes. The reference is insufficient in determining whether the original words were expressed orally or in writing. The shift from the third to the first person narration that the DS creates changes the perspective of the story but does not help identify this particular instance of presented discourse as either speech or writing. DS in 2.1. can be easily compared to direct speech in a novel, where the “idea of anterior vs. posterior discourse situations does not sensibly apply at all” (Short 2012: 20) since it is impossible to determine what the original was. In my opinion, the distinction between speech and writing in this case is not important since as Semino and Short (2004) and Short (2012) note the effects each produces are similar.

The same situation occurs in Kean (2012: 138-141) in his narrative of Rouse discovering that a virus can cause cancer. Speech presentation appears without any references in the chapter, but the end notes indicate that a biography of the scientist was used in creating the story; the reference is not specific enough to identify which instances of the speech presentation it covers, and it is certainly not enough to distinguish between writing and speaking. This makes it problematic to check the

potential instances of writing presentation for accuracy—the chief parameter for the division between writing and speech (see Short et al. 2002: 327, Semino and Short 2004: 113).

Overall, explicit references to writing are sparse in my corpus, and the majority of the reporting verbs are non-specific enough to allow presented discourse to be interpreted as either speech or writing. To me, the very presence of the ambiguity suggests the lack of importance of the distinction in the narratives. For these reasons, I will use the label Public Discourse to cover both speech and writing presentation. In contrast to this category, I will refer to thought presentation as Private Discourse. In distinguishing between speech and writing on the one hand and thought on the other, I am in accord with Short (2012: 22), who notes that speech and writing have communicative functions, while thought is reflective of a private inner world. Short (2012) also combines the categories of speech and writing presentation for the purposes of his analysis; however, he does not give a specific name to the combined category and refers to it as “speech and writing”.

Another adjustment I make is the merging of NPV and NPT (the categories prototypically associated with production of minimal summaries of discourse) with NPSA and NPTA. While degrees of summarizing could be important, for my purposes, a general indication of a summary is sufficient. When discussing summaries, I will rather focus on whether they are created by means of direct or indirect discourse than on the degree of summarizing. Thus I will consider both of the following examples NPSA even though one introduces more details than the other:

2.2. a. Conway related the story of searching for the Higgs boson in Fermilab data (the LHC wasn't online yet) using his personal favorite channels, ones where a tau lepton is produced. (Carroll 2012: 199)

2.2.b. He said no. (Kaku 2011: 130)

Both 2.2.a. and 2.2.b. are summaries created using indirect discourse. What is important to me are the summarizing properties of both instances of presented discourse not so much the degree of detail.

The categories introduced in the Semino and Short (2004) multi-genre corpus offer some very fine distinctions, which are less relevant in a more homogenous corpus representative of one genre. Previous analyses of speech and thought presentation in a single genre (see, for example, Waugh 1995, Myers 1999, Toolan 2001, Urbanova 2012) tended to have a narrower focus. Waugh (1995) analyses only Direct and Indirect Speech in newspaper reports. Myers (1999) chooses to emphasize direct discourse only when examining presented speech in oral group discussions. Toolan (2001) suggests that it is possible to omit Internal Narration and Narrative Report of Voice from the discourse presentation scales when analyzing fiction; he also draws attention to the more broad distinction between direct and indirect discourse—something that Semino and Short (2004) do not explicitly emphasize. Urbanova (2012) sees it sufficient to examine only free direct and direct forms of presented discourse, which also suggests an underlying broad contrast between direct and indirect discourse.

The one category introduced by Semino and Short (2004) that I found more relevant than other additions is NRS/NRT. I did not include it on the scales because it represents not presented discourse itself but the reporting signals used to introduce it. Short (2007, 2012), for instance, also omits it from the scale. What I find useful about this category is that it accounts for a broader range of phenomena than reporting

clauses. Of all the new categories proposed by Semino and Short (2004), it is the only one that broadens the reach of an older counterpart—reporting clause.

In general, I find the categories with a broader reach more useful for my analysis, as I focus on the interaction and functions of the discourse presentation types. Semino and Short (2004) and Short (2007, 2012) identified the issue of interaction among the types of presented discourse labeling the instances “embedding”, “quotation phenomenon” (Semino and Short 2004), “discourse-domain summary” and “quotative summary” (Short 2012). However, they did not analyze these interactions and combinations of presented discourse types for their dramatization properties. (I explore this issue in chapter 4.) The same is true for the issue of fictionality. Even though Semino and Short (2004) acknowledge the presence of dramatization, emotionality, and personal perspective in presented discourse, they do not discuss these as manifestations of fictionality in non-fiction. At the same time, the conclusion that Semino and Short (2004: 170-171) draw from the analysis of presented discourse is important—the “differences in SW&TP [Speech/Writing & Thought Presentation]...do not necessarily contrast the fiction section with the two non-fictional sections, but suggest much more complex similarities and contrasts among different text-types” (Semino and Short 2004: 170). However, they do not venture beyond this acknowledgement. I hope that my analysis of fictionality illuminates these aspects of presented discourse in non-fiction.

## **2.5. Corpus Selection and Methodology**

For this module I analyzed a corpus of 100 narratives of discovery with 50 narratives being taken from books written by scientists and 50 from books written by science journalists. I initially separated the corpus into the two subgroups anticipating



differences in the numbers, types, and treatment of the discourse presentation. This hypothesis was based on de Oliveira and Pagano's (2006: 642, 643) findings that show discrepancies in the treatment of presented discourse by professional scientists and science journalists. However, upon closer analysis, my corpus did not supply the evidence to support their observations. The reason might be the difference in the texts examined. While de Oliveira and Pagano (2006) looked at articles—professional research articles and popular scientific articles—my corpus is based on popular science books. Therefore, the final version of my analysis does not distinguish the discourse presentation based on the qualifications of the author.

There are 10 books used to construct the corpus. They are listed below alphabetized by the author's last name:

- Bill Bryson 2003, *A Short History of Nearly Everything*
- William Bynum 2012, *A Little History of Science*
- Sean Carroll 2012, *The Particle At the End of the Universe*
- Enrico Coen 2012, *Cells to Civilization*
- Marcus du Sautoy 2011, *The Number Mysteries*
- Timothy Ferris 1988, *Coming of Age in the Milky Way*
- Brian Greene 2011, *The Hidden Reality*
- Michio Kaku 2011, *Physics of the Future*
- Sam Kean 2012, *The Violinist's Thumb*
- Carl Zimmer 2011, *A Planet of Viruses*

These texts represent the following scientific disciplines: astronomy, chemistry, genetics, mathematics, medicine, physics, and virology. All of them are originally written in English, and most have been published between 2011 and 2012. However,

unlike the previous two modules where I focused exclusively on the recently published books, the present study also incorporates two older texts: one from 2003 and one from 1988. The reason behind including older texts was to see whether examples taken from them fit within the analytical categories adopted primarily with the newer texts in mind. For example, one of the underlying claims of the thesis is that popular science is directed towards the presentation of scientific issues through emotionally engaging mechanisms, especially dramatizing. Using older texts allows me to say that such mode of presentation is not as novel as current research of popular science suggests. It was probably underreported by the analysts, who, as my overview of the field leads me to believe, became focused on the idea of the emotional connection with science fairly recently (see 1.3.).

Overall, even though I do supply the frequency counts for the types of the discourse presentation observed, this is largely a qualitative study with a sample of 193 occurrences of the discourse presentation of scientists. These occurrences are short stretches of discourse that are on average about 35 words long. However, the narratives themselves are not very long either, ranging from between 200 to 500 words. These narratives of discovery are not themselves the end products but rather brief excursions into history on a larger journey to uncovering the potentials of the modern-day science. They often provide the reader with the much-necessary background of the fundamental laws and scientific principles.

Although I haven't analyzed every instance of the discourse presentation in the books, having examined the texts beyond the narratives as well, I conclude that the categories of discourse presentation used for the analysis of the narratives of discovery are exhaustive and reflect the forms of discourse presentation found outside of the

narratives. I will provide a general overview of the discourse presentation in the selected books in chapter 6 and offer a comparison with presented discourse inside the narratives.

In order to collect the sample of the discourse presentation occurrences that was representative of each author but at the same time still manageable for manual analysis, I first limited the number of the narratives analyzed from each text. I looked at 10 narratives of discovery from each author. To collect the 10 narratives from each text, I first went through each book and identified all the narratives of discovery using the criteria for narrative outlined in Module Two<sup>1</sup>. From the books that included 15 or fewer narratives of discovery, I took the first 10. From the books that included more than 15 narratives of discovery, I used three narratives from the beginning of the text, three from the middle, and four from the concluding sections.

Having selected the narratives, I then analyzed each narrative for evidence of presented discourse of scientists. After that I proceeded to identify all occurrences of Public and Private Discourses, labeling them according to the categories introduced at the beginning of 2.4. In addition to the discourse presentation categories, I also analyzed the Narrator's Reports of Speech/Thought (reporting clauses) for the presence of emotionality that projects the authors' feelings toward presented discourse that follows. NRS/NRT have been suggested (see, for example, de Oliveira and Pagano 2006: 641) as mechanisms that place the "writers and readers in interactive relation" by allowing the authors to evaluate the stretch of presented discourse that follows. Thus

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<sup>1</sup> Narratives of discovery possess a certain structural makeup: they start out with a hypothesis, develop/prove/disprove it, and then supply an evaluation, which examines the discovery's relevance. Such narratives often function as explanatory vehicles for the scientific concepts discussed in the books.

authors can guide the readers' perception of and emotional reaction to presented discourse through specially marked NRS/NRT. Consider example 2.3. (NRS bolded):

**2.3. Then, in 2010, scientists made the shocking announcement that 5**  
percent of the debris contained water, so the moon was actually wetter than  
parts of the Sahara desert. (Kaku 2011: 268)

By evaluating the discovery as “shocking” before presenting the actual details of the announcement, Kaku is influencing the readers' emotional reaction to the discovery. The readers are to perceive the findings as unexpected and unusual. In cases like these, especially where presented discourse is indirect, the author takes it upon himself to convey the emotionality of the message possibly because the original utterance did not possess the same level of emotionality. This could be also seen as the author's monitoring of the understanding and evaluation of the discovery by the reader (The notion of monitoring is usually associated with fiction; see, for example, Murphy 2005.). I shall refer to such NRS/NRT as NRSe/NRTe, where “e” indicates emotionality (see chapter 4).

My analysis yielded 193 total occurrences of speech and thought presentation (not counting NRS/NRT as separate occurrences) in 100 narratives of discovery. While the number of occurrences is not very large, I believe the sample to be sufficient for a qualitative study that focuses on the effects created by the presentation of discourse.

## **2.6. Conclusion**

In this chapter I looked at the existing models of discourse presentation analysis, focusing on the studies of Leech and Short (1981), Semino and Short (2004), and Short (2007, 2012). I found the Semino and Short (2004) model the most comprehensive. At the same time, I proposed several simplifications of their model which led me to

combine the categories of speech and writing into one category of Public Discourse and consequently rename thought presentation Private Discourse. I also chose not to regard Narrator's Representation of Voice/Writing (NV/NW) as a separate category but rather to include it inside NPSA. I use NPTA as the combined category that contains Narrator's Presentation of Thought (NT) [as described by Short 2007] and Narrator's Presentation of Thought Acts. Thus the category of Narrator's Presentation of Speech/Thought Acts (NPSA/NPTA) becomes the only category to represent those forms of presented discourse that are most controlled by the author. In introducing two categories that reflect the author's utmost mediation of presented discourse, Semino and Short (2004) and Short (2007, 2012) attempted to determine to what degree such mediation is possible before it blends into narration. For my purposes, the simple distinction between narration and NPSA/NPTA is sufficient, as I am not focusing on author mediation and the techniques and effects it produces. As I noted before, the Semino and Short (2004) study is concerned primarily with the accuracy of the presentation and less so with function. The focus on accuracy is also evident in their earlier work (see, for example, Short, Semino, and Wynn 2002: 334).

As a result of the changes, my model of presented discourse analysis is a combination of all the three models discussed in this chapter, with the basic structure based on Leech and Short (1981) and Semino and Short (2004), and the terminology from Short (2012). Below are my scales for Public and Private Discourses:

**Public Discourse Presentation Scale**

NPSA—IS—FIS—(F)DS

**Private Discourse Presentation Scale**

NPTA—IT—FIT—(F)DT

## CHAPTER THREE

### QUANTITATIVE CORPUS DATA: COMPARISON WITH SEMINO AND SHORT (2004)

#### 3.1. Introduction

In the preceding chapter, I suggested a combined category of Public Discourse to cover both speech and writing presentation, and I proposed the label Private Discourse to describe thought presentation. I will continue to use the terms Public and Private Discourse throughout the thesis when referring to my own findings, but I will use “speech/writing presentation” and “thought presentation” when discussing research of others who employed these specific terms. I will also continue to use the acronym “R” (Representation) when discussing the findings of Semino and Short (2004) since this was the term they used. However, when talking about my own findings, I will use the more recent term “Presentation” and the acronym “P”. The names of the categories in the tables and the table titles will also reflect this discrepancy.

In this chapter I present the quantitative data from my corpus and compare it with that of Semino and Short (2004). The reason for this comparison is that the Semino and Short (2004) study is the most comprehensive corpus analysis of presented discourse in non-fiction to date even though it does not deal with non-fiction exclusively. The size of their corpus (258,348 words and 16,533 occurrences of presented discourse) allows for their findings and conclusions to be representative of the genres they examined. At the same time, I remain mindful that Semino and Short (2004) included only certain genres to represent fiction and non-fiction. For instance, the fiction section was represented by novels and non-fiction section by newspapers,

biographies, and autobiographies. While it is possible that the newspaper reports analyzed contained scientific news and thus represented the genre of popular science, there is no clear indication of that in Semino and Short (2004). Therefore it is unclear if their findings can be generalized to include the genres beyond those examined. In investigating another non-fiction genre, I am testing their observations and conclude that for the most part their findings are more generalizable than Semino and Short (2004) themselves were able to argue based on the limitations of their corpus.

In the frequency information introduced below, the numbers for the non-fiction section of the Semino and Short (2004) corpus are a combination of the figures for their press and (auto)biography sections unless otherwise identified.

### **3.2. General Comparison of Frequency Information**

By contrast with the vast Semino and Short (2004) corpus, my sample is rather small. I analyzed a total of approximately 30,000 words and 193 occurrences of presented discourse. At the same time, my smaller corpus is much more specialized, dealing not only with just one non-fiction genre but also focusing on a very specific subset of texts within it—narratives of discovery. However, my data correlates with the general findings about the distribution of presented discourse observed by Semino and Short (2004). For example, Semino and Short (2004: 59) demonstrate that the speech/writing presentation occurs more often than the presentation of thought. What Semino and Short (2004) analyzed under the categories of speech presentation and writing presentation corresponds to my category of Public Discourse. The category I label Private Discourse corresponds to Semino and Short's (2004) thought presentation.



Tables 3.1. a. and 3.1.b. show the correlation between my data and that of Semino and Short (2004).

Table 3.1.a. Frequency of Private and Public Discourse Presentation in the Narratives of Discovery

Total number of discourse presentation occurrences	
193	
Public Discourse # of occurrences/ Percentage	Private Discourse # of occurrences/Percentage
140/72%	53/28%

Table 3.1.b. Semino and Short’s Frequency Counts for Speech/Writing and Thought Presentation [Source: Semino and Short 2004: 59]

	Speech/Writing	Thought
Whole Corpus	58.62%	16.24%
Non-fiction [press]	70.65%	5.66%
Non-Fiction [(auto)biography]	53.89%	18.23%
Fiction	51.71%	24.40%

I should note that Semino and Short (2004) included Narration and what they called “Portmanteau” tags as part of their frequency counts. Portmanteau tags were assigned to stretches of presented discourse that contained “ambiguities within each mode of presentation (e.g. DS-FDS)” (Semino and Short 2004: 58). I did not include Narration as part of the frequency counts and did not consider portmanteau tags. This is why my percentages of Public and Private Discourse frequencies add up to one hundred, while Semino and Short’s (2004) percentages for speech/writing and thought presentation do not. Taking these discrepancies into account, the overall picture is the same for both studies: thought presentation is significantly less frequent. These numbers also show that the relationship between Private and Public Discourses in the narratives of

discovery is somewhere between that of speech/writing and thought in the (auto)biography section and in the fiction section of the Semino and Short (2004) corpus. The ratio of Public to Private Discourse in the narratives of discovery is 2.5. The ratio of speech/writing to thought presentation in the (auto)biography section of the Semino and Short (2004) corpus is 3, and in the fiction section it is 2.1. See table 3.2.

Table 3.2. Speech/writing to Thought Presentation Ratios (Semino and Short 2004) Compared with Public to Private Discourse Ratios

Ratio of Speech/writing to Thought Presentation in Semino and Short's (2004) <b>Fiction Section</b>	2.1 : 1
Ratio of Public to Private Discourse in the <b>Narratives of Discovery</b>	2.5 : 1
Ratio of Speech/writing to Thought Presentation in Semino and Short's (2004) <b>(auto)biography Section</b>	3.0 : 1
Ratio of Speech/writing to Thought Presentation in Semino and Short's (2004) <b>Whole Corpus</b>	3.6 : 1
Ratio of Speech/writing to Thought Presentation in Semino and Short's (2004) <b>Press Section</b>	12.5 : 1

When the individual categories of discourse presentation are considered, Semino and Short's (2004) frequency counts confirm the earlier observations of Leech and Short (1981) of what constitutes the norms. It is important to keep in mind though that Leech and Short (1981) dealt only with fiction, while Semino and Short (2004) examined non-fiction as well. At the same time, the general findings are still similar. That is for speech presentation, direct discourse is the norm, and (Free)Direct Speech is the most frequent category in Semino and Short (2004: 96, 150). For thought presentation, indirect forms are the norm. Here, however, there is a difference in the exact categories suggested as the norm by Leech and Short (1981) and observed by

Semino and Short (2004). Leech and Short (1981: 276) concluded that Indirect Thought is the norm for thought presentation. Semino and Short's (2004: 114, 151) observations suggest that Free Indirect Thought is the norm (that is the most frequently occurring category) for the corpus overall and for fiction. For non-fiction, however, Semino and Short's (2004) data suggest Indirect Thought is the norm. In general, their frequency counts indicate Internal Narration (NI) as the most frequent category; however, they express doubt whether or not this category belongs on the thought presentation scale (Semino and Short 2004: 147-149). Later, Short (20012: 23) confirms that it does not. His decision is clearly influenced by Toolan's (2001: 142) proposition that NI belongs in the Narration category (see Short 2007: 233-234). Examples 3.1.a. and 3.1.b. illustrate NI as presented by Short (2012) and as found in my corpus:

3.1.a. Anger well up inside him. (Short 2012: 31, note 7)

3.1.b. To Rutherford's astonishment some of the particles bounced back.  
(Bryson 2003: 139)

Toolan (2001:142) points out that occurrences like these “differ from all the other modes for reporting character's discourse in that they carry no mention of the content of the speaking or thinking, but chiefly report its manner or style”. For that reason they belong outside the discourse presentation scale, and this is why I am not considering NI in the frequency counts introduced below.

For writing presentation (a category not addressed by Leech and Short (1981)), Semino and Short (2004: 151) show that Narrator's Representation of Writing Acts is the most frequent category. This finding is suggestive of the major difference between speech and writing presentation. In almost everything else, as Semino and Short (2004) observed, these categories are similar. In the comparison of the frequency counts, the

data from the speech and writing sections of the Semino and Short (2004) study will be combined to make it easier to compare with the Public Discourse category.

### 3.2.1. Public Discourse in the Narratives of Discovery and Speech/writing Presentation in Semino and Short (2004)

As I consider speech and writing presentation as a single category of Public Discourse, I compare my findings with a combined category speech/writing from Semino and Short (2004). Despite this divergence from their model, the observations I made support those of Semino and Short (2004). For instance, (F)DS has a large number of occurrences in both corpora. However, it is not the most frequently occurring category of Public Discourse; it shares this title with NPSA. Table 3.3. presents the comparison between my data and that of Semino and Short (2004). Table 3.4. includes the data from my corpus with examples.

Table 3.3. Comparison of Public Discourse Frequencies in the Narratives of Discovery with the Speech/Writing Frequencies in the Semino and Short (2004) Whole Corpus  
[Source: Semino and Short 2004: 67, 101]

		Narratives of Discovery # of occurrences followed by percentage	Semino and Short (2004) # of occurrences followed by percentage
Type	(F)DS/(F)DW	47 (33%)	3155 (47%)
	IS/IW	34 (25%)	1188 (18%)
	FIS/FIW	4 (3%)	188 (2.8%)
	NPSA (NV/NW + NRSA/NRWA)	47 (33%)	2045 (31%)

Table 3.4. Types and Frequency of Public Discourse Presentation in the Narratives of Discovery

		Example	# of occurrences out of 140 total
Type	(F)DS	“What a field of novelty is here opened to our conceptions!” he exclaimed, more delighted by the variety of the sky than bothered at having been wrong. (Ferris 1988:157)	47 (33%)
	IS	Moreover, they claim that this process is universal, that, any visual thought or even dream should be able to be detected by the fMRI scan. (Kaku 2011: 57)	34 (25%)
	FIS	Far from rejoicing, the older scientist screwed up his brow.... Miescher had made a mistake, surely. (Kean 2012:20)	4 (3%)
	NPSA	Penzias and Wilson phoned Dicke at Princeton and described their problem to him. (Bryson 2003: 12)	47 (33%)
Mixed Categories	<u>NPSA+DS</u>	A colleague later described him as “ <i>driven by a demon.</i> ” (Kean 2012:20)	5 (4%)
	<u>NPSA+IT</u>	<u>Newton is said to have recalled</u> , near the end of his life, that <b>this inspiration came to him when he saw an apple fall from the tree in front of his mother's house.</b> (Ferris1988:107)	1 (.7%)
	<u>IS+DS</u>	But Cirelli insists that <b>he obtained permission from the PAMELA physicists who were at the conference:</b> “ <i>We asked the PAMELA people [there], and they said it was not a problem.</i> ” (Carroll 2012:200)	2 (1.3%)

As Table 3.3. shows, the percentages for the frequency of the specific discourse presentation categories in my corpus and in that of Semino and Short (2004) are rather similar. In fact, if my data is compared to the Semino and Short (2004) non-fiction section (see figure 3.1. below), the percentages are almost identical: with (F)DS and NPSA (NV+ NRSA) dominating the Public Discourse presentation spectrum. In both the Semino and Short (2004) study and in my corpus, the most and the least author-controlled types of presented discourse, (F)DS and NPSA, account for a little over 1/3 of the total occurrences each. This means that more than 60% of Public Discourse and speech/writing is located at the extremes of the discourse presentation scale. See figure 3.1. The types of Public Discourse and speech/writing presentation that occupy the middle of the scale (IS and FIS) vary in the two corpora by only one percentile point:

IS in Public Discourse is responsible for 25 % of total occurrences, while in Semino and Short (2004: 67, 101) speech/writing category the number is 24%. FIS is the least frequent type in both corpora with only 3 % of occurrences in each.

Figure 3.1. Public Discourse Presentation Scale with Percentages from Semino and Short (2004) non-fiction section [1] and from The Narratives of Discovery [2]

	NPSA	IS	FIS	(F)DS
[1]	38%	24%	3%	35%
[2]	33%	25%	3%	33%

Note that my percentage points do not correspond to 100% because in addition to the standard types of presented discourse I also singled out what I shall call “mixed categories”. See Table 3.4. Semino and Short (2004: 153-159) observed similar occurrences and analyzed them under the category of “specific phenomena” (Semino and Short 2004: 153-200). My “mixed categories” correspond to two such specific phenomena—quotation phenomena and embeddings. Quotation phenomena are defined by Semino and Short (2004: 153) as “the presence of a stretch of text surrounded by quotation marks within a non-direct form of” speech/writing/thought presentation. In Table 3.4. such occurrences are introduced as +DS categories. The reason for identifying the individual parts of the quotation phenomena is to show which types of Public Discourse allow for quotations. Semino and Short (2004: 156) identify NRSA/NRWA and IS/IW as the most frequent categories to host stretches of text in quotation marks for either fiction or non-fiction. My data correlates with their findings. In fact, NPSA and IS are the only categories in my corpus to contain quotation phenomena. When Semino and Short’s (2004: 156) frequency counts of quotation phenomena in the whole corpus are translated into percentages, it becomes clearer that, just like in my corpus, such occurrences are rare. However, my corpus shows slightly

higher percentages when compared with those of Semino and Short (2004). See Tables 3.5.a. and 3.5.b.

Table 3.5.a. Frequency Counts for Quotation Phenomena in Semino and Short (2004)

[Source: Semino and Short 2004: 156]

	Category of Speech/writing Presentation	Combined Frequency Count	Category of Speech/writing Presentation	Combined Frequency Count
Whole Corpus	NRSA/NRWA	174 (1.05%)	IS/IW	153 (0.92%)
Non-Fiction	NRSA/NRWA	153 (0.92%)	IS/IW	147 (0.88%)

Table 3.5.b. Frequency Counts for Quotation Phenomena in the Popular Science Narratives of Discovery

Category of Public Discourse Presentation	Frequency Count
NPSA	5 (4%)
IS	2 (1.3%)

Once again, the frequency counts are different due to the sizes of the corpora, but the general trend identified by Semino and Short (2004) is present in my corpus as well. NPSA in my corpus and NRSA/NRWA in the Semino and Short (2004) contain quotation phenomena more often than any other category. At the same time, my corpus exhibits a higher frequency of quotation phenomena overall. Percentage wise, NPSA in my corpus contain quotation phenomena almost twice as often as the fiction and non-

fiction sections of the Semino and Short (2004) corpus combined. As I will demonstrate in the following chapter, NPSA are a very important category to the narratives of discovery. The fact that they are more likely to contain quotation phenomena than any other type of Public Discourse and their overall prominence in the corpus becomes clearer when I consider their functions. At this point, the numbers indicate that NPSA play a very active role and are, perhaps, more versatile than the other types of Public Discourse.

The other representative of the mixed categories (NPSA+ IT) is an example of embedding. Semino and Short (2004: 171) define embeddings as “individual instances of SW&TP [that] themselves involve the presentation of more speech, thought or writing”. The example listed in Table 3.4. is the only example of embedding in the corpus that demonstrates a combination of Public and Private Discourses. Another example that includes a combination of speech and writing is analyzed under DS as part of the Public Discourse category since I am not separating speech and writing presentation. There is also an occurrence of IS embedded inside DS, which is analyzed under the (F)DS category. Needless to say that with only three examples of embedding, my frequency counts do not resemble those of Semino and Short (2004: 176), who find that NRSA that serve as the host category for embeddings account for 36% of their non-fiction section.

Overall, despite the great discrepancies in the number of occurrences between my corpus and the Semino and Short (2004) data, the general tendencies of discourse presentation for non-fiction are the same, as the analysis of percentage points clearly demonstrates. Both corpora show that in non-fiction presentation of speech/writing, the preferred forms are at the opposite ends of the discourse presentation scale. Not only



that, but the frequency of (F)DS is roughly the same in both studies, and so is the frequency of NV+NRSA and NPSA. What these figures show is that the discourse presentation in the narratives of discovery corresponds more closely to the Semino and Short (2004) non-fiction data than it does to the discourse presentation in fiction. Such correlation was expected since the narratives of discovery fall within the genre of non-fiction.

I will interpret these findings in more detail and explain their significance in the following chapter. For now, I turn the attention to the comparison of the frequency counts for Private Discourse with those of thought presentation from Semino and Short (2004).

### **3.2.2. Private Discourse in the Narratives of Discovery and Thought Presentation in Semino and Short (2004)**

Unlike Public Discourse, Private Discourse presentation in the narratives of discovery does not follow the overall pattern established by Semino and Short (2004) very closely. See Table 3.6. However, as Table 3.7. demonstrates the distribution of Private Discourse in the narratives of discovery resembles the pattern for non-fiction observed by Semino and Short (2004). As I noted at the beginning of the chapter, I eliminated the category of Internal Narration (NI) from the frequency counts since other studies (see, for example, Toolan 2001 and Short 2007, 2012) suggest that it belongs inside the category of Narration and should not be part of the discourse presentation scale. I adjusted the total number of occurrences in each section of the Semino and Short (2004) corpus accordingly. Thus the data in Tables 3.6. and 3.7. reflects the numbers and percentages that do not take NI into account. Tables 3.6. and 3.7. below reflect the

comparison of my data with that of Semino and Short (2004). Table 3.8. shows my data with examples from the corpus.

Table 3.6. Comparison of Private Discourse Frequencies in the Narratives of Discovery with Thought Presentation Frequencies in the Semino and Short (2004) Whole Corpus [Source: Semino and Short (2004: 115)]

		Narratives of Discovery # of occurrences followed by percentage	Semino and Short (2004) # of occurrences followed by percentage
Type	(F)DT	3 (5.6%)	107 (15%)
	IT	24 (≈47%)	201 (29%)
	FIT	0	275 (40%)
	NPTA	26 (≈47%)	114 (16%)

Table 3.7. Comparison of Private Discourse Frequencies in the Narratives of Discovery with Thought Presentation Frequencies in the Semino and Short (2004) Non-fiction Section [Source: Semino and Short (2004: 115)]

		Narratives of Discovery # of occurrences followed by percentage	Semino and Short (2004) # of occurrences followed by percentage
Type	(F)DT	3 (5.6%)	30 (13%)
	IT	24 (≈47%)	106 (46%)
	FIT	0	45 (19%)
	NPTA	26 (≈47%)	52 (22%)

Table 3.8. Types and Frequency of Private Discourse Presentation in the Narratives of Discovery

		Example	# of occurrences out of 53 total
Type	(F)DT	The healthy plants, Mayer discovered, turned sick as well. <i>Some microscopic pathogen must be multiplying inside the plants.</i> Mayer took sap from sick plants and incubated it in his laboratory. (Zimmer 2011: 3-4)	3 (5.6%)
	IT	It occurred to Bradley that the earth is like a boat adrift in winds of starlight—that, as the earth moves through the starlight, its motion alters the apparent positions of the stars. (Ferris 1988: 138)	24 (≈47%)
	FIT		0
	NPTA	Hubel and Wiesel decided to look at what would happen if animals were deprived of sight in one or both eyes as they grew up. (Coen 2012: 324)	26 (≈47%)

Semino and Short's (2004) frequency counts for thought presentation in non-fiction and in the whole corpus suggest two different categories as the norm: FIT for the corpus and as a whole (and for fiction) and IT as the norm for non-fiction. FIT as the norm for thought presentation (especially in fiction) contradicts the earlier assumptions of Leech and Short (1981), who suggested that in fiction (and by their extension, overall) IT should be the norm for the presentation of thought. Ironically, the findings from the Semino and Short (2004) non-fiction section and from my non-fiction corpus of the narratives of discovery are the ones that provide support for Leech and Short's (1981) suggestion. In my corpus, however, IT occurs just as often as NPTA (both at ≈47%), which is not the case with the Semino and Short (2004) non-fiction data. At the same time, in their corpus, NRTA in non-fiction is the second most numerous category after IT, with 22% of total occurrences.

FIT, the norm for Semino and Short's (2004) whole corpus, is not represented at all in the narratives of discovery. This might appear as a striking difference between the

two corpora. However, when my data is compared with the non-fiction section of the Semino and Short (2004) corpus, the difference is less pronounced. Especially if the non-fiction section is analyzed not as a combination of press and (auto)biography but as its component parts. According to Semino and Short (2004: 115), there are no occurrences of FIT in the press section. The 45 occurrences reflected in Table 3.7 are all from (auto)biographies. This helps reconcile my data with the figures from Semino and Short (2004) since, as they show, not every non-fiction genre includes FIT. However, FIT in the Semino and Short (2004) non-fiction section is not the least frequent category. In the whole corpus and in the non-fiction section of Semino and Short (2004), it is (F)DT that occupies this position. If FIT is excluded from the consideration in my corpus, then the frequency count for (F)DT falls in line with what Semino and Short (2004) observed.

Private Discourse in the narratives of discovery is free from quotation phenomena or embeddings (except for one occurrence listed in Table 3.4). Semino and Short (2004: 157, 172, 174, 179), on the other hand, introduce numerous examples of embeddings that include thought presentation, and their frequency counts suggest that embedding of thought is rather common for non-fiction: with 217 occurrences out of 327 total occurrence of embedding of thought in their corpus. In this aspect, the narratives of discovery differ radically from the pattern shown in Semino and Short (2004).

When it comes to quotation phenomena, the difference is less striking. While Semino and Short (2004) do not claim that there are no quotation phenomena inside thought presentation, they note that the most frequent occurrences of quotation phenomena are found within speech presentation (Semino and Short 2004: 155). They

continue to say that “the eight most frequent ‘q’ [quotation phenomena] tags do not include any thought presentation” (Semino and Short 2004: 155). In this respect, the absence of quotation phenomena in Private Discourse is not extraordinary, and it is not expected given the nature of this discourse presentation type. As I will show in the following chapters, the lack of embeddings and quotation phenomena among Private Discourse types does not necessarily mean that these categories do not interact with Public Discourse. It suggests, however, that the interactions are realized differently.

Overall, Private Discourse in the narratives of discovery follows the pattern established for the presentation of thought in non-fiction by Semino and Short (2004), but it does not correspond closely with the data on thought presentation in the whole corpus. For instance, the norm for Private Discourse presentation suggested by the frequency counts corresponds to that for non-fiction in the Semino and Short (2004) study. However, there are some marked differences between Private Discourse in the narratives of discovery and the presentation of thought in non-fiction analyzed by Semino and Short (2004). For example, the comparative analysis of the frequency counts suggests that Private Discourse lacks some complex features like embeddings and quotation phenomena observed in thought presentation by Semino and Short (2004).

### **3.3. Conclusion**

As the comparison of the frequency counts for Public and Private Discourses with the Semino and Short (2004) corpus indicates, the narratives of discovery distribute presented discourse across the available categories in a manner consistent with the other non-fiction genres. That means that indirect forms of discourse presentation dominate. The only instance where this is not entirely so is in Public Discourse, where

(F)DS is found to be as frequent as NPSA. The difference between (F)DS and NRSA in the Semino and Short (2004) non-fiction section is 3%. While this is not a significant gap, its very presence allows Semino and Short (2004: 226) to conclude that “non-fictional genres make greater use of the less direct categories of speech presentation”. At the same time, the data from the Public Discourse of the narratives of discovery does not lead to the same conclusion and points in favour of my initial assumption that the popular science narratives of discovery use indirect discourse for the purposes usually assigned to direct discourse in fiction. I explore this assumption in the following chapter.

## CHAPTER FOUR

### DRAMATIZATION OF THE NARRATIVES OF DISCOVERY: THE ROLES OF PUBLIC AND PRIVATE DISCOURSES

#### 4.1. Introduction

As I look at my data in light of the comparative analysis undertaken in chapter 3, I begin to identify notable points about the roles of Public and Private Discourses in the popular science narratives of discovery. For instance, the frequency counts indicate that (F)DS and NPSA are prominent in Public Discourse and that IT and NPTA are important to Private Discourse. In this and the following chapter I will analyze the forms and functions of Public and Private Discourses and will examine not only the individual types but also address the issue of interaction of the various discourse types.

In the present chapter I am concerned with dramatization achieved through presented discourse. By dramatization I understand those aspects of fictionality that contribute to the re-imagining and reconstructing of real-life events (presentation of dialogue) and also those mechanisms that help show to the reader the subjective experiences of the scientists (emotionality and personal perspective). When the categories of Public and Private Discourses are considered individually, it appears that only Public Discourse contributes to dramatization. For instance, a little over half of all occurrences of Public Discourse perform dramatizing functions, while no occurrences of Private Discourse are used to dramatize. This breakdown is somewhat unusual since other studies suggest that Private Discourse has dramatizing properties, especially those associated with emotionality (see, for example, Semino and Short 2004: 118, 124; Short 2007: 231). On the other hand, Private Discourse categories that are traditionally regarded in connection with “vividness” and “drama” (Short 2007: 231) or with

“heightened emotion” and “protracted access to the consciousness of characters” (Semino and Short 2004: 118, 124) are practically absent from the narratives of discovery. These categories are FDT, DT, and FIT. There are only 2 occurrences of DT in the narratives, 1 occurrence of FDT, and 0 occurrences of FIT. At the same time, when Private Discourse is considered not separately but alongside Public Discourse, it does contribute to dramatization.

While I argue that all types of Public Discourse can potentially contribute to dramatization, my data suggests that (Free)Direct Speech and Narrator’s Presentation of Speech Acts are the most prominent ways of fictionalizing the narratives of discovery. When it comes to Private Discourse, NPTA are most likely to combine with Public Discourse. There are 9 NPTA that work in combination with Public Discourse versus only 4 occurrences of IT that do so.

Taking into account that the majority of dramatization occurs through Public Discourse, the chapter will address Public Discourse in more detail, with NPSA and (F)DS being the focus. Other categories of Public Discourse as well as Private Discourse will be mentioned in the discussion of the interaction among discourse types. However, they will receive more attention in the following chapter that addresses non-dramatizing properties of presented discourse in the narratives.

I propose that in the narratives of discovery the functions of NPSA are not limited to summarizing as has been suggested by previous analyses of speech and writing presentation (see, for example, Toolan 2001, Semino and Short 2004, Short 2007). I argue that NPSAs can be used to dramatize as well as to summarize and are the preferred method of introducing dialogue in the narratives of discovery.



In effect, I am proposing a new look at the function scale for presented speech/writing found in Short (2007: 230). Dealing with examples from literary fiction, Short (2007: 23) assigns dramatizing properties (“drama”, “Showing”) primarily to direct and free direct forms of speech/writing. He does, however, allow the possibility that FIS/FIW may also contain these but to a lesser degree. Thus, in a way, Short (2007) sets the precedent for indirect discourse possessing some level of dramatization. At the same time, FIS/FIW is the cut off point for the dramatizing properties on his functional scale—IS and NRSA are seen as fulfilling the summarizing functions only and thus distancing the reader from the characters and their actions. I suggest that the dramatizing function is universal in Public Discourse of the narratives of discovery and may be found throughout the scale but is concentrated mostly at the very ends of the scale with (F)DS and NPSA exhibiting more dramatizing properties than other types of Public Discourse.

I also argue that the degree of dramatization is not tied to the directness or indirectness of a discourse presentation type but should be evaluated on a case by case basis. Myers (1999: 397) comes to a similar conclusion regarding the functions of presented discourse. He points out, relying on his own evidence and on that of Baynham (1996) and Thompson (1996), that the functions of presented discourse “are more complex than was suggested by studies of...literary language, and that the functions vary with mode, genre, and social roles”. Below I reproduce the function scale from Short (2007: 230)—figure 4.1.a—and present my proposed scale that reflects the modifications suggested above—figure 4.1.b.

Figure 4.1.a. Functions of Speech/Writing Presentation [Source: Short (2007: 230)]

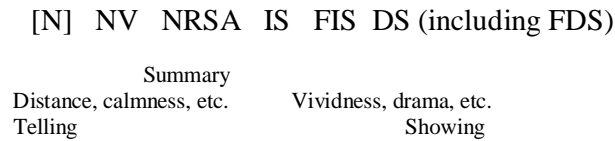
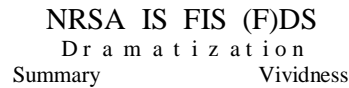


Figure 4.1.b. Functions of Public Discourse in the Narratives of Discovery



In my opinion, NPSAs retains their summarizing properties but may utilize them to dramatize. In the following sections, I supply examples and explain the reasoning behind the proposed changes to the function scale.

#### **4.2. Dramatization in Presented Discourse: It Is Not Just (F)DS**

Semino and Short (2004: 96, 150-151) note that (F)DS is the most frequent category “by a long way” in their whole corpus. The combined frequencies for speech/writing represent almost 50% of their whole corpus and 73% of the fiction section. This finding confirms Leech and Short’s (1981/2007: 276) suggestion that DS is the norm for the presentation of speech. On the other hand, Semino and Short’s (2004) study and my analysis of the narratives of discovery highlight the prominence of another category of discourse presentation—NRSA/NRWA in Semino and Short (2004) and NPSA in my analysis. In my corpus NPSAs are as frequent as (F)DS, and in Semino and Short’s (2004) frequent whole corpus NRSAs/NRWAs are the second most category after (F)DS (see chapter 3 for more precise data). The Leech and Short (1981/2007: 260) study that focused on fiction only, designated NRSA as only “useful for summarizing relatively unimportant stretches of conversation”. However, my data and that of Semino and Short (2004) shows a very high frequency for this category, which suggests

two possible conclusions: (1) either NPSAs summarize more than just “unimportant” conversations or (2) they perform functions additional to summarizing. The data from my corpus, in particular, [(F)DS and NPSA have the same number of occurrences, with each accounting for about 33% of Public Discourse] points to the importance of this category. It is generally accepted that (F)DS is associated with dramatization (see, for example, Semino and Short 2004: 89, Short 2007: 230) and NPSA with summarizing (see, for example, Toolan 2001: 130, Semino and Short 2004: 73, Short 2007: 230). At the same time, in my corpus, the authors often draw on the summarizing properties of NPSA in order to dramatize, as I will demonstrate below.

Dramatization, as it relates to discourse presentation, is usually understood differently when it comes to fiction and non-fiction. However, it is most often associated with (F)DS no matter the text type. For example, in fiction (F)DS is used to create characters, achieve insight into their lives, and position the reader as an overhearer of character dialogue (Rimmon-Kenan 2002: 63-64; Semino and Short 2004: 92; Toolan 2001: 129). In non-fiction, dramatization, according to Semino and Short (2004: 94), is limited primarily to the presentation of personal perspective and the demonstration of emotions.

The dramatizing properties of (F)DS in non-fiction are secondary, eclipsed by the primary expectation of accuracy and faithfulness of representation (see, for example, Bell 1991, Semino and Short 2004, Urbanova 2012). The studies that suggest such breakdown of functions for (F)DS draw their conclusions primarily from the examples found in newspapers.

These findings on dramatization suggest two possible outcomes for non-fiction: (1) there is very little dramatization in non-fiction, and (2) dramatization in non-fiction

might be achieved through the means of discourse presentation other than (F)DS. It is important to keep in mind, however, that the narratives of discovery appear to differ from other non-fiction genres in the expectations of faithfulness for (F)DS. The absence of clear references to sources in the narratives suggests that dramatization is more important than reliability. In that, the narratives of discovery are closer to fiction than to non-fiction. My data suggests that there is no lack of dramatization in non-fiction but that it is divided between two discourse presentation categories—(F)DS and NPSA. The features of dramatization associated primarily with (F)DS in fiction—showing of characters’ personalities/relationships—in the narratives of discovery manifest through NPSA. (F)DS in the narratives performs the functions usually associated with it in non-fiction—offering of personal perspective and addition of emotionality.

In the following two subsections, I will discuss the dramatizing properties of both NPSA and (F)DS in the popular science narratives of discovery.

#### **4.2.1. Dramatization through NPSA and NPTA**

When (F)DS is associated with dramatization, it is mostly for its ability to create fictional dialogue. In fact, Semino and Short (2004: 90) use an example of character dialogue to highlight dramatizing properties of (F)DS. Example 4.1. shows a typical dramatization of dialogue in a fiction text:

- 4.1. “This is not how we want to present ourselves.”  
“I know,” said Cliff, “I didn’t think—“  
“Well, you should have thought about it.”  
“It’s just a student paper,” said Cliff. “And it’s the summer weekly issue. Nobody’s going to read it.”  
“Your interview is in the public record now,” Glass snapped.  
“You told me to meet with him!” Cliff burst out. “You asked me to speak with him.”  
“I assumed that while speaking to Jeff, you’d use your common sense.”

“Look, he asked me about my role in the work. I just answered his questions.”

“Your answers,” said Glass, “do not match any of the other stories out there.” (Goodman 2006: 167)

There are no examples like this in my corpus, and the most typical use of (F)DS is to introduce single utterances as in example 4.2. This is precisely what Semino and Short (2004: 93) observed in the non-fiction section of their corpus—(F)DS “is normally used to present individual utterances in isolation”.

4.2. Rous himself later admitted, “I used to quake in the night for fear that I had made an error.” (Kean 2012: 140)

This does not mean that there is no dialogue in the narratives of discovery. The dialogue found in my corpus is, however, of a different nature—both formally and functionally. Formally, it is introduced using NPSA and not (F)DS, and functionally, it is often employed in order to dramatize not only the immediate events but also to re-imagine scientific debates and present them as dynamic verbal exchanges rather than as a series of publications or talks that took place over a lengthy period of time. In the process of these dramatizations, the authors project the personalities and the relationships of the scientists.

In fact, if dramatization is equated with the presentation of dialogue [the prototypical function of (F)DS in fiction and thus the prototypical way of looking at dramatization], then it is possible to make a claim that in the narratives of discovery NPSA alone perform the dramatizing function since majority of the dialogue, by far, is introduced via NPSA. There are 18 NPSA that in one way or another contribute to interactive exchanges, while (F)DS alone is never used to create dialogue, and there is only one instance of dialogue presented as IS. Those NPSA that do not present interactive exchanges function as prototypical NPSA that supply summaries. Most

often (17 out of 29 non-dramatizing NPSA) they deal with scientific ideas and concepts proposed by scientists. However 12 out of 29 non-dramatizing NPSA showcase the scientists' reaction to the research of their colleagues or their own findings, thus still contributing to character creation. I discuss the non-dramatizing NPSA in the next chapter.

There are four subtypes of NPSA that are used to create interactive exchanges between the characters in the narratives. These are: (1) dialogic NPSA—one NPSA that incorporates two distinct voices in dialogue with each other, (2) strings of individual NPSA that together form a backbone of a dialogic exchange, (3) borderline dialogic NPSA—these either name a second interactant but do not give voice to him/her, or name the people involved in an interaction without introducing their emotional reactions to the situation or each other. The third category is probably the closest to the traditional understanding of NPSA as summaries of utterances. (4) NPSA can also be part of a combination of Public and Private Discourse categories all of which are used together to condense an event (usually a debate) into a dialogue-like interaction. I will now discuss each category in detail.

#### **4.2.1.1. Dialogic NPSA**

The first category—dialogic NPSA— includes NPSA that introduce two voices in a single occurrence. See example 4.3.

4.3. Penzias and Wilson **called Dicke**, who quickly **confirmed** that they had unintentionally tapped into the reverberation of the big bang. (Greene 2011: 40)

There are two speech acts (bolded) presented here and two speakers (underlined), each of whom is given voice. However, I argue that this is one NPSA and not two because both speech acts are part of one speech activity—a phone call initiated by Penzias and

Wilson. The act of calling prompted the confirmation; that is the exchanges are sequential and present a dialogue not isolated utterances.

While NPSA in 4.3. introduces a dialogic exchange, it does so purely through the summarizing properties of NPSA. There is no clear “projecting [of] the characters’ different personalities and mutual relationships”—one of the requirements of dramatization suggested by Semino and Short (2004: 92). Example 4.3., I would say, has a minimal degree of dramatization since it introduces an interaction but does not necessarily project character personalities or reveal the nature of their relationship. At the same time, this exchange between Penzias and Wilson and Dicke is not unimportant or trivial. It is a crucial moment in the development of the narrative and a key event in the discovery process. Example 4.4. demonstrates an NPSA with a higher degree of dramatizing properties:

4.4. Miescher protested, but Hoppe-Seyler insisted on repeating the young man’s experiments—step by step, bandage by bandage—before allowing him to publish. (Kean 2012: 20-21)

In this exchange, the reader gets an indication of the kind of relationship between the two scientists: Miescher is clearly a less established figure who needs Hoppe-Seyler’s permission to publish his findings. Hoppe-Seyler is the dominant presence in the relationship. At the same time, Miescher’s personality is such that he is capable of expressing dissatisfaction to his superior, while Hoppe-Seyler’s character is revealed as somewhat more careful and not entirely accepting of a younger colleague’s success. This is a good example of dramatization, I argue, and combined with the summarizing properties of NPSA it allows the author to keep the narrative short without sacrificing characterization.

#### 4.2.1.2. Strings of NPSA and Interaction of Discourse Presentation Types

Another way to use NPSAs to introduce interactive exchanges into the narratives is to employ not one but a string of NPSAs, which form a backbone of an argument constructed using various types of presented discourse. Strings of NPSA are often used to introduce the readers to scientific debates, imagining them as immediate interactive exchanges rather than presenting them more accurately as a series of publications or conference presentations. Consider example 4.5.

4.5. (1) **Most scientists in the mid-1960s explained the origin of mitochondrial DNA rather dully**, *arguing that cells must have loaned a bit of DNA out once and never gotten it back.* But for two decades, beginning with her Ph.D. thesis in 1965, (2) **Margulis pushed the idea that mitochondrial DNA was no mere curiosity**...*Margulis argued, a large microbe ingested a bug one afternoon long, long, ago, and something happened: nothing. Either the little Jonah fought off being digested, or his host staged off in internal coup....And after untold generations, this initially hostile encounter thawed into a cooperative venture.* (3) **Her opponents countered (correctly) that mitochondria don't work alone; they need chromosomal genes to function, so they're hardly independent.** (4) **Margulis parried**, saying that *after three billion years it's not surprising if many of the genes necessary for independent life have faded, until just the Cheshire Cat grin of the old mitochondrial genome remains today.* (5) **Her opponents didn't buy that—absence of evidence and all—but unlike, say, Miescher, who lacked much backbone for defending himself,** (6) **Margulis kept swinging back.** (7) **She lectured and wrote widely on her theory and delighted in rattling audiences.** (She once opened a talk by asking, “Any real biologists here? Like molecular biologists?” She counted the raised hands and laughed, “Good. You’re going to hate this.”)

(Kean 2012: 103-104)

The NPSA are bolded and create the frame for the debate [especially (1)-(5)], presenting it as an immediate exchange rather than as a prolonged argument that played out in scientific journals, as the remainder of the narrative and the reference to Margulis' Ph.D. thesis indicate it to be. It is worth noting that NPSA do not work alone to dramatize the debate. They are supplemented by IS (italicized), FIS (italicized and underlined), DS and Narration, more specifically, commentary from the author



(underlined). The NPSA supply the outline with DS, IS, FIS, and author commentary providing the details and expanding the ideas introduced by NPSA. Each dialogic turn, in fact, begins with an NPSA.

While NPSA, DS, IS, FIS, and Narration work together to dramatize the event, each type of Public Discourse retains the properties prototypical for it in the narratives of discovery. Since NPSA are most often associated with the presentation of dialogue, they guide the exchange. IS, as I will show in greater detail in the following chapter, can be used to introduce scientific hypotheses, and this is exactly what both instances of IS do here. The hypothesis for the narrative is presented in the form of an argument to keep in line with the general concept of the scientific debate presented as a dialogue. The first occurrence of IS is introduced by the reporting verb “argued”. The second occurrence uses a neutral reporting verb “saying”; however, it follows an NPSA that positions the hypothesis as a counter argument, “Margulis parried”.

The verbs used in NPSA project confrontation, but they do so without clearly indicating if the argument played out in print or orally. This particular portion of a narrative is also a good example of how speech and writing presentation are treated as interchangeable. The mention of the thesis suggests that the initial argument was introduced in writing; however, the verb “pushed” is ambiguous in this regard. So are all the other verbs—“explained”, “countered”, “parried”, “didn’t buy”, “swinging”—associated with the NPSA. All of them except “explained” are used in their metaphorical senses since their literal meanings indicate physical rather than verbal actions, and verbal actions associated with physical confrontation at that.

I first mentioned the metaphorical use of verbs to describe the actions of scientists in Module 2, where I observed verbs denoting physical action being used to

describe mental processes. As parts of NPSA the verbs listed above embody the dramatizing properties, as they present the argument in terms of a physical fight. However, coupled with the more traditional reporting verbs that introduce IS and DS (“saying”, asking”), they are to be interpreted as denoting verbal actions, more specifically speech. The fact that NPSA introduce aggression, allows for reporting verbs used in DS and IS to remain neutral.

Semino and Short’s (2004) data reveals a similar use of physical action verbs; however, Semino and Short (2004) did not discuss this issue. While they also did not look at the verbs used in NPSA, their Appendices 3-6 list reporting verbs for direct and indirect speech and writing. There are 12 physical action verbs identified. Out of those, 9 are associated with non-fiction only. This tends to suggest that the metaphorical use of physical action verbs is more common in non-fiction, and the phenomena observed in the narratives of discovery are not random. Such use of the verbs in the NPSA also appears to be a careful choice made to dramatize the events.

Verbs in the NPSA are not the only examples of metaphors. The role of FIS in this exchange is to introduce a metaphorical explanation of the scientific hypothesis. This is a common use of IS and FIS in the narratives, where these forms of Public Discourse often function as vehicles for creative explanations, which are attributed to the scientists (see chapter 5). Considering the first instance of FIS, it is unclear if Margulis herself employed the Biblical reference, or whether it is coming from the author, but the use of FIS attributes the metaphor to the scientist. The same happens with the second occurrence of FIS. It also uses a metaphor that follows the hypothesis. It is possible to see these portions as narration since they appear out of place in a scientific debate. However, they are different from the instances of narration

(underlined). Narration in this case tends to interrupt not explain. It is also evaluative and does not employ metaphors. In addition, there are other examples in the narratives of (F)IS that facilitate explanation through metaphors. All of this leads me to classify the underlined and italicized portions as FIS.

DS, like IS and FIS, is also used to expand the NPSA it follows. It shows an interaction outside the immediate dialogue (“a talk”), but the lecture DS is connected with serves as an example and a continuation of the larger debate projected via NPSA.

Overall, as example 4.5. shows, dramatization can be achieved not through one or another single type of Public Discourse but through a combination of several types. In the process, those types of Public Discourse that are not commonly associated with dialogue (DS and IS) do contribute to dialogic exchanges. In fact, they play vital roles by introducing the subjects of the debates—the hypotheses—and supplying examples and explanations.

The relationship between the types of Public Discourse involved in dialogues, as in example 4.5., is such that each following type expands the ideas introduced in the preceding one. For instance, IS gives more details to the preceding NPSA. FIS that follows IS supplies explanations for IS. The level of emotionality (aggression, in case of example 4.5.) decreases with each subsequent Public Discourse type. NPSA present the argument in the most aggressive manner using the verbs that describe a physical confrontation, while IS and DS use neutral reporting verbs, and FIS does not present arguments at all but provides explanations. Working together, the multiple types of Public Discourse produce a detailed dramatization of the events. At the same time, by making NPSA the backbone of the dialogic exchange, the author condenses a debate that took decades into a series of dynamic exchanges each of which is a reaction to a

previous statement. This is an example of the summarizing and the dramatizing functions of NPSA working together and being supplemented by other forms of Public Discourse.

Combining the various types of Public Discourse is not the only way of introducing interaction among the types of presented discourse. There are several examples in the corpus that use Public and Private Discourses to dramatize the narratives. Taking into account that Private Discourse alone is never used for dramatization, interaction between Private and Public Discourses deserves close attention.

Usually, studies of presented discourse focus on individual categories and discuss combinations of speech and thought in terms of contrast that can produce stylistic effects (see, for example, Toolan 2001, Short 2007). Semino and Short (2004: 153-159, 171-182) take a different approach. The relationship between speech/writing and thought presentation that they observe is hierarchical. To illustrate my point, I reproduce an example of an embedding from Semino and Short (2004: 172) as example 4.6. It shows an interaction between writing, thought, and speech presentation (original formatting preserved, [e] indicates embedding):

4.6. Example (18) is taken from Christopher Isherwood's autobiography, and is part of a long FDW [Free Direct Writing] quotation from his diaries:

(18) <FDW>  
[...] Thinking of Sister,  
<eNRT level=1>  
**I remembered**  
<eIT level=1>  
    <eNRS level=2>  
    **how I asked her, once**  
    <eIS level=2>  
    **what Vivekananda had been like.**

In Semino and Short's (2004: 172) example, each following type of the discourse presentation is structurally subordinated to the preceding one, with Free Direct Writing being the subsuming type of presented discourse that includes others. Thus IS is subordinated to IT, and both are subordinated to FDW. Semino and Short's (2004) designation of levels further illustrates the hierarchical structure of the embedded interactions. Quotation phenomena, as found in Semino and Short (2004), also follow a hierarchy with one type of presented discourse being the host to another.

The interactions of Public and Private Discourses I observed work differently; when Public and Private Discourses are combined, the relationship among the individual types of presented discourse remains linear. Consider example 4.7. (NPTA bolded, IS italicized, NPSA bolded and underlined, FIS italicized and underlined):

4.7. **Rutherford thought long and hard about this strange result**; *it was*, he remarked, *as startling as if a bullet were to bounce off a sheet of tissue paper*. Finally, at a Sunday dinner at his house in 1911, **he announced to a few friends that he had hit on an explanation**—*that most of the mass of each atom resides in a tiny, massive nucleus*. (Ferris 1988: 256)

In this example, each type of the discourse presentation contributes to the narrative progression without an overarching category inside which other types exist. The transition from Private to Public Discourse is smooth and logical. There was first a thought (NPTA) that was later voiced (IS). Then a public announcement of the discovery was made (NPSA, FIS). It is possible to describe the relationship between Private and Public Discourses in 4.7. as chronological. It is also worth noting that NPSA implies a dialogic exchange since it introduces Rutherford's audience.

On its own, the NPTA in 4.7. does not appear to contribute to dramatization. However, when it is seen in combination with Public Discourse, it becomes clear that the exchange introduced via Public Discourse (NPSA, FIS) would be impossible

without the NPTA. In fact, it is possible to consider “he had hit on an explanation” as an NPTA embedded in NPSA as a reminder of an earlier thought process. Regardless one’s position on the embedding, the NPTA contributes to dramatization when analyzed as part of the combination of Private and Public Discourses.

The example 4.7. is much more similar to what Toolan (2001: 122-123) and Short (2007: 231) include to illustrate a contrast between thought and speech presentation than it is to the interactions found in Semino and Short (2004). However, the instances of combination I observed appear to focus less on the contrast and more on a seamless transition from Private to Public Discourse, preserving the chronological order of the events that led to the discovery.

The prominence of NPTA and NPSA in such combinations once again points to the importance of these forms of discourse presentation and highlights the dramatizing properties of NPSA. Every time NPSA are present, the combined stretch of discourse presentation has a degree of dramatization via dialogic exchange. NPTA are revealed as the most frequently used type of Private Discourse to be associated with dramatization even if only in the presence of dialogic NPSA.

#### **4.2.1.3. Borderline Dialogic NPSA**

The third category of NPSA that I regard as contributing to dialogue creation and thus to dramatization I am labeling “borderline dialogic NPSA”. Examples of this category are used to set up an interactive exchange but give voice only to one interactant.

Consider example 4.8., which is extracted from example 4.5. above:

4.8. Finally, at a Sunday dinner at his house in 1911, he announced to a few friends that he had hit on an explanation—that most of the mass of each atom resides in a tiny, massive nucleus. (Ferris 1988: 256)

The verb used in the NPSA in the example 4.8. suggests the presence of an audience, which is identified as “a few friends”. However, these interlocutors are voiceless. Following the view of NPSA expressed by Leech and Short (1981/2007) and Toolan (2001), the omission of the audience’s response is perhaps due to the unimportance and/or low relevancy of their remarks to the story. On the other hand, I suggest, NPSAs may use silence as a form of non-verbal communication. In such a case, demonstrated in example 4.9., the voiceless interactant is still shown as reacting to the preceding voiced exchanges. The narrative from which example 4.9. is extracted talks about the Yang-Mills theory and relates an important point in its development—a seminar by Chen Ning Yang introducing the idea. During the seminar Yang was bombarded by questions from Wolfgang Pauli:

4.9. In the face of Pauli’s onslaught, Yang found himself at a loss, and eventually he simply sat down quietly in the middle of his own seminar. Robert Oppenheimer, who was chairing the proceedings, coaxed him into resuming his talk, and Pauli stewed in silence. (Carroll 2012: 155-156)

There are two NPSAs that show a loss of voice—“Yang found himself at a loss”, and “Pauli stewed in silence”. The reason I consider these occurrences to be NPSA is that they do not describe physical actions—Yang did not physically find himself, nor did Pauli really stew. The metaphorical use of the verbs, as I have noted above, is not unusual for NPSA. At the same time, even though no words are uttered, these are not thought acts either. It is possible to see these actions as behavioural processes (see Halliday and Matthiessen 2014: 214-215). However, the behaviour here is clearly a loss of voice; this is why I suggest it would be more accurate to classify such occurrences as Narrator’s Presentation of voiceless Speech Acts (NPSAv), which constitutes a subcategory of NPSA. Rimmon-Kenan (2002: 63) gives a possible definition of “A

character's speech" as "a silent activity of the mind", in addition to "conversation". These silences, I suggest, are employed strategically to communicate messages just as voiced speech acts do, and in example 4.9. they are responses to the voiced NPSA "Pauli's onslaught" and "coaxed him into resuming his talk". Being part of a communicative exchange, I suggest, allows these occurrences to be classified as NPSA and not Narration.

The voiced NPSAs in 4.9. are also good examples of the previous category of the dramatizing NPSA, where a string of two or more NPSAs are used to construct an interaction. There are three speech acts: "Pauli's onslaught", "chairing the proceedings", and "coaxed him". Combined together they supply the skeleton of the interaction, with NPSAv introducing the details. The scheme of this interaction is shown in figure 4.2., with each new line representing a reaction to a previous communicative move, as commonly found in a dialogue:

Figure 4.2. Schematic Representation of Interaction in Example 4.9.

Pauli to Yang: NPSA

Yang to Pauli: NPSAv

Oppenheimer to Yang: NPSA, NPSA

Pauli to both: NPSAv

The extensive use of NPSA in the narratives of discovery in order to dramatize the events may be unexpected, yet it falls in line with the general preference of non-fiction for indirect forms of discourse presentation as observed by Semino and Short (2004). The association between (F)DS and faithfulness of representation (especially in non-fiction), I believe, is also a factor in favouring NPSA over (F)DS. Using (F)DS in a non-fiction text to present dialogue may create the false impression in the reader that



the presentation is faithful and accurate when in reality it is dramatized. By not using (F)DS to present dialogue, the authors are giving themselves more license to fictionalize the events without being accused of misrepresentation.

The phenomenon of dialogue that is not a verbatim report of the anterior discourse is also common (according to Tannen 2007: 112 and Mildorf 2008: 289) in oral narratives that describe real-world events. There too, it is used as a dramatization mechanism that gives the speaker license to interpret and shape the material. Another reason for not using (F)DS might lie in the following argument introduced by Toolan (2001). Toolan (2001: 129) writes, “To opt for Direct Speech reporting is also to accept a scenic slowing of pace...[and] the inevitable fact that the narrated action will proceed...far more slowly”. Using NPSA to present dialogue avoids this problem, as NPSA offer more authorial control and thus do not necessarily slow down the narrative pace.

Assigning the dramatizing function to NPSA goes against the established standard where indirect forms of speech and writing are considered more author-centered and therefore lacking the ability to present the events from the characters’ points of view. NPSA have been traditionally associated with the summarizing function only (see, for example, Short 2007: 230). However, Short (2012) argues that the summarizing functions can be extended to all the categories of speech and writing presentation (Public Discourse, to use my terminology). In 2.3.3. I briefly examined Short’s (2012) argument, the main point of which is as follows: NPSA summarize one proposition at a time (Short 2012: 24), while other types of Public Discourse presentation can be used to create summaries of “what was said rather than of a single proposition” (Short 2012: 25). The second type of summary Short (2012) calls a

“discourse-domain summary”. Short (2012: 24) warns that not all summaries are automatically NPSA and that researchers need to pay attention not only to the presence of a summary but also to what is summarized and the degree of summation.

To return to example 4.9., the last sentence demonstrates an example of both types of summaries: “Robert Oppenheimer, who was chairing the proceedings, coaxed him into resuming his talk, and Pauli stewed in silence”. The first NPSA expressed via a relative clause—“who was chairing the proceedings”—would be a discourse domain summary since it summarizes the discourse of chairing a physics seminar not one particular speech act associated with such an activity. The second NPSA, “coaxed him into resuming his talk” is a proposition-domain summary since it deals with one specific speech act and summarizes by eliminating the exact words used.

Short (2012) sets the precedent for regarding the functional scale for Public Discourse presentation not as compartmentalized according to the categories but as fluid and gradual based on the degree of a function rather than on the presence/absence criteria. The fluidity of the functional scale for Public Discourse, I suggest, extends to the dramatizing properties as well as to the summarizing ones examined by Short (2012). Just like NPSA possess the higher degree of summarizing properties, so (F)DS does exhibit more of the dramatizing capabilities; however, this does not mean that NPSA cannot dramatize. The dramatizing function of NPSA, as demonstrated by my popular science corpus, is not only present but quite pronounced, especially in the absence of (F)DS in the presentation of dialogue.

The findings of this section lead me to propose that the distribution and the degree of the dramatizing function in Public Discourse depends on the type of the text analyzed. Thus in popular science narratives of discovery, NPSA possess higher degree

of dramatizing properties than they do in novels as analyzed by Semino and Short (2004), Leech and Short (1981/2007), and Short (2007).

#### **4.2.2. Dramatization through (F)DS: Emotionality**

Research into direct discourse presentation in non-fiction (see, for example, Bell 1991, Calsamiglia and Ferrero 2003, Moirand 2003, Semino and Short 2004, de Oliveira and Pagano 2006, Smirnova 2009, Urbanova 2012) singles out the following functions most commonly performed by (F)DS: distancing the author from the presented claim, establishing credibility and reliability, supplying accuracy, and providing a personal perspective of the original speaker. However, some studies (see, for example, Bell 1991: 209, Calsamiglia and Ferrero 2003: 169, Semino and Short 2004: 93-95) demonstrate that (F)DS retains its dramatizing properties in non-fiction. In Bell's (1991: 209) words, (F)DS adds "a flavour" of the original speaker's "own words". It also, according to Semino and Short (2004: 95), may be used for "dramatizing protagonists' lives". When analyzing the functions of (F)DS in non-fiction, Bell (1991), Calsamiglia and Ferrero (2003), and Semino and Short (2004) draw on examples from newspapers and (auto)biographies. However, their findings on the dramatizing properties of (F)DS can be corroborated by the observations in the narratives of discovery.

Because in the narratives of discovery (F)DS performs functions other than dramatizing (see chapter 5), it covers only some aspects of dramatization, namely emotionality and personal perspective, with presentation of dialogue reserved for NPSA. There are 26 occurrences of (F)DS that project emotionality and 12 occurrences

that introduce personal perspective of a scientist. The remaining 9 occurrences fulfill functions outside the realm of dramatization.

The fact that (F)DS occurs just as often as NPSA, in my opinion, points to the possibility that both of these categories share functions. At the end of the previous section, I introduced Short's (2012) suggestion that all the categories of Public Discourse share summarizing properties. Following this argument suggests that (F)DS and NPSA share summarizing functions. However, Short (2012: 25-26) and Semino and Short (2004: 95) show that the summarizing properties of (F)DS are employed to produce only one specific type of summary found primarily in newspapers— headlines. Since the narratives of discovery are not separate texts but fully-integrated segments inside popular science books, there are very few headlines to signal the beginnings of stories. Neither Short (2012) nor Semino and Short (2004) supply any other examples of summaries created via (F)DS. Short's earlier works (see, for example Short 1988, 2007, and Short et al. 2002) that deal with (but do not fully develop) the idea of the summarizing properties extending along the Public Discourse presentation scale also do not give examples other than headlines. Thus it is more likely to assume that in the narratives of discovery (F)DS and NPSA share the dramatizing properties.

There are clear examples in the narratives of (F)DS being used to achieve emotionality and to infuse the narratives with “a flavour”, to use Bell's (1991) word, of the scientists' speech. Consider examples 4.10. and 4.11.

4.10. “What a field of novelty is here opened to our conceptions!” he [Herschel] exclaimed, more delighted by the variety of the sky than bothered at having been wrong. (Ferris 1988: 157)

4.11. “Well boys, we've just been scooped,” he [Dicke] told his colleagues as he hung up the phone. (Bryson 2003: 12)

Example 4.10. clearly shows Herschel’s emotional state as he discovered that nebulae can be made of gas as well as of stars. Example 4.11. uses DS to expose the reader to Dicke’s ways of speaking around his colleagues—the reader is to believe that Dicke referred to his fellow researchers as “boys” and used the verb “scooped” to indicate that Penzias and Wilson beat them to the discovery of the cosmic microwave background radiation.

These examples also illustrate important differences in the presentation of (F)DS observed in the corpus. For (F)DS that introduces emotions, the emotionality can be projected in two ways: either in the reported clause (projected as the emotionality of the scientists) or in the reporting clause (projected as the author’s emotional evaluation). It is also possible to have both the reported and the reporting clauses contain emotionality. Example 4.10. shows emotionality that is projected as coming from both the scientist (use of an explicative and an exclamation mark) and the author (emotionally evaluative reporting clause—“he exclaimed”). There are 6 examples of this kind in the corpus, where the Narrator’s Representation of Speech (reporting clause) is emotionally marked—what I label NRSe. When such a reporting clause is used in combination with emotionally charged DS, the author appears to reinforce the emotionality of the utterance. There are also 5 occurrences where emotion is projected as coming from the author only—emotionally charged reporting clause followed by neutral DS. Consider example 4.12. (NRSe bolded):

4.12. **Weber was so excited by the potential of their discovery that he prophetically declared,** “When the globe is covered with a net of railroads and telegraph wires, this net will render services comparable to those of the nervous system in the human body, partly as a means of transport, partly as a means for the propagation of ideas and sensation with the speed of light.”  
(du Sautoy 2011: 177)

When Weber's direct speech is evaluated without du Sautoy's introduction, there is no expression of emotion. In fact, the reader would not know of Weber's excitement, nor would he/she necessarily feel excited about the information. However, the author's emotionally charged, evaluative reporting clause claims that the scientist produced this utterance as an exclamation of excitement upon the discovery of how to transmit messages via electric wires. The adverb "prophetically" reinforces the importance assigned to the discovery by Weber. In choosing to use an NRSe, du Sautoy is guiding the reader's emotional reaction to the DS, making sure that the reader understands not only the practical significance of science but also experiences the rise of emotions associated with discoveries. Reporting clauses in general (see, for example, Smirnova 2009) and in popular science texts in particular (see, for example, Calsamiglia and Ferrero 2003: 149, 156, 159; de Oliveira and Pagano 2006: 641, 644) are regarded as locations for authorial evaluation of DS. The presence of NRSe in the corpus points to the author-controlled means of dramatization, just like dramatizing NPSA do. Calsamiglia and Ferrero (2003) note the influence of what they call "quoting frame" of an utterance presented via DS. They demonstrate using examples from Spanish newspapers describing and explaining the mad cow crisis that reporting verbs have the power to alter the readers' attitudes toward an issue and are often used this way by journalists. It appears that the authors of the narratives of discovery also employ this technique.

It is noteworthy that the emotions NRSe project, and therefore the emotions that the reader is to experience, are always positive. They are emotions of excitement, enthusiasm, and, at times, surprise. Negative evaluation of discoveries, if introduced, always comes from the fellow scientists not from the authors. Calsamiglia and

Ferrero's (2003) findings suggest that by using reporting clauses the authors can either predispose or turn away the readers from the presented voices in the text. Clearly, the authors of the narratives of discovery want their readers to appreciate the scientists they write about and their achievements.

There are also occurrences of DS that include neutral reporting clauses coupled with emotionally charged DS. Of these there are 10 out of 38 occurrences of DS. I should note at this point, that majority of emotionality is projected through DS, with only 4 occurrences of FDS [out of 9] that have emotionality markers. The combination of emotionally charged DS with a neutral reporting clause is more commonly associated with fiction where the characters are expected to speak for themselves and thus create an emotional attachment with the reader. For instance, Goffman (1981: 152) argues that "a full-scale story" requires that the narrator disengage for parts of the story from the immediate interaction with his/her addressee. Neutral reporting clauses in the narratives of discovery are evidence of such disengagement especially when analyzed against the examples of NRSe. Consider example 4.13.

4.13. Atomic scientist Ralph Lapp said, "I know what the other material is that the Argentines are using. It's baloney." (Kaku 2011: 236)

In this example the neutral reporting clause ("Atomic scientist Ralph Lapp said") introduces a very emotional statement. The reason for using a neutral reporting clause, I think, is two-fold. Firstly, there is no need to interpret Lapp's emotions for the reader; they are fairly clear. Secondly, by not evaluating the DS, Kaku is allowing his character to speak for himself. This utterance is clearly designed to expose the reader to the scientist's personality and to present his discourse as unedited—a feature of dramatization in fiction, according to Toolan (2001: 129-130).

Even though dramatization is not the main function of (F)DS in non-fiction (according to, for example, Semino and Short 2004: 93-95, Urbanova 2012: 51), in my corpus, (F)DS that projects emotion outnumbers (F)DS than does not: 26 occurrences are associated with emotionality while 21 perform other functions, some of which, presentation of personal perspective, for instance, are also associated with dramatization.

#### **4.2.3. Dramatization through (F)DS: Personal Perspective**

I consider presentation of personal perspective a dramatizing facet of (F)DS in the narratives of discovery. While (F)DS that fulfills this function is not as numerous as (F)DS that introduces emotionality, presentation of personal perspective is the second most frequent function of (F)DS in the corpus, with 12 occurrences. Even when (F)DS is not projecting emotionality, it is still most often used in a way that helps transform scientists from impersonal researchers into human characters. Example 4.14. shows DS used to present a personal perspective of a scientist:

4.14. ...Lahn screened different populations alive today and determined that the brain-boosting versions [of microcephalin and aspm genes] appeared several times more often among Asians and Caucasians than among native Africans....follow up studies determined that people with these genes scored no better on IQ tests than those without them. Lahn...soon admitted, “On the scientific level, I am a little bit disappointed. But in the context of the social and political controversy, I am a little bit relieved.” (Kean 2012: 344-345)

Lahn’s DS is not necessarily emotional; its purpose is to show the scientist’s personal reaction to the findings that have proven him wrong. Another example of DS being used to reflect a personal perspective is from the narrative about Yang and Pauli (described in 4.2.1.3. as example 4.9. and figure 4.2.). A new extract from this narrative is introduced below as example 4.15.



4.15. The next day, Pauli sent a simple note to Yang: “I regret that you made it almost impossible for me to talk to you after the seminar. All good wishes. Sincerely, W. Pauli.” (Carroll 2012: 156)

The narrative makes it clear that Pauli was quite obnoxious during Yang’s seminar. As Carroll (2012: 155) tells the reader, “As an audience member in a scientific seminar, it may occasionally happen that you disagree with something the speaker is saying. The usual protocol is to ask a question, perhaps make a statement to register your disagreement, and then let the speaker continue. That wasn’t Pauli’s style. He interrupted Yang repeatedly...”. From this brief excursion into the etiquette of scientific seminars and the situation described in example 4.9., the reader knows that Pauli behaved discourteously. Yet, his personal message to Yang given in example 4.15. has no trace of remorse or apology; on the contrary, it places the blame on Yang, “you made it almost impossible for me to talk to you”. Pauli’s interpretation of the situation is radically different from that of the author and of the other scientists involved. Using an instance of direct Public Discourse to relay Pauli’s side is quite effective in presenting his perspective.

It is possible to interpret the use of DS in example 4.15. as distancing since the sentiment expressed appears to be not shared by the author. At the same time, when the narration around the utterance is considered, it becomes clear that DS does not distance the author from the scientist but is used by the author as almost a justification for the discussion of the flaws in Yang’s theory. In general, the distancing function of (F)DS is very rare in the narratives of discovery, and I address it in the following chapter.

### 4.3. Dramatization through IS and FIS: Emotionality and Dialogue

Unlike (F)DS, IS and FIS are not the common means of dramatization. Semino and Short (2004: 78) argue that IS “does not easily serve the purposes of dramatization”. Of FIS Semino and Short (2004: 83-85) note that it can be used to create “irony at the expense of the person whose speech is being presented” and that FIS generally produces a distancing effect. Semino and Short (2004: 78) say that IS is more likely to occur in non-fiction (in newspapers especially). FIS, on the other hand, is more commonly associated with written fiction (see, for example, Rimmon-Kenan 2002: 116, Semino and Short 2004: 82). In fact, Rimmon-Kenan (2002: 116) argues that FIS has “a fictional ring even when found in other types of discourse”. While this is an interesting proposition, the findings of my corpus do not support it, and FIS in the narratives of discovery, just like IS, has relatively unpronounced dramatizing properties.

The small degree of dramatization that is assigned to IS and FIS in the narratives limits its manifestation primarily to expressions of emotionality. There are 7 occurrences of IS (out of 34) that contain emotionality markers and 2 occurrences of emotional FIS (out of 4). Of the 7 occurrences of IS with emotionality, 6 contain emotionality markers in the reporting clause (NRSe), and 1 has emotionality marker in the reported utterance. Examples 4.16. and 4.17. show emotionally marked IS and FIS respectively. The NRSe in 4.16. is bolded; FIS in 4.17. is italicized with emotionality marker bolded.

4.16. ...light’s speed, **Einstein forcefully declared**, is 300, 000 kilometers per second relative to anything. (Greene 2011: 320)

4.17. Far from rejoicing, the older scientist screwed up his brow and expressed his doubts that the nucleus contained any sort of special, non-proteinaceous substance. *Miescher had made a mistake, surely.* (Kean 2012: 20)

The emotionally marked reporting clause in 4.16. (bolded) functions similarly to NRSe that accompany neutral DS. The reporting clause shows the reader the emotion that the author assigns to the scientist who produced the utterance. Since it is hard to determine whether or not a particular utterance was, in fact, accompanied by the emotion the author chose to associate with it, such use of IS fictionalizes the narratives. Emotionally marked FIS functions similarly to emotionally marked DS: it attributes the emotional expression to the speaking scientists. However, the indirect form of the discourse makes the effect less pronounced. In example 4.17. the emotionality marker contrasts FIS with the preceding NPSA, giving the reader a more direct presentation of the scientist's emotional reaction.

When it comes to the presentation of dialogue, there is one instance when a dialogic exchange is created using IS. See example 4.18.

4.18. A member of the collaboration might say that the data is not yet ready for publication should never be used in a theoretical analysis. But a member of the audience might reply that data that isn't ready shouldn't be shown in public talks, either. (Carroll 2012: 201)

Note that IS in 4.18. is hypothetical—it presents not actual but possible utterances and does not attribute them to specific members of the scientific community. This kind of dialogue is purely fictional, and, as some analysts might suggest (for example, Skov Nielsen et al. 2015 a, b) the only possible kind of fictionality in non-fiction. As I have been demonstrating, however, fictionality in the narratives of discovery does not have to be tied to hypothetical utterances only. This kind of dramatization is different from the dramatization created via NPSA, where real, not hypothetical events, are played out

as dialogic exchanges. While this example seems out of place compared with other instances of dramatization in the corpus, it does point to an important function of IS in the corpus—that is the ability to introduce scientific hypotheses. I will discuss this and other non-dramatizing properties of Public Discourse in the following chapter.

#### **4.4. Conclusion**

I began this chapter with a proposition that the function scale for presented speech/writing based on examples from fiction is not fully representative of the way Public Discourse functions in non-fiction. For instance, the traditional scale denies the indirect forms of discourse (NPSA especially) any reader-engagement properties. NPSA are usually assigned the distancing and summarizing functions (see, for example, Short 2007), while dramatization is reserved primarily for (F)DS.

With non-fiction, the situation is somewhat different and less clear since, to my knowledge, no function scale based solely on examples from non-fiction exists, and the functions of Public Discourse in non-fiction are usually evaluated in terms of the scale created for fiction (see, for example, Semino and Short 2004). However, those who research presented discourse in non-fiction (written or oral) note that the functions are not as neatly arranged as the scale created for fiction suggests (see, for example, Myers 1999; Short et al. 2002; Short 2012). There is a fair amount of cross-over between the functions traditionally associated with direct and indirect discourse. For instance, (F)DS may perform both the distancing and the dramatizing functions (see, for example, Myers 1999, Calsamiglia and Ferrero 2003, Semino and Short 2004). In some instances, (F)DS in non-fiction possesses summarizing properties (see, for example, Short 1988, 2012, and Short et al. 2002). In fact, Short (2012) argues that any type of

Public Discourse presentation can be used to create summaries. Thus his is the first study to suggest the possibility of universal functions for Public Discourse.

In my opinion, studies of discourse presentation in non-fiction have enriched the outlook on discourse presentation in general. However, only one genre has achieved most of the attention, and the newspaper article remains the best-analyzed non-fiction text. My data from a popular science corpus contributes to the discussion and reveals functions of presented discourse not previously observed in news reports and other non-fiction corpora.

This chapter extends Short's (2012) argument to include not only the summarizing function but the dramatizing function also as a universal function of Public Discourse. As this chapter demonstrates, NPSA (and to a lesser degree IS and FIS) can be the means of dramatization and reader-engagement in the narratives of discovery. NPSA are overall very prominent in the narratives of discovery.

The prominence of NPSA in non-fiction is not surprising. Semino and Short (2004), for example, note that this was the second most frequent category to occur in their corpus as a whole, and my frequency counts presented in chapter 3 show that in the Semino and Short (2004) non-fiction section of the corpus, NPSA were the most frequent category. In general, it is expected that non-fiction favours indirect discourse. As I noted in 2.2., presented discourse in non-fiction is seen as having less to do with character creation and more with the construction of the author's professional identity. That means that more reformulation and interpretation would be necessary, activities which produce indirect discourse. The use of indirect discourse is expected of a genre like popular science where the authors have to introduce complex ideas in ways which

are understandable for non-specialists. In this communicative situation, reformulation becomes key, as Ciapuscio (2003) demonstrates.

At the same time, popular science books are not as homogenous as they are believed to be. They are usually discussed in terms of their overarching function of explaining science to the public (see, for example, Turney 2004 a, b), but functions of their individual components are largely ignored. Thus the narratives of discovery function somewhat differently from the segments designed to explain the most cutting-edge theories. While explanation remains a vital goal of the narratives, they also connect the public with the scientific community by other means. One of them, I suggest, is the presentation of scientists as characters in fiction with whom the reader can connect. In fiction, creation of such characters is usually achieved, in terms of discourse presentation, with (F)DS. However, in the popular science narratives of discovery, NPSA and, to a lesser degree, some other indirect forms of Public Discourse take on the character creating properties such as the presentation of dialogue and the showing of the relationships between characters.

This happens, I argue, because of the pressure of the conventions to use indirect discourse and because the narratives are fictionalizing real events rather than inventing new worlds and characters. (F)DS in addition to being an excellent means of dramatization is also associated with an expectation of accuracy [for a discussion of accuracy in (F)DS see Short et al. 2002 and Short 2012]. A lot of dialogue that is introduced in the narratives of discovery appears to be fabricated rather than reproduced from original interactions. For example, the authors tend to dramatize scientific debates that took place over a period of time as dialogue. Using (F)DS in such situations, where the characters and the issues are real but the interaction is

fictionalized, might pose a problem. Using indirect discourse, and the most author-controlled type of it, avoids this predicament. NPSA allow the authors more creative freedom than (F)DS would.

At the same time, not all forms of indirect discourse contribute to dramatization in such an important way as NPSA do. It appears that IS and FIS possess some dramatizing properties but do not capitalize on them. These types of Public Discourse exemplify how the dramatizing function can extend to all the categories of discourse presentation without eclipsing the prototypical uses of each discourse type.

## **CHAPTER FIVE**

### **BEYOND DRAMATIZATION**

#### **5.1. Introduction**

In the previous chapter I addressed the uses of Public and Private Discourses from the point of view of dramatization and demonstrated that it is primarily Public Discourse that dramatizes the narratives by using NPSA and (F)DS. I concluded that Private Discourse and certain types of Public Discourse do not have much to do with dramatization. This finding raises the question about the primary roles of Private Discourse, IS, FIS, and non-dramatizing NPSA and (F)DS. In this chapter, I discuss the functions of Private Discourse and spend more time on non-dramatizing Public Discourse. I propose that next to dramatization, the other major role of presented discourse in the narratives of discovery is introduction and explanation of scientific concepts and hypotheses. While explanation is a commonly observed role of non-dramatizing Public Discourse in popular science (see, for example, Moirand 2003), presentation of scientific hypotheses, and especially their introduction via Private Discourse is a less discussed phenomenon. In general, it appears that Private Discourse is more science-oriented than Public Discourse, which tends to highlight personal relationships and arguments as examples in chapter 4 demonstrate.

The different roles performed by Public and Private Discourses and the different effects associated with each are not unexpected taking into account the juxtaposition of speech/writing with thought presentation highlighted in the previous studies of presented discourse (see below for examples). In this chapter, however, I will focus not only on the differences but also outline a number of links between Public and Private Discourses.



Those who study speech/writing and thought presentation often note the functional distinctions. For instance, Semino and Short (2004: 118) confirm that “the effects that result from their [thought presentation] types are quite different from those we have noted for speech and writing”. The difference, as Leech and Short (2007: 270) point out, lies in the inaccessibility of thought, “We cannot see inside the minds of other people”. Short’s later works (see, for example Short 2007 and Short 2012) further this point by stressing that thought presentation does not possess those communicative properties that are common for speech/writing presentation. In addition, Short (2007: 231, 2012: 23) notes that thought presentation categories do not have summarizing properties: NPTA do not really present summaries of propositions but rather indicate “the extent of narrator ‘interference’” compared to FDT, for example (Short 2007: 231).

It is commonly assumed that since thought is not directly accessible in everyday life and is not used for communicative purposes, presentation of thought centers on the inner worlds of actants (see, for example, Toolan 2001, Semino and Short 2004, Leech and Short 2007, Short 2007, Short 2012). As a result, thought presentation is usually discussed in close connection with dramatization. While my corpus follows the observations of Semino and Short (2004) regarding the frequencies of DT, FDT, and FIT (see chapter 3), I interpret the functions associated with Private Discourse as radically different from those assigned to thought presentation by the previous studies, which dealt with non-fiction genres other than popular science. By using Private Discourse to introduce scientific hypotheses and discoveries, the authors of the popular science narratives take thought presentation out of the realm of the intimate. Private Discourse introduces the reader to common knowledge or cutting edge scientific

advancements rather than to the intimate thoughts of the scientists. In other words, the messages delivered through Private Discourse are very much public and, for the most part, do not contribute to characterization of the scientists, something that would be expected of thought presentation based on the previous analyses.

Private Discourse in the narratives of discovery is closely associated with the experimental and the empirical (and thus the more physical rather than the mental) sides of science. The decision to focus on the empirical side of science through the presentation of mental processes might be an attempt at establishing a kind of closeness between the reader and the scientific issues discussed.

In the narratives of discovery overall, experimental procedures are not foregrounded, and the discoveries are often described as being the products of intellectual rather than experimental processes, so it appears that overall scientific discovery is presented as a result of thinking rather than doing. Presented discourse, however, brings the experimental procedures to the forefront even if they are introduced through Private Discourse, and therefore internal, modes of discourse presentation.

The connection of Private Discourse to physical experimental procedures is in contrast to the observations I made regarding the narratives of discovery in Module 2 (see chapter 3 of Module 2), where I suggest that intellectual actions dominate the discovery process. However, having looked at my examples from Module 2, I realize that my conclusion was based on evidence from narrated segments rather than on the examination of presented discourse. It appears that while Narration emphasizes the theoretical and the intellectual side of the discovery process, Private Discourse is more strongly aligned with experimentation. The authors do not always take it upon

themselves to give accounts of experiments but prefer to relate this information through presented discourse.

In the following sections, I will discuss the types of Private Discourse associated with the presentation of scientific hypotheses and discoveries as well as address non-dramatizing Public Discourse. I will demonstrate that even those forms of Public Discourse that are associated primarily with dramatization [NPSA and (F)DS] can contribute to the presentation of scientific ideas. To carry over an argument from the previous chapter, individual types of presented discourse do not have to be confined to single functions. For example, while the primary role of (F)DS in the narratives may be dramatization, this type of discourse presentation has other uses as well. However, they do not align with the traditional distancing functions of (F)DS common in non-fiction. In fact, (F)DS is more likely to convey the alignment of the author and the scientists, in some cases to the point that the presented voices are allowed to take over the narratives—with FDS significantly contributing to narrative progression and fulfilling the functions of Narration. (F)DS is also a popular means of including explanations.

Non-dramatizing NPSA also play their part in introducing scientific ideas. However, these ideas are quite often supplemented by explanations provided by other forms of presented discourse or Narration.

## **5.2. Hypotheses and Discoveries: Private Discourse Is Not So Private**

As I will demonstrate in the following two subsections, Private Discourse in the narratives of discovery is dedicated not so much to the unveiling of the inner worlds of scientists but rather to tracing the mental processes and reactions to empirical work

which result in discoveries. NPTA and IT aid the most in accomplishing this goal. These two types of Private Discourse are responsible for introductions of scientific hypotheses and discoveries in the narratives.

IT and NPTA are the least dramatic means of Private Discourse. For instance, Toolan (2001: 139) writes, "...recourse to more direct thought-presentation than IT [FIT, DT, FDT] may...invite the inference of ...'entering' of the character's intimate mental space". Like Toolan (2001), Semino and Short (2004: 128, 131) observe that IT and NPTA are "less dramatic" means of accessing the inner world of a character. Semino and Short (2004: 115) note the relative lack of NPTA across their corpus and in the non-fiction section in particular. It is IT that is more prominent in their frequency counts (Semino and Short 2004: 115). In my corpus, however, both IT and NPTA have nearly the same number of occurrences, accounting for almost all of the instances of Private Discourse (see chapter 3).

The preference for the most non-dramatizing categories of Private Discourse falls in line with the purpose of IT and NPTA in the narratives of discovery, where Private Discourse focuses on science rather than on the scientists. Out of 53 occurrences of Private Discourse, 44 focus on the scientific issues rather than present more personal thoughts.

The introductions of scientific hypotheses and discoveries reveal several important points about Private Discourse. Firstly, they demonstrate a strong connection between Private Discourse and Narration that describes experimental procedures, thus supplying evidence for Private Discourse being concerned more with the empirical than with the intimate. Secondly, presentations of discoveries and hypotheses follow specific verb patterns that, I suggest, generalize Private Discourse and, again, provide support

for my argument that Private Discourse does not focus on expressions of individual inner worlds. In fact, I suggest that verb choices identified during the analysis of hypotheses and discoveries presentations function as what Mildorf (2008: 288) calls “a mitigating strategy which helps the speaker disclaim any ultimate knowledge or access to...other people’s minds”. Mildorf’s (2008) study is of oral narratives, and consequently the mitigating strategies for thought presentation she observed are different; however, her analysis is valuable for identifying the phenomenon of a mitigating strategy, which I propose extends beyond spoken discourse.

Other than emphasizing scientific issues, Private Discourse is also responsible for contributing to a positive image of scientists through highlighting hypotheses that have been proven correct and showing the scientists as creative thinkers when it comes to descriptions of their discoveries.

I will begin the discussion of Private Discourse with an examination of hypotheses and follow up with an exploration of discovery descriptions.

### **5.2.1. Scientific Hypotheses: NPTA and IT**

Scientific hypotheses are an important part of the narratives of discovery. They are signposts that guide the readers’ expectations of what is to be discussed in a narrative. Even though only about 20% of the narratives use presented discourse to introduce hypotheses, these narratives rely overwhelmingly on Private Discourse to do so. Out of all the occurrences of Private Discourse, 43.3% is used to present hypotheses, with only 13.5% of Public Discourse (mostly IS) serving the same role. Example 5.1. shows a hypothesis presented via IT:

5.1. Many scientists at the time were skeptical, but Shope wondered if rabbit “horns” were also tumors, somehow triggered by an unknown virus.  
(Zimmer 2011: 24)

This is a typical hypothesis expressed using Private Discourse. It contains a verb of mental action (“wondered”) and a hedge (“if”) to indicate uncertainty that is to be eliminated once the proof is obtained. Using Private Discourse to introduce a hypothesis inevitably personalizes the discovery process.

There are two major ways to introduce scientific hypotheses using NPTA and IT. The first one involves interaction of Private and Public Discourses and Narration and involves mostly NPTA. The second one is to use single occurrences of IT, as in example 5.1.

NPTA that appear in combinations with Public Discourse and Narration do not themselves introduce hypotheses and are more likely to resemble prototypical NPTA observed by Semino and Short (2004: 130) and described as “occurrences of a specific individual thought in the mind of a participant in the story, which do not include any indication of the propositional content or the ‘wording’ of the thought”. Such NPTA, as Semino and Short (2004: 131) suggest, most often introduce the character’s motivations that help explain his/her speech or actions that precede or follow. This is also true for this category of NPTA in my corpus. However, the thoughts and motivations that they present are connected with scientific hypotheses and never uncover personal feelings of the scientists. Consider example 5.2. (NPTA is bolded followed by the italicized Public Discourse):

5.2. While delving microscopically through the pus in surgical bandages, Miescher found a substance he didn’t recognize and called it nuclein (because it resided in the nuclei of cells). At the time, Miescher did little more than note its existence, but **nuclein clearly remained on his mind**, for *twenty three years later in a letter to his uncle he raised the possibility that such molecules could be the agents behind heredity.*  
(Bryson 2003: 400)

As Semino and Short (2004: 131) note, NPTA of this kind often appear as interjections within characters' conversations. While this is not the case in my corpus, NPTA that do not themselves express hypotheses are much more likely to be followed by Public Discourse than the other types of Private Discourse. For instance there are 17 prototypical NPTA and 5 of them are followed by Public Discourse. As with example 5.2., Public Discourse in such combinations is motivated by NPTA and contains the hypothesis. In a way, NPTA of this kind, while not introducing the hypotheses themselves, trace the mental path the scientists take to arrive at a hypothesis.

There is also a connection of Private and Public Discourses with Narration that such NPTAs highlight. Note that in example 5.2., the narrated segment describes the experimental procedure. Example 5.3. (NPTA bolded, IS italicized, Narration unmarked) also demonstrates the interaction of Private Discourse with the experimental procedure presented via Narration. The IS that follows the NPTA contains the hypothesis, to which the Narration and the NPTA lead. The rest of the narrative discusses and confirms this hypothesis.

5.3. Thompson and his colleagues at the Cavendish Laboratories began to measure the electrical charge and the weight of some of these radiations. **They tried to decide how these two measurements were related to each other.** *In 1987 Thompson proposed that these rays were streams of charged subatomic particles: bits of atoms.* (Bynum 2012: 183)

Just as with the other instances of the discourse interactions addressed in chapter 4, the different types of discourse presentation introduce the different chronological stages of the discovery process.

Hypothesis-introducing NPTA may also manifest as single occurrences (there are 9 such cases) that themselves carry the hypotheses. Consider example 5.4.

5.4. This set Bunsen to wondering whether they might be able to detect chemical elements in the spectrum of the sun as well. (Ferris 1988: 164)

Single occurrences of hypotheses presentation are, however, much more commonly expressed via IT (see example 5.1.). In fact, there are only 4 interactions between Private and Public Discourses that include IT. Single-occurrence hypotheses presentations reveal clear verb choices associated with hypotheses expressed through NPTA and IT. Consider example 5.5.

5.5. He wondered if something other than bacteria was responsible for tobacco mosaic disease, something far smaller. (Zimmer 2011: 4)

The hypothesis is introduced via IT. The verb “wondered”, is part of a pattern for hypotheses presentation via Private Discourse. There are four verbs/verbal phrases that occur most often with hypotheses in Private Discourse: “wonder”, “come up with an idea”, “think”, and “assume”. The first two most often indicate what I call “positive hypotheses”—hypotheses that are proven correct as the narrative progresses. The last two are associated with “negative hypotheses”—hypotheses that are later refuted. Accordingly, example 5.5. introduces a positive hypothesis, while example 5.6. illustrates a negative hypothesis:

5.6. Perhaps, he thought, the plants were suffering from an invisible infection. (Zimmer 2012: 3)

Other than the verb used to present it, it is impossible to distinguish a negative hypothesis from a positive one without the context of the narrative. The verb choice, however, creates a distinction between the two hypotheses and can help predict the narrative’s resolution when hypotheses are analyzed in isolation. Examples 5.5. and 5.6. are taken from the same narrative on the discovery of viruses and show that other than the verb used in the reporting clause of IT, there is nothing to separate a negative



hypothesis from a positive one. For instance, both contain hedges (“if” and “perhaps”) that point to the tentativeness of the statements. This demonstrates the key role reporting verbs play in Private Discourse introducing hypotheses.

I mentioned at the beginning of the chapter that while Private Discourse dominates introduction of hypotheses over Public Discourse, IS also contributes to the presentation of hypotheses. The numbers are, however, lower: only 14 hypotheses presented via IS compared to 26 introduced with the aid of Private Discourse. There are certain verbs (“argue” and “propose”, for example) which are frequently used in IS that expresses hypotheses, but the verb choices pointing to positive and negative hypotheses are less pronounced. While the verbs “propose” and “suggest” are associated with positive hypotheses, there is no discernible verb pattern for negative hypotheses. Both positive and negative hypotheses could be expressed using the verbs “argue” and “ask”. Consider examples 5.7. and 5.8.

5.7. Everett argued that Schrodinger’s equation should apply to everything because all things material, regardless of size, are made from molecules, atoms, and subatomic particles. (Greene 2011: 321)

5.8. He argued that this first cell obviously contained a complete set of molecular instructions, but that each time the zygote and its daughter cells divided, the cells lost half of their instruction. (Kean 2012: 130)

It is hard to distinguish the positive from the negative hypothesis in this case. Example 5.8. uses an intensifier “obviously” which projects certainty, while 5.7. hedges the proposition with the use of “should”. Based on this observation, it is possible to assume that example 5.7. presents a negative hypothesis and 5.8. a positive one when, in fact, the opposite is true.

The lower number of hypotheses introduced via IS and the less rigorous verb choices point to the dominance of Private Discourse when this particular function is concerned. The preference for Private Discourse suggests the focus on the personal observations and the empirical work in the road to discovery rather than on publications, for example, which would manifest as instances of Public Discourse.

In both the hypotheses introduced via Private Discourse and via IS, positive hypotheses outnumber the negative. The emphasis on the positive hypotheses also confirms the general focus of the narratives on the positive outcomes of science. In Module 2, I demonstrated that the majority of the narratives tell the stories of successful discoveries, while very few narratives describe what I called “failed discoveries” (see Module 2, section 3.5.1.) Negative hypotheses, however, are much more likely to appear not as focal points in the narratives of failed discoveries but as side steps in the narratives of success.

The prevalence of positive hypotheses is only one example of presented discourse being used to boost the image of scientists. Another way Private Discourse contributes to presenting scientists in a positive way is by showing them as creative thinkers. Descriptions of discoveries incorporating figurative language serve as examples, and I discuss them later in the chapter.

### **5.2.2. Introduction of Discoveries: IT**

After hypotheses presentation, the introduction of discoveries forms the second most numerous functional category of Private Discourse. There are 12 occurrences of Private Discourse that introduce discoveries, and all of them use IT. IT appears to be the only

mechanism of Private Discourse for signaling these important points in the narratives.

(Other options include Narration and non-dramatizing NPSA.) Consider example 5.9.

5.9. An atom, Rutherford realized, was mostly empty space, with a very dense nucleus at the center. (Bryson 2003: 140)

This example demonstrates the most popular way of incorporating statements of discoveries into the narratives: the use of what I label “pragmatic” as opposed to figurative language. Such descriptions use generic terms of the disciplines to present the discoveries. This method of discovery presentation reveals the connection of IT with Public Discourse and Narration and also uncovers a popular verb choice associated with discovery presentation. In other words, IT that presents discoveries acts similarly to hypotheses-presenting NPTA.

Almost all of the discoveries introduced via IT use the verb “realize”—10 out of 12 total occurrences. The remaining two instances of IT that introduce discoveries use the verbs “occur” (see example 5.12. below) and “assume”. Except for the instance that uses “assume” [“she assumed...that the change involved hydrogens shifting around” (Kean 2012: 100)], all of the discoveries introduced through IT contain an element of sudden enlightenment, which the verbs “realize” and “occur” express. At a first glance this observation suggests that some scientific discoveries are being presented as serendipitous insight not necessarily dependent on consistent empirical work. However, when the instances of discoveries introduced via IT are examined in the context of the narratives, the connection between Private Discourse and descriptions of experiments provided via Narration show that just the opposite is true.

Out of the 12 occurrences of discovery introductions via IT, 8 are preceded and/or followed by descriptions of experimental procedures, presenting the Eureka

moment as a reaction to a specific experimental result. Consider example 5.10., which supplies the rest of the narrative introduced in the previous example:

5.10. In 1910, Rutherford...fired ionized helium atoms, or alpha particles, at a sheet of gold foil. To Rutherford's astonishment some of the particles bounced back. *It was as if he said, he had fired a fifteen-inch shell at a sheet of paper and it rebounded into his lap. This was just not supposed to happen.* **After considerable reflection he realized there could be only one possible explanation: the particles that bounced back were striking something small and dense at the heart of the atom, while the other particles sailed through unimpeded. An atom, Rutherford realized, was mostly empty space, with a very dense nucleus at the center.** This was a most gratifying discovery, but it presented one immediate problem. By all the laws of conventional physics, atoms shouldn't therefore exist. (Bryson 2003: 139-140)

With such an introduction, the discovery presented as IT does not seem as sudden or as unfounded as it might when IT is analyzed in isolation as in example 5.9. Note also the interaction of Narration (underlined), Public Discourse: IS and FIS (italicized), and Private Discourse: IT (bolded). The narrated segment supplies the details of the experiment (and later the evaluation of the discovery); IS and FIS show Rutherford's reaction to the experiment, and the second sentence of IT presents the discovery itself as a culmination of all the previous activities provided via Narration and Public Discourse. The combination of presented discourse (Public and Private) and Narration works to create a chronological account of the discovery and to position it as the outcome of the experiment. Rutherford's thoughts are presented as focused on the observation, from which he deduces the structure of the atom—his discovery.

When IT is not connected with an experimental procedure, the discovery process appears underdeveloped and the discovery announcement comes somewhat suddenly. However, this mode of introducing discoveries appears to be a deliberate choice on the part of the authors. A discovery presented through IT which is not connected to an experiment is usually not the main discovery of a narrative (see

example 5.11.), or it mimics the actual events where a discovery was indeed a sudden realization (see example 5.12.).

5.11. Despite the evidence mounting against him, Bekenstein had one tantalizing result on his side. **In 1971, Stephen Hawking realized that black holes obey a curious law.** (Greene 2011: 247)

In this case, Hawking's discovery helps Bekenstein strengthen his own theory and provides evidence for the main discovery of the narrative—the multiverse. There is no need to take up room with the descriptions of Hawking's discovery process; the mention of the discovery is sufficient. The remainder of the narrative provides a brief explanation of Hawking's findings and connects them to Bekenstein's ideas.

5.12. As often happens, the answer came to him not while he was at work in his observatory but while he was relaxing. While on a boat in the Thames, Bradley found himself gazing at a wind vane mounted atop the mast. It pointed into the wind and therefore seemed to change direction whenever the boat turned. What was changing, of course, was the orientation, not of the wind, but of the boat.

**It occurred to Bradley that the earth is like a boat adrift in winds of starlight—that, as the earth moves through the starlight, its motion alters the apparent positions of the stars.** (Ferris 1988: 138)

Example 5.12. presents a different reason for not including a description of the experiment—it did not happen—and illustrates the use of figurative language in the description of the discovery. Ferris (1988: 137-138) tells a discovery story different from those found in the majority of the narratives but one that nonetheless is not uncommon when it comes to discoveries, as he himself suggests.

Thought presentation is usually regarded as arbitrary since it is, most of the time, impossible to connect it to the anterior discourse (see, for example, Short 2012: 23). That means that the criterion of faithfulness is even less applicable to thought presentation than it is to speech/writing. This is what leads some researchers (see, for example, Cohn 1990: 784-785, Dawson 2015: 80) to suggest that if at any time a

presentation of thought occurs without specific references to memoirs, journals, or similar materials, it therefore contributes to fictionality. This line of argument gains more strength once Private Discourse becomes detailed and includes figurative language as is the case with example 5.12. The analogy between the boat on the water and the earth in space is clearly attributed to Bradley, but it is not clear if the scientist expressed it in quite the same creative manner as Ferris (1988: 138) does. In the last sentence of 5.12, is the reader experiencing the creativity of the writer or that of the scientist?

With IT, the content rather than the wording is in the forefront; however, analogies and metaphors shift the focus back to wording, producing IT that is more suitable for fiction, where the narrator has unlimited access to the thoughts of his/her characters. Incidentally, example 5.12. does not employ the verb “realize” commonly associated with the introduction of discoveries via IT and which I consider a mitigating mechanism which signals the generalized and non-intimate nature of Private Discourse. By using the verb “occur” Ferris (1988: 138), in a way, breaks with the tradition and thus signals an instance of Private Discourse similar to thought presentation usually associated with fiction.

While I do not subscribe to the line of argument that suggests any manifestation of Private Discourse automatically designates a text as a fiction, I still believe that more elaborate instances of Private Discourse (as in example 5.12.) contribute to dramatization and thus do fictionalize the texts in which they appear. In general terms, thought presentation is usually discussed in close connection with dramatization. For instance, Toolan (2001: 139) and Semino and Short (2004: 123, 128, 131) explain the differences in the effects produced by thought presentation categories in relation to the

degree of dramatization. Semino and Short (2004: 121, 123) also note that there is not much difference in the effects produced by thought presentation in fiction and non-fiction: in both thought presentation is connected with dramatization, differing only in the degree. Thus DT, FDT and FIT (the types of Private Discourse considered as possessing the highest dramatizing properties by Toolan and Semino and Short) are more common in fiction, while almost nonexistent in non-fiction.

The scarcity of these forms of Private Discourse in the narratives of discovery (see chapter 3) supports the claim made in the beginning of this chapter that Private Discourse's functions lie beyond dramatization. Example 5.12. is the only instance of Private Discourse that uses figurative language. The overwhelming majority of occurrences express the thoughts of scientists in more pragmatic language less likely to raise questions of faithfulness. I suggest that the lack of elaborate descriptions in Private Discourse and the preference for reporting verb patterns (certain verbs associated with positive and negative hypotheses and almost universal use of the verb "realize" for the presentations of discoveries) constitute the mitigating strategies for Private Discourse that point to the overall lack of inner world access for thought presentation in the narratives.

At the same time, the incorporation of figurative language in such a way that it is attributable to scientists shows the willingness of the authors to present the scientists as capable of creative approaches to their work. Figurative language is, however, not common for Private Discourse, but it is more likely to occur in non-dramatizing IS.

### **5.3. Non-Dramatizing Public Discourse: Explanation of Science**

#### **5.3.1. Indirect Speech**

I will begin the discussion of non-dramatizing Public Discourse with an exploration of IS since its non-dramatizing functions relate closely to those of Private Discourse. IS is the only type of Public Discourse to introduce scientific hypotheses and is the most likely form of presented discourse to include figurative language.

Traditionally, IS, just like NPSA, has been valued for its ability to present the message but omit its exact wording, which is potentially a useful aspect when it comes to popularization since not all discourse produced by scientists can be clear and straightforward enough to be incorporated via (F)DS. Some of it, as Ciapuscio's (2003) study suggests, may be too technically worded to be quoted directly and requires reformulation. IS supplies an excellent means of reformulation. In fact, the authors in the corpus sometimes use IS to infuse the narratives with figurative language. I have identified three types of tropes found in IS: prosopopoeia<sup>2</sup>, metaphor, and analogy.

The decision to include figurative language as part of IS can make the reader wonder whether it is the author or the scientist who is responsible for the figurative language. This is especially relevant for metaphors and analogies since they are parts of IS itself rather than of the reporting clause as is the case with prosopopoeia.

As Ciapuscio (2003: 209-210) notes, "science popularization texts originate in other texts", which often include professional research articles. Using prosopopoeia the authors can emphasize this connection in a somewhat unusual way: written works may take on the identities of their authors and function as speakers in Public Discourse.

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<sup>2</sup> Prosopopoeia is a rhetorical device that presents a speaker's voice as coming from an inanimate object or from another person. I consider written works or theories treated as speakers in the narratives examples of prosopopoeia.



There are 3 examples of prosopopoeia created via IS in the corpus. Consider examples 5.13.a. and 5.13.b. In each example the reporting clause (bolded) indicates that a work rather than the scientists functions as a speaker. In example 5.13.b. “Kaluza-Klein” refers to the Kaluza-Klein theory.

5.13.a. Even as far back as the early decades of the twentieth century, **a prescient series of papers by the German mathematician Theodor Kaluza and by the Swedish physicist Oskar Klein suggested that** there might be dimensions that are proficient at evading detection. (Greene 2011: 84)

5.13.b. **Kaluza-Klein echoed across the decades answering that** the dimensions are all around us but are just too small to be seen. (Greene 2011: 88)

Even though Semino and Short (2004: 106) note that the verbs for the presentation of writing often remain the same as the verbs for speech presentation, I consider examples 5.13.a. and 5.13.b. presentation of speech and argue that Greene (2011) specially avoided presenting these proposition as writing by choosing to use prosopopoeia. This is one more example of the blurred boundaries between speech and writing in the narratives.

Occurrences of IS like these support Ciapuscio’s (2003: 209-210) claim about professional publications being the inspiration for popular texts. They also demonstrate the willingness of the authors to acknowledge the original written text and emphasize its prominence by assigning to it the status of the speaker. Prosopopoeia is the only instance of figurative language that can be clearly attributed to the author. There is no doubt that it represents the creativity of the narrator and not of the scientists.

The question of attribution becomes less clear, however, when metaphors and analogies figure in IS. When the primary function of IS—content presentation— is considered, the conclusion is that IS reflects only the ideas and not the original

wording. At the same time, the creative presentation of a scientific issue is a conscious decision and thus could be regarded as part of the content. This line of thought would suggest that the analogies and the metaphors found in IS should be attributed to the scientists. On the other hand, the reformulating properties of IS dictate that the authors are the more likely originators of the figurative language in order to explain the material and make it more relatable. I tend to think that the second proposition is closer to the truth. The major role of non-dramatizing IS with its reformulating as well as summarizing abilities is to present scientific ideas as coming from the scientists yet explained by the authors. Consider example 5.14. (metaphor italicized):

5.14. The authors concluded that we are all *immersed in a bath of photons, a cosmic heirloom bequeathed to us by the universe's fiery birth.*  
(Greene 2011: 39)

Popular science authors may capitalize on the freedom to reshape the wording of an utterance that IS provides and choose to restate the original in a simpler and a more engaging way. The example above illustrates Greene's (2011: 39) summary of the result found in "the papers of Gamow, Alpher, and Herman that in the late 1940s announced and explained" the cosmic microwave background radiation—a text which might pose difficulties for a non-specialist. By using IS instead of quoting verbatim, Greene reformulates the utterance as a metaphor, thus making it not only easy for the reader to understand but also creating a sense of the sublime.

Turney (2004a: 91) defines the sublime as "an aesthetic category", with the help of which "Science writers evoke their most telling effects". He goes on to say that "the feeling generated by the sublime includes both awe at the overwhelming sensory impact...and at the human capacity to apprehend it in its full extent" (Turney 2004 a: 93). Turney (2004 a: 93) also suggests that there could be a more practical application

for the metaphors of the sublime since they can function as “the safeguard against the feelings of insignificance induced by cosmic immensities”. The fact that the authors choose to incorporate the sublime as part of presented discourse points to a conscious choice to associate the advantages of this strategy (the ability of the human mind to comprehend the universe, anticipation of the possible feelings of insignificance on the part of the reader) with the scientists and thus portray them in a positive light.

Turney (2004 a: 90) claims that “the sublime has become the characteristic aesthetic of much contemporary popular science”. Metaphors of the sublime—the ones similar to example 5.14.—have been employed by such celebrity popularizers as Carl Sagan and by the relatively new authors such as Adrian Woolfson (Turney 2004 a). Turney (2004 a) argues that the phenomenon has been used so often that certain standards have emerged. For example, Turney (2004 a: 96) identified “the vocabulary of the sublime” as predominantly seascapes and landscapes. Example 5.15. supports Turney’s observations:

5.15. Six years later, in a seminar room at Mount Wilson Observatory in California, Einstein focused intently as Lemaitre laid out a more detailed version of his theory that **the universe began in a primordial flash and that the galaxies were burning embers floating on a swelling sea of space.**  
(Greene 2011: 12)

Turney (2007: 2) also notes that the use of figurative language is so ubiquitous to popular science that certain metaphors and analogies start to contribute to a pool of stock imagery that many authors “adopt and modify” for their own purposes. In contrast, new metaphors, according to Turney (2004 b: 337), indicate that “there is not yet a widely accepted formula for describing...novel” ideas. Turney (2004 b: 343) suggests that the adaptation and modification of certain metaphors indicate the success of their originator. There are examples in the corpus that illustrate Turney’s (2004 b,

2007) observations. Consider example 5.16.a. and 5.16.b. They share an analogy introduced as IS:

5.16.a. ... it was, he [Rutherford] remarked, as startling as if a bullet were to bounce off a sheet of tissue paper. (Ferris 1988: 256)

5.16.b. It was as if, he [Rutherford] said, he had fired a fifteen-inch shell at a sheet of paper and it rebounded into his lap. (Bryson 2003: 139-140)

To follow Turney's (2004 b, 2007) reasoning, the analogy is repeated in Bryson (2003) because it affords a good way of describing the scientist's reaction. On the other hand, when offering his observations of recycled tropes Turney (2004 b, 2007) does not take into account that some of them appear as parts of presented discourse and therefore cannot be automatically attributed to the authors. At the same time, Turney's explanation in this particular case is quite appealing considering the facts that Bryson's text is published after Ferris', that Bryson (2003: 6) acknowledges that he collected his material by "reading books" among other means, and that Bryson (2003: 5) mentions Ferris by name as an example of a science author who writes "the most lucid and thrilling prose". Still, the question of attribution remains. It is unclear whether Ferris (1988: 256) coined this description of the experiment and presented it as coming from the scientist, or whether Rutherford has been recorded expressing his reaction as such an analogy. The absence of references to a source in Ferris' (1988) chapter end notes leaves the question open and rather suggests that Ferris might have come up with the analogy since, as Toolan (2001: 128) points out, not all IS is "necessarily traceable to DD [direct discourse] antecedents". After all, Toolan (2001: 128) notes that "People are quite capable of 'reporting' things that their reportees never said". However, the decision to present the analogy as IS rather than make it a part of Narration is significant even if the report of Rutherford's reaction is not accurate. Such view of IS

with tropes links it to Tannen's (2007) notion of constructed dialogue and thus to dramatization. However, I am arguing that this kind of IS serves a different primary purpose.

In his exploration of figurative language (particularly metaphors and analogies) in popular science, Turney (2004 a, 2004 b, 2007) finds that they are used most of the time for explanatory purposes. The fact that the figurative language in Private and Public Discourses occurs in indirect forms (IT and IS) also points to its use for explanation since indirect forms offer the means to reformulate and focus on the content. In effect, the authors are trying to present scientific ideas in more manageable terms for the lay reader and at the same time preserve the place of the scientists as the creators of the content if not necessarily the wording.

Like Ciapuscio (2003), Turney (2004 b: 331) explicitly links explanation in popular science with what he calls "re-creation". The types of presented discourse most suitable for this role are the indirect varieties: IS, NPSA, IT, NPTA. However, as I have shown already (and will continue to demonstrate) NPSA and NPTA are not used for explanations, nor does IT function in this way. This leaves IS as the primary means of presented discourse to introduce explanations. The prominence of figurative language in IS also points to the highly pronounced explanatory properties of this type of presented discourse.

### **5.3.2. Narrator's Presentation of Speech Acts**

It is possible to divide the non-dramatizing NPSA into two groups according to their use of Gilbert and Mulkey's (1984) empiricist or contingent repertoire (see chapter 1, section 3.). The majority of the non-dramatizing NPSA (17 out of 29) will fall under

the category of empiricist NPSA—they present scientific concepts and ideas. See example 5.17. Contingent NPSA are a slightly smaller group with 12 out of 29 occurrences. They showcase the issues outside science that nevertheless influence it and present a personal perspective of the scientists on the subject discussed. In example 5.18. it is the reference to the arms race with Russia and the emotional renunciation of the claim (underlined) that allow me to classify the NPSA as contingent.

5.17. On his sixty-fourth PowerPoint slide, Incandela revealed what you get when you combine these two channels together: 5.0 sigma. (Carroll 2012: 184)

5.18. The American scientific community, which was still grappling with fusion in the fierce race with Russia to produce the H-bomb, declared that the claim was nonsense. (Kaku 2011: 236)

Empiricist NPSA do present scientific content, but they hardly explain it. By their nature, they supply a summary which is elaborated on using either Narration or other means of Public Discourse, most often FIS. Consider examples 5.19. (NPSA bolded, Narration underlined) and 5.20. (NPSA bolded, FIS italicized):

5.19. **...Italian physicist Dario Autiero announced a result that ended up being more infamous than famous: neutrinos that appeared to be moving faster than the speech of light.** The finding came from the OPERA experiment, which tracked neutrinos that were produced at CERN and traveled 450 miles underground to a detector in Italy. Because neutrinos interact so weakly, they can pass through many miles of solid rock with very little loss of intensity, making this kind of arrangement a uniquely effective window onto their properties. (Carroll 2012: 195-196)

5.20. **Some argued that Rous had misdiagnosed the tumors;** *perhaps the injections caused an inflammation peculiar to chickens.* (Kean 2012: 140)

Those NPSA that are followed by Narration, as in example 5.19., tend to appear at the beginnings of the narratives, with NPSA announcing the subject—usually the discovery discussed. In that, non-dramatizing NPSA resemble IT which presents

discoveries. NPSA that are followed by FIS are more likely to be found in the middle of a narrative. In such cases, as example 5.20. shows, FIS adds additional details to the summary provided by NPSA. Example 5.20. also demonstrates how NPSA and FIS can combine to create a hypothesis—again, a function reserved primarily for Private Discourse. Overall, it appears that non-dramatizing NPSA functionally resemble Private Discourse.

### **5.3.3. (Free) Direct Speech**

The explanatory function is prominent among the occurrences of (F)DS in the corpus. Quite often the authors use (F)DS instead of narration in order to tell the readers how something works or to introduce more details to a concept presented in Narration.

Consider example 5.21.

5.21. When George Stratton first put reversing goggles on, he had a sense of external motion when he moved his head: “It did not feel as if I were visually ranging over a set of motionless objects, but the whole field of things swept and swung before my eyes.” (Coen 2012: 191)

Using (F)DS this way the authors once again show the scientists in a positive light—this time, the scientists are able to avoid technical terminology, producing language easily understood by the public, and by doing so, they are also able to incorporate their personal experiences and emotional responses—elements that are likely to engage a lay reader.

The scientists themselves are given the opportunity to explain their experiments and discoveries through (F)DS. See example 5.22.

5.22. ...Stephen Davies of the University of Colorado has had impressive success in treating spinal cord injuries in rats. He says, "I conducted some experiments where we transplanted adult neurons directly into adult central nervous system. Real Frankenstein experiments. To our great surprise, adult neurons were able to send new nerve fibers from one side of the brain to the other in just one week." (Kaku 2011: 128)

Note that both occurrences of DS above contain a degree of dramatization expressed via introduction of personal perspective (example 5.21.) and emotionality (example 5.22.). The dramatizing properties of these occurrences, however, are less prominent than the explanatory function. These examples show the pervasiveness of dramatization in presented discourse and support my argument that dramatization in various degrees can easily combine with the other functions.

The explanatory and interpretive segments of popular science texts are usually associated with the direct and heavy involvement of the author, which results either in Narration or indirect discourse (see, for example, Ciapuscio 2003, Moirand 2003, Turney 2004 b, de Oliveira and Pagano 2006). For example, Turney (2004 b: 332) regards explanation as "teaching how something is to be understood". The author in this case is seen as the teacher. Even though those who write about explanatory properties of popular science (see, for example, Turney 2004 a,b, 2007, Ciapuscio 2003) acknowledge that explanations can be delivered via presented discourse, they do not accentuate such examples. Both Turney (2004 b) and Ciapuscio (2003) show that explanations and interpretations originate as direct voices of scientists obtained during private interviews conducted by the authors. However, Ciapuscio (2003: 209) regards explanations and details of the discoveries/experiments supplied by the scientists only as "intermediate stations" of the popularization process, meaning that (F)DS of this kind is not intended as part of a finished popular text but rather serves as a blueprint for



the author that he/she will later reformulate and restructure, turning direct discourse into Narration. Turney (2004 b), on the other hand, suggests that interviews can be presented verbatim as explanations of the scientific concepts.

I can confirm that the authors use the techniques discussed by both Ciapuscio (2003) and Turney (2004 b), incorporating reformulated personal interviews as well as including (F)DS. Example 5.23. shows a lengthy stretch of DS from a scientist, which Bryson (2003: 208) obtained during a personal interview:

5.23. He [Mike Voorhies] took me to the spot atop a twenty-foot ravine where he had made his find. “It was a dumb place to look for bones,” he said happily. “But I wasn’t looking for bones. I was thinking of making a geological map of eastern Nebraska at the time, and really just kind of poking around. If I hadn’t gone up this ravine or the rains hadn’t just washed out that skull, I’d have walked on by and this would never have been found.” He indicated a roofed enclosure nearby, which had become the main excavation site. **I asked him in what way it was a dumb place to hunt for bones.** “Well, if you’re looking for bones, you really need exposed rock. That’s why most paleontology is done in hot, dry places. It’s not that there are more bones there. It’s just that you have some chance of spotting them. In a setting like this”—he made a sweeping gesture across the vast and unvarying prairie—“you wouldn’t know where to begin. There could be really magnificent stuff out there, but there’s no surface clues to show you where to start looking.”

This example sets DS of the scientist in contrast with IS of the narrator who was conducting the interview, thus marking the voice of the scientist as more important. DS takes center stage in this narrative, and Narration is used to interject details and set the scene. Voorhies’ explanation is clear and is obviously targeting the lay audience of Bryson’s (2003) book. Ciapuscio (2003: 209-210) notes that scientists usually are able to “‘reformulate’ their message according to the addressee” and, in fact, take control “of the content presentation” during interviews, which results in “long monologues”. The example from Bryson (2003: 208) is a good illustration of this. However, the text produced by Voorhies is included verbatim as part of a finished popularization and

does not function only as an intermediate stage of the writing process—the role it would be more likely to perform according to Ciapuscio (2003).

The fact that the scientists are able to present their findings in a way easily accessible to the public, I suggest, encourages the authors to use (F)DS rather than Narration for explanatory purposes. After all, one of the functions of (F)DS in non-fiction is projection of credibility. Using the voices of the scientists to create explanations and supply details of the discoveries enhances the credibility of the authors and their texts while giving the readers an opportunity to experience an unmediated voice of a scientist. Thus it is possible to say that in popular science narratives of discovery the explanatory and the credibility functions of (F)DS converge.

In addition to its explanatory properties, (F)DS can also announce the breakthrough moments in the discovery process—a function that links it with Private Discourse that introduces discoveries and, as I will demonstrate, with Narration.

Toolan (2001: 129) suggests that DS may slow down narrative action by focusing on characterization. This is one of the reasons why, I argued in chapter 4, that NPSA are favoured for dialogue presentation in the narratives of discovery. At the same time, Semino and Short (2004: 90) point out that “(F)DS is crucial...to the advancement of the plot” in fiction; they do not, however, mention the affects of (F)DS on the speed of narrative pace. Based on my observations, I propose that in the narratives of discovery (F)DS, since it is not the primary means of dialogue presentation, may be used to advance narrative action. In fact, there are several examples where the authors use (F)DS to supply the main portion of the narrative, with the author providing a brief introduction and evaluation of the material. Example 5.24. is one instance of such use of (F)DS, where a major portion of the narrative is presented

in the voice of the scientist. Example 5.24. illustrates how (F)DS can be used to showcase the eureka moment of the discovery:

5.24. The idea of natural selection first occurred to Darwin shortly after he returned from his five year odyssey on the *HMS Beagle*....As a result of the trip, Darwin became convinced that species were not fixed but could be modified over time. But he did not know of a mechanism that could explain how species change and adapt. Then...he was reading a book on population growth by Thomas Malthus. Malthus had pointed out that...the population size would eventually outstrip the food supply, and struggle and starvation would...follow. This idea struck home:

I happened to read for amusement Malthus on *Populations*, and being well prepared to appreciate the struggle for existence which everywhere goes on from long-continued observation of the habits of animals and plants, it at once struck me that under these circumstances favourable variations would tend to be preserved and unfavourable ones destroyed. The result of this would be the formation of new species. Here, then, I had at last got a theory by which to work. (Coen 2012: 24-25)

Coen (2012) could have easily presented this pivotal moment in Darwin's career using Narration. However, using FDS shows Darwin himself as a capable storyteller, able to supply the information using language suitable for a lay reader.

In instances like this, the author sets up the narrative by supplying the reader with the relevant background information (underlined portion of example 5.24., which includes indirect forms of discourse presentation) but then disengages from the story, leaving the scientist to move the narrative forward from that point on. Thus FDS takes on the functions of Narration. This is demonstrated even more clearly in the case of a narrative from Carroll (2012: 68-69) that embeds DS and NPSA inside (F)DS that is used as Narration. Example 5.25. shows the portion of the narrative related via (F)DS with embedded DS (italicized) and embedded NPSA (underlined):

5.25. Completed in 1983, the Tevatron was the highest-energy accelerator in the world until LHC [Large Hadron Collider] took the crown in 2009. Its crowning achievement was the discovery of the unusually massive top quark...in 1995. Gordon Watts...remembers the moment when the signal climbed above the important “three sigma” threshold [an indication that a new particle is discovered]:

We were in one of the big top meetings reviewing all the analyses that were about to go out for one of the conferences. Every analysis was seeing a small excess, but it was so small that it wasn't really meaningful....one of the people...raised his hand... “*Uh...hold it a moment...if I do the simplest thing here and add up all the backgrounds and the signals I get over three sigma.*” There was a silence in the room while everyone went scrambling back through the talks to figure out if that was actually correct. Either the spokesperson or the top convener spoke next...it was a four-letter word. I think everyone felt the chill go down their spine.

Semino and Short (2004: 171-175) also noted that FDS can host embeddings.

However, the examples they supply are relatively short and by no means represent whole stories. Thus, it would be hard to make an argument that FDS in their corpus takes on the functions of Narration. FDS in the popular science narratives of discovery when presenting the whole stories resembles first-person narration in fiction when the narrator is also one of the characters in the story. In such situations, the voice of that particular character-narrator seizes to be an instance of discourse presentation and is regarded as pure Narration. I suggest that in the narratives of discovery lengthy occurrences of FDS function the same way. Whenever a scientist engages in a monologue that contributes a significant portion of a narrative, he/she becomes the narrator for the duration of FDS. Such use of FDS is an example of fictionalizing the narratives.

The willingness to relinquish the telling of the story to the scientists points to a kind of respect and solidarity between the authors and the scientific community which is also evident in the near absence of the distancing function of (F)DS. The authors and

the scientists present a united front when it comes to addressing scientific issues. The only occurrence of the distancing function of DS is shown in example 5.26.

5.26. In response to the question “If string theory is the long-sought unified theory, then why haven’t we seen the extra dimensions it needs?” Kaluza-Klein echoed across the decades answering *that the dimensions are all around us but are just too small to be seen.* (Greene 2011: 88)

DS in this case is unattributed, which indicates a hypothetical and a general disagreement rather than a concrete objection. By placing the question in quotation marks, Greene is acknowledging the presence of the issue without being responsible for raising it. The positive response to the question presented as IS (italicized) contrasts with the DS used to pose it. By choosing a more author-controlled mode of speech presentation to give the answer, Greene demonstrates his support for the latter.

I think that the near absence of the distancing function of (F)DS in the corpus could be explained by the overall purpose of popular science—that is to promote scientific advancements and to connect the public with the scientists. Unlike journalistic writing, which even when describing scientific subjects, tends to dwell on social controversy (see, for example, Calsamiglia and Ferrero 2003, Moirand 2003), popular science books are more concerned with knowledge transfer and with the presentation of science as a positive force. Distancing themselves from the voices of the scientists will not help these authors achieve their goals. Expressing solidarity with presented discourse is much more productive. Myers (1999: 389) notes a similar use of presented discourse in oral group discussions, where the speakers express solidarity with the presented utterances. At the same time, analyses of (F)DS in written non-fiction (see, for example, Bell 1991, Calsamiglia and Ferrero 2003, Moirand 2003, Semino and Short 2004, de Oliveira and Pagano 2006, Smirnova 2009, Urbanova 2012)

tend to focus on the distancing function and do not mention that (F)DS can be employed “to signal solidarity” as well as “suggest detachment between the reporting and reported utterances” (Myers 1999: 389).

Fu and Hyland (2014: 123) argue that popular science is “persuasive, seeking to convince the reader both of the importance of the content and a wider ideology of scientific progress”. This goal would be hard to attain if the authors distanced themselves from the practitioners of science. Instead, the authors choose to praise the scientists and their achievements. Bucchi (1998: 14) calls this kind of popularization technique “‘celebratory’ discourse”. While Bucchi (1998) explores the multiple linguistic strategies that can help the authors create such a discourse, he does not distinguish between Narration and presented discourse, and, in fact, seems to focus on narration alone. My observations indicate that presented discourse of scientists is a significant contributing factor to celebratory exposition of science.

#### **5.4. Conclusion**

It is commonly assumed (see, for example, Semino and Short 2004, Leech and Short 1981/2007, Short 2007, 2012) that Public and Private Discourses have radically different functions, with Public Discourse accounting for the presentation of communication and Private Discourse being used to disclose the inner worlds of actants. At the same time, my exploration of presented discourse shows that in the narratives of discovery there are many functions that the Private and Public Discourses share. The greatest difference between the two appears to be the degree of dramatization. Unlike other studies (see, for example, Toolan 2001, Semino and Short 2004), however, my analysis suggests that Private Discourse in the narratives of

discovery has very little to do with dramatization. Instead of revealing the inner worlds of the scientists (and thus dramatizing the narratives), Private Discourse is more closely connected with the scientific matters than it is with the intimate thought processes. In fact, the presence of the verb patterns associated with the presentation of hypotheses and discoveries via Private Discourse functions as a mitigating strategy that suggests the general rather than the individual nature of the information introduced.

By bringing the scientific rather than private issues to the forefront, Private Discourse is functionally connected to the non-dramatizing Public Discourse, which too is science-focused and most often is devoted to the explanation of scientific concepts. Overall, Private Discourse in the corpus is almost devoid of emotions and does not possess any of the emotional markers associated with the dramatizing Public Discourse. This does distinguish the two discourses but not for the reason most often highlighted in other studies where Private Discourse is seen as the primary carrier of dramatization.

A function that firmly connects Private Discourse with non-dramatizing Public Discourse is celebration of science and scientists. In fact, these two modes of discourse presentation could be united under Bucchi's (1998) label "celebratory discourse". Bucchi (1998: 14) understands celebratory discourse as an "outcome of communication at the public level" that "further strengthens the certainty and solidity of theories and results". My analysis demonstrates that presented discourse expands the reach of the celebratory discourse to include not only science in general ("theories and results") but also individual scientists. As Private Discourse indicates, the scientists are much more likely to come up with positive hypotheses than with ideas that find no empirical ground. Both Private and non-dramatizing Public Discourses show scientists as creative thinkers who are capable of producing engaging and meaningful explanations of their

findings. Public Discourse also reveals the story-telling talents of the scientists. Overall, Private and non-dramatizing Public Discourses introduce a portrait of an idealized scientist who is not only accomplished on a professional level but is also willing and able to communicate his/her discoveries to the curious public.



## CHAPTER SIX

### PRESENTED DISCOURSE OUTSIDE THE NARRATIVES OF DISCOVERY

#### 6.1. Introduction

Until now, this thesis has not addressed presented discourse outside the narratives of discovery. This chapter fills this gap by providing a brief overview of presented discourse outside the narratives and comparing it with the phenomena observed within the narratives. The goal is to create a fuller picture of the role presented discourse plays in popular science and to test the claims about the nature of presented discourse of scientists made on the basis of the analysis of the narratives of discovery. I believe that the comparison between the functions of presented discourse inside and outside the narratives reveals several important points.

Firstly, the narratives present the scientists' discourse as science-centered (this is especially evident in Private Discourse) and produce a picture of scientists who are predominantly research-oriented. In contrast, presented discourse outside the narratives produces a more balanced portrayal with the scientists occupied with personal as well as professional issues.

Secondly, presented discourse outside the narratives uncovers a variety of voices, not just those of the scientists, while the narratives contain presented discourse of scientists almost exclusively. One of the new voices that I find particularly interesting is connected with the issue of fictionality; it is the voice of the reader, who through discourse presentation effectively becomes a character in the books. I propose that introducing presented discourse of the reader goes beyond the construal of the "reader-in-the-text" that Thompson and Thetela (1995) and Thompson (2001, 2012)

discuss. What I shall call the “fictionalized reader” is a more salient and concrete presence than Thompson’s (2012: 80) “virtual entity, which haunts all discourse”. The fictionalized reader is an embodied representation with a clear voice.

The construction of the fictionalized reader is not the only fictionalization technique evident in presented discourse outside the narratives. In chapter 4, I mentioned that dialogue incorporated via (F)DS is nonexistent in the narratives of discovery. This popular feature of fiction (according to Semino and Short 2004: 90, for example) is, however, part of presented discourse outside the narratives and could be seen as a fictionalization mechanism. The presence of the fiction-like elements outside the narratives points to the overall tendency for fictionalization in popular science.

Thirdly, a look at presented discourse outside of the narratives uncovers an interdisciplinary side of popular science. It indicates the strong connections that the authors draw between science and literature. References to literary works as well as Private and Public Discourses of writers are used as support for the points the authors make.

The presentation of discourse of other writers is directly connected with the presentation of writing, which I have chosen to consolidate with the speech presentation in the analysis of the narratives because of the difficulties in distinguishing between speech and writing. In presented discourse outside the narratives, however, the line between speech and writing is significantly less blurred, allowing me to confirm Semino and Short’s (2004) proposition that writing presentation should be regarded as a separate category of presented discourse alongside speech and thought presentation. Outside the narratives of discovery, it becomes clear that the presentation of writing is a viable category of presented discourse in popular science.

In the sections that follow, I will elaborate on each of the aspects introduced above and offer examples and comparisons. I should note at this point that while the analysis of presented discourse in the narratives included a quantitative component, the present investigation is solely qualitative, and any comparison with presented discourse inside the narratives is based on qualitative analysis. The reason for choosing an exclusively qualitative approach is two-fold. Firstly, the space and time constraints of the present work do not allow for a construction of another corpus. Secondly, the focus of the thesis (as a continuation of the work began in Module 2) is on the narratives of discovery aspect of the popular science books rather than on the whole texts. For the purpose of providing a backdrop against which the data from the narratives may be analyzed in a different light, I judge the qualitative approach sufficient.

## **6.2. Celebratory Discourse**

I concluded the previous chapter suggesting that presented discourse in the narratives of discovery, and especially Private Discourse and non-dramatizing Public Discourse, produce a celebratory presentation of science and scientists. I identified specific types and functions of presented discourse that are used to achieve this goal in the narratives—namely IT and NPTA that introduce positive hypotheses and IS that shows scientists as creative thinkers. In this section, I will further explore the resources of presented discourse devoted to inducing a positive outlook on science.

### 6.2.1. “A Neutrino Walks Into a Bar”: Humour in Presented Discourse

Presented discourse of scientists in the narratives of discovery tends to cover science-related topics exclusively. This is especially evident in the analysis of Private Discourse, which fails to reveal intimate thoughts and observations in favour of projecting science-centered mental processes. As I mentioned in chapter 5, such treatment of presented discourse creates a picture of scientists who are dedicated to their work but fails to reveal their personalities. Presented discourse outside the narratives remedies this situation by including personal thoughts and even jokes from scientists introduced in their own voices. For example, Bryson (2003: 30) uses DS to juxtapose Bob Evans’ extraordinary talent for spotting supernovae with his lack of other, more practical, skills thus showing the scientist in a more personal light. Consider example 6.1.

6.1. “I just seem to have a knack for memorizing star fields,” he told me....”I’m not particularly good at other things,” he added. “I don’t remember names well.”

“Or where he’s put things,” called Elaine [Evans’ wife] from the kitchen.

This example demonstrates another characteristic of presented discourse absent in the narratives of discovery—the voices of the non-scientists. These voices that include spouses, biographers, and colleagues often supply evaluations of the scientists, taking them out of the realm of science and into the realm of the personal. This function is usually associated with Private Discourse (see chapter 5), but in popular science, it appears, it can be fulfilled by Public Discourse. Indirect forms of Public Discourse alongside (F)DS can also showcase the personal sides of the scientists. Example 6.2. uses NPSA (bolded) to display Buckland’s dietary preferences:

6.2. Depending on whim and availability, guests to Buckland's house might be served baked guinea pig, mice in batter, roasted hedgehog, or boiled South Asian sea slug. Buckland was able to find merit in them all, except the common garden mole, which **he declared disgusting**. (Bryson 2003: 69)

In addition to displaying skills and preferences of the scientists outside the laboratory, Public Discourse can also be used to incorporate humour originating with the scientists into the texts. Examples 6.1. and 6.2. may be considered somewhat amusing, but the use of NPSA instead of (F)DS in example 6.2. points to the author as the source of humorous presentation. In example 6.2., the reader encounters essentially Bryson's (2003) take on Buckland's eating habits; there is no indication that Buckland himself regarded his unusual menus with anything but scientific curiosity. When (F)DS is used to introduce humour, it is unmistakably associated with the speaking scientist thus showing him/her as capable of a lighthearted approach to scientific issues.

Consider example 6.3.

6.3. Another physicist at the party, **Gordon Watts of the University of Washington, was asked whether the long anticipation for the LHC has been successful**.  
"Oh yeah, completely. I have this shock of gray hair here now. My wife claims it's because of our kid, but it's really because of LHC." (Carroll 2012: 2)

Besides introducing humour via DS, example 6.3. also demonstrates several other characteristic properties of presented discourse outside the narratives of discovery. There is an interaction of discourse presentation types that represents a dialogue: NPSA (bolded) introduces a question from an anonymous speaker, which receives a not-altogether serious response via DS of the scientist, which in turn contains embedded IS of his wife. The juxtaposition of the wife's IS with the DS of the scientist creates the humorous effect. Secondly, as I suggested above (see example 6.1.) the introduction of voices that do not belong to the scientists tends to shift the focus of presented discourse from science to the more intimate setting of home and to personal

responsibilities. In example 6.3., the wife's voice reveals the scientist as a father, while his own DS puts the focus back on his work—the Large Hadron Collider.

Other instances of presented discourse, however, show scientists venturing outside of their professional sphere (usually to find analogies and draw comparisons) without any help from other speakers. Kean (2012: 151) provides a good example (presented discourse of the scientist bolded):

6.4. ...a lab-tweaked version of one virus can turn polygamous male voles—rodents who normally have, **as one scientist put it, a “country song...love ‘em and leave ‘em” attitude towards vole women**—into utterly faithful stay-at-home husbands....

Showing scientists as having a humorous and lighthearted attitude toward their research and being able to incorporate popular cultural references may create a more balanced picture when this portrayal is considered against the one supplied by the narratives. Outside the narratives of discovery scientists emerge as having one more dimension to their personalities. I regard this as a contribution to celebratory discourse. Through the use of humour in presented discourse, the authors produce a picture of science and scientists that is rooted, in some way, in a universally positive emotion.

### **6.2.2. “All Healthy Bodies Resemble Each Other, while Each Unhealthy Body is Unhealthy in its Own Way”: Literary References in Presented Discourse**

Another aspect of presented discourse outside the narratives of discovery that I consider significant to the celebration of science is the connection between science and literature. It can manifest as DS in form of a quote from a famous literary work or through IS or IT of well-known writers. Examples 6.5.a., 6.5.b. (IS italicized), and 6.5.c. (IT bolded) illustrate these occurrences:

6.5.a. ...William Shakespeare was born...in a plague year..., and his career was interrupted several times, when plague epidemics forced the theatres to close down. Shakespeare had Mercutio, in *Romeo and Juliet*, say, “A plague on both your houses!”...His audiences would have understood what he meant. Most doctors thought that plague was a new disease, or at least one that Galen had not written about.... (Bynum 2012: 42)

6.5.b. As well as responding to individual events, animal nervous systems can also respond to sequences of events over time. If you repeatedly stimulate the slug’s siphon, the gill-withdrawal reflex progressively weakens....It is a case of what Marcel Proust called *the anaesthetizing effect of habit*.... (Coen 2012: 141)

6.5.c. Verne, more than others, realized that **science was the engine shaking the foundations of civilization**.... (Kaku 2011: 5)

The inclusion of presented discourse of literary figures and their characters establishes science as a discipline that does not stand alone, nor is in opposition to other forms of human inquiry, but functions in accord with them. It is worth noting that presented discourse connected with literature works as a supporting mechanism for the scientific issues discussed, thus evaluating the subjects at hand as recognizable and valuable outside the circle of professional scientists.

Presented discourse of this kind works as a reader engagement mechanism, as it alludes to the reader’s possible familiarity with certain literary figures and their works and uses those to make the new, scientific information more relatable. The degree of assumed familiarity of the reader with a certain literary work, of course, varies from text to text, and some authors include introductions of writers whose works are presented (as in example 6.5.a.), and some rely on the reader’s ability to recognize the writer and the work without any help. This last method allows the popular science authors to present fictional literary discourse as a source of wordplay and jokes.

Example 6.6. shows Kean's (2012: 300-301) use of Tolstoy's opening lines in *Anna Karenina* to illustrate a process of chromosome sequencing:

6.6. As observers have noted, the process was analogous to dividing a novel into chapters, then each chapter into sentences. They'd photocopy each sentence and shotgun all the copies into random phrases—"Happy families are all," "are all alike; every unhappy," "every unhappy family is unhappy," and "unhappy in its own way."

The first part of the title for this subsection is another example of Kean's (2012: 312) use of the same novel as a source of wordplay attributed to the scientists. Example 6.7. provides the full sentence from Kean in context:

6.7. ...even if the large-scale symptoms are identical, the underlying genetic causes...might be different. (Some scientists misquote Tolstoy to make this point: perhaps all healthy bodies resemble each other, while each unhealthy body is unhealthy in its own way.)

This incorporation of a distorted quotation into presented discourse is similar to the use of figurative language in indirect discourse (see chapter 5). In both cases the creative use of language is attributed to the scientists, showing them as versed in the subjects other than the ones required for their professions.

Incorporating humour and literary references into presented discourse, and especially into presented discourse of scientists, positions scientific endeavours as part of universal human knowledge and experience. Presented discourse that shows science as applicable and relatable to a variety of human activities contributes to celebrating its achievements.

### **6.3. Speech Presentation versus Writing Presentation: Another Look**

In chapter 2, I argued for not distinguishing between speech and writing presentation in the corpus of the narratives of discovery because unambiguous references to writing



were few and a clear distinction between speech and writing was not always possible. This is why I have been using the term Public Discourse which includes both speech and writing presentation.

The investigation of presented discourse outside the narratives of discovery, however, made me question the amalgamation of the two discourse presentation categories as applicable to the popular science books in general. It appears that presented discourse outside the narratives of discovery makes the distinction between speech and writing much clearer, and the references to writing are not only numerous, but would also lose part of their significance if analyzed as speech presentation—which is not the case inside the narratives of discovery. References to literature and to specific works of literary fiction are in some measure, I think, responsible for the clearer lines between writing and speech. In such cases as in examples 6.5.a., 6.6., and 6.7., presented discourse introduces quotations from literary works not the discourse of individual authors. For example, when Bynum (2012: 42) quotes Shakespeare, it is important to let the reader know that he is quoting a play *Romeo and Juliet* and not something Shakespeare possibly said or thought. In other words, presented discourse introduced as the presentation of writing reflects Shakespeare the author, who expresses himself through his characters, as opposed to Shakespeare the person, who would speak/write as himself (in a letter to a friend, for example). The same is true for Kean's (2012: 300-301, 312) examples (6.6. and 6.7.), as they deal with Tolstoy the author, who is projected through the voice of the narrator in *Anna Karenina*.

Furthermore, writing presentation is distinguishable from speech in occurrences other than the ones dealing with literary works. For example, Ferris (1988: 331-332) refers to Howard Georgi "writing a limerick on the blackboard". Carroll (2012: 78)

quotes a caption that appeared under “a photograph of the CMS detector next to a photograph of a pigeon” in the *Telegraph*. See examples 6.8.a. and 6.8.b.

6.8.a. ...Howard Georgi, known for his work in grand unified theory, introduced a 1984 Weinberg lecture at Harvard by writing a limerick on the blackboard that read:

Steve Weinberg, returning from Texas,  
Brings dimensions galore to perplex us.  
But the extra ones all  
Are rolled up in a ball  
So tiny it never affects us.

6.8.b. The *Telegraph* printed a photograph of the CMS detector next to a photograph of a pigeon, with the caption, “The Large Hadron Collider (left) and its arch-nemesis (right).”

These and similar occurrences are unmistakably presentations of writing and explicitly intended as such. Introducing them indicates that the authors, on these particular occasions, wish for the reader to process the information as having come from a written source. Mistaking writing for speech would either alter the facts (as in the case of Georgi) or would make the discourse nonsensical (in the case of the *Telegraph*'s caption). Presented writing is usually associated with additional artifacts such as specific forms of writing (e.g. limericks, novels, etc.) or images (as in example 6.8.b.). Once divorced from these scaffolds, the presentation of writing may become unclear to the reader. In a way, what this evidence shows is that writing is a more constrained form of presented discourse as compared with speech. When the scaffolding background is less important, writing can be substituted for speech—as is the case in the narratives of discovery. However, once the background scaffold is vital to the correct interpretation of the message, the presentation of speech cannot be substituted for writing.

This idea is supported in the findings of Short et al. (2002) and Semino and Short (2004: 113), who suppose the presentation of writing more accurate and attentive to the details of the anterior discourse than the presentation of speech. The suggestions of Short et al. (2002) are of particular relevance. Short et al. (2002: 327) argue for a “context-sensitive account of discourse presentation” that gives writing presentation the monopoly on accuracy because of the “checkability” factor. This attention to context and the potential for checking an instance of the writing presentation for accuracy is connected with what I have been referring to as “artifacts” and “scaffolding background” of presented writing.

One possible explanation for more explicit references to writing outside the narratives of discovery is the general broader range of the topics covered by presented discourse and also the broader range of the presented voices, some of which are available only through writing and become less effective as presented speech, as is the case with some literary references. Another possible reason is that outside the narratives of discovery the broader focus allows for introducing contexts other than those of communication between scientists.

Examination of presented discourse outside the narratives of discovery confirms the need for the introduction of a separate category of writing presentation as suggested by Semino and Short (2004).

#### **6.4. Confirming the Fusion of Non-Fiction and Fiction-like Qualities of Presented Discourse in Popular Science**

In general, it is possible to say that presented discourse outside the narratives of discovery is functionally similar to presented discourse in the narratives. It too is used

to dramatize and to present factual information and thus demonstrates a fusion between the functions usually associated with fiction and non-fiction. However, presented discourse outside the narratives appears to preserve the distinction between fiction and non-fiction when it comes to the form presented discourse takes, while the narratives blend the forms and functions more thoroughly. Comparison of (F)DS outside and inside the narratives of discovery provides some of the most vivid examples of the formal contrasts and functional similarities.

As Semino and Short (2004: 93) demonstrate, (F)DS in non-fiction (especially in newspapers) is mostly used to incorporate facts and, when necessary, distance the author from the presented voice. I showed in chapter 4 that a significant portion of (F)DS in the narratives of discovery is used for dramatization—a function reserved primarily for (F)DS in fiction (see, for example, Toolan 2001, Semino and Short 2004). In chapter 5, having analyzed the non-dramatizing occurrences of (F)DS, I came to the conclusion that (F)DS can be used for explanatory purposes and can even contribute significantly to narrative progression. Semino and Short (2004: 90, 93) note that (F)DS in non-fiction manifests as “individual utterances in isolation”, while in fiction it is more likely to create “stretches of dialogue”. In fact, I demonstrated in chapter 4 that (F)DS in the narratives of discovery is not used to create dialogue and that this role is performed by NPSA instead.

Outside the narratives of discovery, however, there are numerous examples of fiction-like dialogic exchanges presented via (F)DS, which align popular science more closely with fiction than with non-fiction. Consider example 6.9.

6.9. “Would you do me the favor, said Frederick to the darkling Lambert, “of telling me in what sciences you are specialized?”  
“In all of them,” Lambert replied, addressing a point in space ninety degrees away from the king.  
“Are you also a skillful mathematician?” asked Frederick.  
“Yes.”  
“Which professor taught you mathematics?”  
“I myself.”  
“Are you therefore another Pascal?” asked Frederick, referring to the great mathematician of the previous century.  
“Yes, Your Majesty,” replied the voice in the dark. (Ferris 1988: 149)

At the same time, presented discourse outside the narratives also contains short, factual, isolated utterances that Bell (1991) and Semino and Short (2004) consider prototypical for non-fiction. Consider example 6.10.

6.10. Commenting on the report, the editors of *Morbidity and Mortality Weekly Report* speculated that the puzzling symptoms of the five men “suggest the possibility of a cellular-immune dysfunction.” (Zimmer 2011: 56)

As examples 6.9. and 6.10. show, (F)DS outside the narratives of discovery conforms to functions generally associated with both fiction and non-fiction. Presented discourse in the narratives of discovery acts similarly, but in the case of (F)DS the form and the function do not always correspond as belonging to fiction or non-fiction as they do outside the narratives. For example, shorter stretches of isolated DS are more likely to dramatize by supplying personal perspective and emotionality (form associated with non-fiction, function associated with fiction)—see example 6.11 a. At the same time, longer occurrences tend to incorporate more factual information (form associated with fiction, function with non-fiction)—see example 6.11.b.

6.11. a. Even at that time it was becoming clear that the basic outline of the Standard Model was “pretty much a done deal,” as he [Wilczek] put it, but that the properties of the Higgs boson were relatively unexplored.  
(Carroll 2012: 169)

6.11.b. Pavlov noticed that many factors could trigger the dog's salivation, as long as they were associated with presentation of food: "Even the vessel from which the food has been given is sufficient to evoke an alimentary reflex complete in all its details; and, further, the secretion may be provoked even by the sight of the person who brought the vessel, or by the sound of his footsteps."  
(Coen 2012: 153)

As Semino and Short (2004: 90-93) observed, for (F)DS in fiction, longer stretches tend to dramatize, for (F)DS in non-fiction, short quotes are more likely to be devoted to the presentation of facts. By changing the alignment between the form and function of (F)DS the narratives of discovery show a greater integration of both fiction and non-fiction-like qualities of presented discourse, while presented discourse outside the narratives remains more identifiable as resembling either fiction or non-fiction.

A feature that aligns presented discourse outside the narratives with non-fiction is the distancing function of presented discourse. This property is usually associated with DS (see, for example, Semino and Short 2004: 93). It should be remembered that DS with distancing properties is absent in the narratives except for one undisputed occurrence introduced in chapter 5 (See chapters 4 and 5 for a discussion of distancing in DS as it relates to the narratives of discovery.). Outside the narratives, however, it is easy to find examples of DS used to create the distancing effect. Consider example 6.12.

6.12. In 1983, as part of the World's Columbian Exposition in Chicago, seventy-four well-known individuals were asked to predict what life would be like in the next 100 years. ... Senator John J. Ingalls said, "It will be as common for the citizen to call for his dirigible balloon as it now is for his buggy or his boots."  
(Kaku 2011: 7)

In this case, and in all the other cases of distancing in the books I analyzed, the author distances himself from what is currently regarded (usually by him) as incorrect

information. For example, Greene (2012: 9) explicitly shows his non-alignment with the presented voices because they do not express the point of view he favours:

6.13. Some people recoil at the notion of parallel worlds. As they see it, *if we are part of a multiverse, our place and importance in the cosmos are marginalized.* My take is different.

Here indirect forms of presented discourse (NPTA underlined and IS italicized) are used to distance the author from the views introduced.

Having seen that outside the narratives of discovery other forms of presented discourse than DS can be used to distance the author from the material, it is possible to regard the negative hypotheses presented via IT and NPTA as instances of distancing. Negative hypotheses introduce information that does not find empirical support and thus is considered incorrect by the scientific community (see chapter 5). The verb choices associated with the presentation of the negative hypotheses can be seen as signals of distancing.

Distancing, dramatization, and the presentation of facts are all confirmed functions of presented discourse inside and outside of narratives and represent a blend of non-fiction and fiction-like qualities of popular science. The brief comparison of these functions shows that in the narratives of discovery the functions associated with non-fiction and with fiction are fused together and appear more difficult to discern because the forms of presented discourse and their respective prototypical functions do not always align. For instance, DS can be used to introduce explanations and NPSA to create dialogue, while IT and NPTA can produce the distancing effect, and IS can introduce figurative language showcasing not content but form; not to mention the preference of Private Discourse for scientific rather than personal matters. Outside the narratives, both non-fiction and fiction-like properties of presented discourse are still

present, but they are usually aligned with the prototypical forms. Thus DS can be used to create dialogue (fiction-like quality) and for distancing purposes (non-fiction-like quality). Both of these functions are clearly identifiable as prototypical for DS in fiction and non-fiction.

I suggest that such a division of functions as observed outside the narratives of discovery can be attributed to a generally lesser need to use presented discourse for dramatization. When dramatization using presented discourse outside the narratives does occur, it takes on a form that is very different from anything in the narratives of discovery.

## **6.5. The Fictionalized Reader in Popular Science**

The label the “reader-in-the-text” was first proposed by Thompson (see Thompson and Thetela 1995); however, the notion of a generalized reader present in a text existed in earlier works (see for example, Iser 1972 and Culler 1982, who account for such a reader in fiction, or Fairclough 1989 and Talbot 1995, who look at non-fiction). While Thompson (2012: 80) suggests that his “admittedly clumsy formulation” has “the advantage” of focusing on the “evidence in the text itself”, it still deals with a mostly ethereal entity that, in Thompson’s (2012: 80) words “haunts all discourse” and whose opinions and preferences cannot be expressed directly but only through the medium of authorial reference to them. Example 6.14. reproduces Thompson’s (2012: 81) illustration of a proposition attributed to the reader-in-the-text to which “the writer is responding” (italics are Thompson’s and indicate “the propositions attributed to the reader-in-the-text”)

6.14. It has been argued that *most libraries have Internet access*. However, many people with disabilities, especially those in rural areas, do not have access



to accessible transportation and cannot get access to information available on Internet.

In other words, the reader-in-the-text is pretty thoroughly hidden and emerges only upon a close linguistic analysis (of which there have been many including, for example, Thompson 2001, Martin and White 2005, Lewin and Perpignan 2012). It is also, as Thompson (2012: 80) points out “unpredictable” how a real-world reader will fit “into the semiotic shape moulded...by the text”. For instance, it is impossible to predict if every reader agrees that most libraries indeed have Internet access.

The authors of popular science, it appears, offer a solution to such indeterminacy by introducing a more direct approach to the incorporation of the reader, the technique I call the “fictionalized reader”. The familiar mechanisms for including the reader in a text include evaluation, modalization, reader pronouns, and others (see Thompson 2012: 81) and deal with covert representation of the reader. The fictionalized reader, on the other hand, manifests through its own presented discourse and functions like any other presented voice in a text. Analysis of presented discourse outside the narratives of discovery reveals that the authors of popular science employ hypothetical DS to enact possible reader reactions to explanations provided in the text. Quite often this hypothetical DS of the reader forms dialogues either with the authors or with other characters in the books, who are, like the reader, given voice in thought experiments. Consider example 6.15.

6.15. Imagine it’s a hot summer night and there’s an annoying fly buzzing around your bedroom. You’ve tried the swatter, you’ve tried the nasty spray. Nothing worked. In desperation, you try reason. “This is a big bedroom,” you tell the fly. “There are so many other places you could be. There’s no reason to keep buzzing around my ear.” “Really?” the fly slyly counters.

(Greene 2011: 29)

By making the reader effectively a character in the story, the author eliminated Thompson's (2012: 80) concern for unpredictability of the real reader's reaction. The author is not dealing with a real-world reader any longer but has constructed a thoroughly fictional character. Unlike presented discourse of scientists, presented discourse of a fictionalized reader has no real-world antecedent and in that is closer to presented discourse found in fiction, where, as Short (2012: 20) notes, the "idea of anterior vs. posterior discourse situations does not sensibly apply at all". The fictionalized reader also eliminates the need to have the author as a representative for the reader. Now there is a character with his/her own presented voice who fulfills this function. The author, thus, is free to speak *to* the reader without speaking *for* him/her also. This appears to be a significant benefit for popular science because the fictionalized reader appears almost exclusively in thought experiments—segments that are heavy with scientific information—where the author presumably needs to concentrate his/her explanatory abilities and not strain the resources by anticipating possible reactions or incorporating possible values of the reader. The fictionalized reader is a perfect mechanism for supplying a reader-oriented interpretation of a difficult issue.

The fictionalized reader in addition to simplifying the writer's task by supplying concrete reactions and eliminating guess work also helps the real reader. As Thompson (2001, 2012) mentions, if a real-world reader is not aligned with the attitudes and positions of the reader-in-the-text, the communication breaks down. However, the technique of the fictionalized reader allows the real reader to step back and experience explanations and arguments through another character in a text without breaking the communication line with the author in case of non-alignment.

The variety of presented discourse types that are assigned to the fictionalized reader suggest that this is a fully functional and well-developed phenomenon. As examples in Table 6.1. demonstrate, the variety is comparable with what is found in the narratives of discovery or in larger corpora such as Semino and Short’s (2004), with both Public and Private Discourses being represented. Another feature of the fictionalized reader that points to the significance and prominence of this technique is that it can be seamlessly integrated with presented discourse of other characters in the texts, forming dialogues. See example 6.15. above or DS example in the table below.

Table 6.1. Discourse Presentation Types Used to Create the Fictionalized Reader

Type of Presented Discourse	Example
DS	Imagine you work for the notorious film producer Harvey W. Einstein, who has asked you to put a casting call for the lead in his new indie, <i>Pulp Friction</i> . “How tall do you want him?” you ask. “I dunno. Taller than a meter, less than two...” (Greene 2011: 152)
NPSA	...you...tell the robotic cook in your kitchen to make breakfast and brew some coffee, and order your magnetic car to leave the garage and be ready to pick you up. (Kaku 2011: 354)
FDT	Now you face a decision. How many actors should you have at the audition? You reason: <b>If W. measures heights to a centimeter’s accuracy, there are a hundred different possibilities between one and two meters.</b> (Greene 2011: 152)
DT	Your first thought is, “Well, protons smash together, the Higgs comes out.” (Carroll 2012: 166)
NPTA	Curled up under a warm duvet, just regaining consciousness but not yet having opened your eyes, <b>you’ll remember the Zaxtarian deal. At first it will seem like an unusually vivid nightmare, but as your head starts to pound you’ll recognize that it is real....</b> (Greene 2011: 230)

The technique of fictionalizing the reader contributes to the similarities between popular science and fiction. In fact, the fictionalized readers can have their own narratives where they are the primary characters, who interact with other characters via a variety of presented discourse forms. The authors create fully fictional stories (usually

as part of thought experiments) to illustrate and explain various scientific concepts and make the reader a fictional character in these stories. The degree of fictionality in such cases is greater than in cases of the presented voices of scientists since the latter are rooted in specific real-world people whilst the fictionalized reader is a fictional stand-in for an indeterminate number of non-specific possible readers.

The notion of a “degree of fictionality” appears in Skov Nielsen et al. (2015 a) and corresponds to the number of fictionalization techniques employed by the author, including the subject matter itself. The gradational view of fictionality is made possible by Skov Nielsen’s et al. (2015 a, b) approach to fictionality as a communicative strategy. Of fictionalization mechanisms in non-fiction Skov Nielsen et al. (2015 a: 65) say the following, “In uses of fictionality outside of generic fictions, a sender [author] does not transform nonfictional subject matter into something fictional but rather adopts a distinct communicative stance”.

In professional and popular science, the concept of the thought experiment often represents a communicative stance connected with fictionality. In fact, those who explore fictionality in professional science (see chapter 1 section 2) focus on thought experiments and models as the most easily observable examples that supply evidence of the importance of the imagination and fictionality to science. The presence of the fictionalized reader in the hypothetical passages of the texts tie the fictionality this strategy produces to the fictionality found in the professional contexts. In popular science books, the authors through the technique of the fictionalized reader give the actual readers a sample of the thought experiment process and so tie the act of reading popular science to the experience of doing professional science.

While I do not fully agree with Skov Nielsen's et al. (2015 a,b) approach to fictionality in non-fiction, as they regard it as almost exclusively composed of hypothetical discourse (see chapter 1 section 2), I believe their view of fictionality as a communicative strategy contributes to the understanding of the fictionalized reader.

Overall, presented discourse that creates the fictionalized reader contributes to two important aspects of popular science. Firstly, it provides additional resources for the explanation of challenging scientific concepts, and secondly, supplies strong evidence in favour of presented discourse in popular science contributing to fictionalization of the texts. As far as the fictionalized reader's communicative properties are concerned, I suggest that this technique places presented discourse alongside such reader-construing elements as interactant pronouns, modalization, evaluation, etc. (see Thompson 2012: 81 for a more complete list).

## **6.6. Conclusion**

A brief investigation of presented discourse outside the narratives of discovery provides a new outlook on the data collected from the narratives and helps confirm some of the propositions regarding presented discourse made in the context of the narratives of discovery. The analysis and comparisons undertaken in this chapter show that while such features as the presentation of writing and the use of presented discourse for distancing are not prominent in the narratives, they are, nevertheless, present in popular science books. Presented discourse outside the narratives demonstrates that distancing occurs in connection with the information that is deemed incorrect or is not supported by the author. As such, distancing from certain voices in the text does not directly interfere with the general celebratory nature of presented discourse. In fact, by creating

a contrast between acceptable and unacceptable knowledge, distancing contributes to the favourable presentation of those voices that project the right information. In light of the new evidence on distancing supplied by presented discourse outside the narratives, I suggest that the negative hypotheses introduced in the narratives can be seen as examples of distancing.

Another important feature of presented discourse in popular science that the narratives obscure but presented discourse outside the narratives brings to the forefront is the presentation of writing. Outside the narratives of discovery, writing presentation is clearly identifiable as such and plays an important role, as it allows, for example, to incorporate literary references.

The use of literary references and humour in presented discourse produce a more balanced portrayal of the scientists. Outside the narratives they are given opportunities to talk about their research in broader terms and to showcase the knowledge of, and the interest in, subjects than lie beyond their professions.

Perhaps the most significant finding of the chapter is the confirmation of the non-fiction and fiction-like qualities of popular science that presented discourse outside the narratives supplies. The analysis of presented discourse outside the narratives reveals that when it comes to forms and functions prototypically associated with either fiction or non-fiction, the alignment of form/function is distorted in the narratives but kept intact outside the stories of discovery.

Connected with the fiction-like features of popular science is a new technique for fictionalization that emerged as a result of the analysis undertaken in this chapter. It appears that the authors create fully fictional characters that represent the reader and express these characters through a variety of presented discourse types. I label this

strategy “the fictionalized reader” and suggest that it is in the tradition of Thompson’s (1995, 2001, 2012) idea of the reader-in-the-text. At the same time, I argue that the fictionalized reader is a more concrete entity that does not attempt to estimate the reader’s attitudes but rather assigns them more aggressively. I see the fictionalized reader as a communicative strategy that supports Skov Nielsen’s (2015 a, b) view of fictionality as a tool of communication.

As such, the technique of fictionalizing the reader is designed to lift some pressure from the author and the real-world reader during the discussion of complex scientific concepts. For the author, the fictionalized reader creates an opportunity to project the reader’s attitudes and reactions overtly. Unlike the reader-in-the-text techniques, which represent the reader covertly through the narrator’s discourse, the use of the fictionalized reader produces its own discourse—presented discourse of the reader. The presence of a concrete reader-character in a text gives the author a chance to focus on the explanation without trying to embed the possible attitudes and reactions of the reader into the explanatory segments. For the real-world reader, the fictionalized reader offers a character with whom one can easily disagree without endangering the loss of communication with the author.

Overall, the analysis of presented discourse outside the narratives of discovery confirms the significance of presented discourse in the exposition of science for the public.

## CHAPTER SEVEN

### CONCLUSION

#### **7.1. Goals and Achievements of the Thesis: From Questions to Answers**

This thesis has explored presented discourse in popular science narratives of discovery, has connected it with the notion of fictionality, and has proposed that the fictionalization of the narratives by means of presented discourse produces popularizations that emphasize the roles of individuals in the production of science.

I began writing this thesis with the idea that popular science can combine the elements of both fiction and non-fiction as Myers (1992, 1997) demonstrates. It appears that in addition to the fictional setting that Myers (1997) describes, presented discourse of scientists can also contribute to fictionality.

I was led to this conclusion by the examination of the forms and functions of presented discourse in the narratives of discovery. This part of the investigation helped me to answer the research questions that concerned the applicability of the existing models of presented discourse analysis to popular science. Semino and Short's (2004) findings became the primary source for the comparison with my own data.

At this point, I can assert that the model proposed by Semino and Short (2004) can be a reliable starting point for the analysis of presented discourse in the narratives. However, it becomes more useful when slightly modified. I propose to organize the categories of the Semino and Short (2004) model somewhat differently. Instead of separating the presentation of speech and the presentation of writing into individual categories, I suggest analyzing such instances under the umbrella term of Public Discourse. I do not eliminate the presentation of writing but choose to follow Semino



and Short's (2004) own observations on the similarity of functions between the presentation of writing and speech. In the sections that follow, I explain the significance and utility of the label Public Discourse.

The next set of research questions that the thesis has addressed deal with the implications of either applicability or non-applicability of the existing analytical models to the narratives of discovery. I wanted to determine what each possible outcome revealed about the genre of popular science. My reservation about the usefulness of the existing analytical frameworks was based on the fact they were designed to accommodate presented discourse in self-evidently fictional genres such as novels. Therefore, complete alignment with, for example, Leech and Short's (1981) model would suggest that presented discourse in the popular science narratives of discovery is not much different from presented discourse in novels. On the other hand, if the forms and functions of presented discourse found in the narratives did not correspond to any already-proposed categories, that would point to a significant rift in the way presented discourse is employed in fiction and non-fiction. Neither of these extreme outcomes was expected. In fact, I was looking for evidence of a middle ground between fiction and non-fiction. This is why the Semino and Short (2004) model that accounts for both fiction and non-fiction appeared the most appealing.

To help me examine its applicability, I turned to the quantitative analysis of the frequency information found in Semino and Short (2004) and in my corpus. I wanted to know if the frequencies of the discourse presentation forms for non-fiction found in Semino and Short (2004) were genre-specific or represented a pattern common for all non-fiction texts. The comparison with the data from the narratives was especially crucial because the Semino and Short (2004) non-fiction section of the corpus did not

include popular science; it used newspapers and (auto)biographies. Thus, a close correspondence between Semino and Short's (2004) frequency information and the data from the narratives would allow me to suggest the general applicability of the Semino and Short (2004) distribution patterns. While I found minor discrepancies in the frequency information, the overall similarity in the distribution of presented discourse forms proved undeniable (see chapter 3 for specific figures).

In addition to the comparison of the percentages for each form of the discourse presentation found in the Semino and Short (2004) and in my corpus, I also analyzed the ratios of speech/writing to thought presentation and Public to Private Discourse in both corpora. Unlike the comparison of the percentage points, which placed the narratives of discovery in direct alignment with the non-fiction section of Semino and Short's (2004) corpus, the analysis of the ratios positioned the narratives of discovery between fiction and non-fiction.

The examination of the frequency information raised the questions about the functions of presented discourse and whether or not presented discourse in the narratives was used for the same purposes as presented discourse observed by Leech and Short (1981), Semino and Short (2004), and Short (2007). The answers to these questions contributed to the applicability of the existing models.

The comparison with the function scales of Leech and Short (1981) and Short (2007) was of particular interest since these functional models were devised using examples from fiction exclusively. As expected, I uncovered differences among the functions generally assigned to certain forms of presented discourse in fiction and the functions of the same forms of presented discourse in the narratives of discovery.

Contrary to the generally accepted distribution of the functions suggested by the previous studies (all of which are in some way influenced by Leech and Short 1981), my data shows that the dramatizing properties can be distributed along the whole scale, with such indirect forms of presented discourse as NPSA being used for dramatization. The explanation for this phenomenon lies in the hybrid nature of the narratives. As a result of fictionalization, presented discourse in the narratives retains the forms associated primarily with non-fiction (indirect forms) but fulfills the functions commonly observed for presented discourse in fiction (character creation, dramatization). Figure 7.1. shows the existing function scale as found in Short (2007) and my proposed function scale.

Figure 7.1. Comparison of Function Scales

**Functions of Speech/Writing Presentation [Source: Short (2007: 230)]**

[N] NV NRSA IS FIS DS (including FDS)

	Summary	
Distance, calmness, etc.		Vividness, drama, etc.
Telling		Showing

**Functions of Public Discourse in the Narratives of Discovery**

NRSA	IS	FIS	(F)DS
	D r a m a t i z i n g		
Summary		Vividness	

The finding that the dramatizing function can be distributed along the whole scale points to the importance of considering non-fiction when it comes to establishing the standards for the use of presented discourse. It also shows that dramatization as a feature of fictionality is not alien to non-fiction in general and especially to the popular science narratives of discovery. This finding provides more support for my initial

suggestion about the hybrid nature of popular science as a genre and the role presented discourse plays in fictionalizing the narratives.

The broad distribution of the dramatizing function provides strong evidence for fictionality in presented discourse. In fact, my next group of research questions concerned the two most popular forms of dramatization achieved through presented discourse: dialogue and the presentation of thought. Since some researchers (see, for example, Cohn 1990, Rimmon-Kenan 2002, Short 2007, and Dawson 2015) suggest that the inclusion of dialogue or thought presentation automatically signals fictionality, I wanted to explore these types of presented discourse in more detail. I was especially interested to determine whether all forms of thought presentation or all instances of dialogue signaled fictionality. While I confirmed that dialogue is strongly connected with dramatization and thus with fictionality (see my proposed definition of fictionality in chapter 1), I did not find evidence that all occurrences of the thought presentation fictionalize the narratives. In fact, my observations suggest the opposite (see chapter 5)—the majority of the thought presentation in the narratives is not used for dramatization but for introduction of scientific hypotheses.

The final set of research questions addressed the presentation of discourse outside the narratives of discovery. In order to make broader assumptions about the nature of presented discourse in popular science books, I needed to compare the findings based on the analysis of the narratives with the data collected from the remaining portions of the books. Many of the observations made on the basis of the analysis of the narratives found support through this comparison. For example, I was able to confirm the presence of the fiction-like elements in presented discourse and the celebratory role presented discourse performs in popular science.

At the same time, the analysis of presented discourse outside the narratives alerted me to a new feature of presented discourse in popular science—the idea of the fictionalized reader discussed in chapter 6. The same analysis also highlighted the importance in this context of the presentation of writing as writing, rather than as just a variant of Public Discourse. The importance of written artifacts had not been apparent in the narratives I examined.

When combined, all of the above research questions correspond to the underlying theme of the thesis—the connection between the scientists and the public. Studies concerned with the communication of science to the public (see, for example, Dennis 2010, Sackler 2014) acknowledge the importance of narrative and recognize the need to represent scientists as relatable and trustworthy. My work shows a possible way in which this goal could be accomplished.

## **7.2. Practical Applications, Theoretical Contributions, and Methodological Suggestions of the Thesis**

In the process of analyzing presented discourse in the narratives of discovery, this thesis outlines possible theoretical, methodological, and practical implications for those who critique, research, or write popular science.

This thesis offers a re-examination of the existing knowledge on fictionality in non-fiction in general and in popular science in particular. Here, the implications are both practical and theoretical. Firstly, the thesis presents to the writers of popular science specific insights about creating relatable characters out of scientists and suggests positioning the reader among the semi-fictional actants. Secondly, the theoretical implication connected with the notion of fictionality has to do with the

nature of science found in popular texts and invites future critics and researchers to look at the genre as representative of reimagined rather than absolute truth.

The main methodological and theoretical implications of the thesis concern its contribution to the existing field of knowledge on presented discourse. Additionally, the thesis suggests the fictionalized reader as a new reader-engagement strategy.

The thesis introduces the categories of Public and Private Discourse that simplify the analytical model presented by Semino and Short (2004) yet preserve the original detailed approach. This thesis also suggests an update on the distribution of the dramatizing properties of presented discourse across the function scale proposed by Short (2007).

The present work reminds those who study presented discourse that function is as important as form and that it cannot be derived simply from the examination of form. The thesis suggests that the generally accepted differences of function between speech/writing and thought presentation should be reexamined, as these categories do not always correspond strictly to the outer and inner worlds of the actants whose discourse is being presented to the reader.

### **7.2.1. Public and Private Discourses**

I see the insights of this thesis on the subject of presented discourse as potentially helpful to future researchers in the field who wish to explore presented discourse in texts that describe the people of the real world yet are written as though they dealt with imaginary characters. Such texts may be popular history or creative non-fiction, in addition to popular science. I predict that fictionality in presented discourse might serve as a mechanism for distinguishing popularizations from other non-fiction genres. While

popularizations tend to fictionalize, textbooks, for example, might be more concerned with accuracy. The most dramatizing forms of presented discourse found in the narratives of discovery (e.g. NPSA) function differently in non-fiction genres guided primarily by the accuracy of the event presentation—news reports, for instance.

The adjustment proposed for the Semino and Short (2004) model suggests looking at presented discourse in slightly broader terms: using the categories of Public and Private Discourse rather than analyzing speech and writing as separate categories. While I recognize the category of the presented writing as a form presented discourse takes, I have not observed that in the popular science narratives of discovery it is employed to create effects significantly different from those produced by the presentation of speech. It is my assumption that other forms of narrative besides the narratives of discovery might use presented discourse in a similar way. For those analysts whose material might not emphasize presented writing, the separation into Public and Private Discourses might afford more flexibility.

From the point of view of methodology and research design, the category of Public Discourse may help avoid unnecessary nomenclature-related clutter yet preserve the possibility of introducing the analysis of the presented writing at the points when it is most relevant. A good example of this could be found in chapter 6, where I point out that presented discourse found beyond the narratives of discovery emphasizes the presented writing as markedly different from the speech presentation. At that point, using the term and the category of presented writing becomes more sensible, and the label Public Discourse easily accommodates this need by unfolding into “the presentation of speech” and “the presentation of writing”.

In terms of theory, this thesis invites a second look at the functional dichotomy between speech/writing and thought presentation. Previous studies (see, for example, Semino and Short 2004, Leech and Short 2007, Short 2007, 2012) tend to agree that speech/writing reflect the outward manifestations of communication, while thought presentation reveals the inner worlds of actants and is not necessarily communicative. I should acknowledge that as I began my investigation of presented discourse, I did not question this separation of functions, and the distinction remains in my discussion in chapter 2. I chose the labels “Public” and “Private” to describe the two distinct categories of presented discourse found in the narratives. However, upon closer examination, it became evident that the commonly assumed separation of functions is not observed in my corpus. As chapters 4 and 5 show, Public Discourse is much more likely to supply emotion—an insight into an inner world—while Private Discourse is used primarily to deal with the scientific matters—issues that are inherently directed to the outward world and are intended to be communicated.

This thesis shows that the separation of presented discourse along the lines of outwardly directed communication and inner world expressions is not always accurate. Instead, I suggest focusing the distinction on the dramatizing properties of presented discourse. This distinction preserves the separation of presented discourse into broad categories and allows for speech/writing to be analyzed opposite thought presentation if necessary, but, at the same time, it does not limit the scope of Private Discourse to the inner worlds of characters but merely indicates that a message is unvoiced. For Public Discourse, the distinction based on the dramatizing properties acknowledges the expression of inner emotional states of actants as the possible main message of an



exchange. For example, consider an instance of Einstein's FDS in response to Lemaitre's idea of the Big Bang as presented by Greene:

7.1. "Your mathematics is correct, but your physics is abominable."  
(Greene 2011: 11)

Einstein could have used different words and still expressed the same indignation. The emotion and the belief system that this utterance reflects are unique, the verbal expression is not. In this sense, an instance of (F)DS communicates primarily an inner state and only secondarily the verbal message. On the other hand, example 7.2. shows Private Discourse being used to reveal not necessarily the inner world of the scientists but rather to communicate a tangible idea:

7.2. In 1954, Chen Ning Yang and Robert Mills came up with the idea that this symmetry should be "promoted" to a local symmetry—i.e., that we should be allowed to "rotate" neutrons and protons into each other at every point in space.  
(Carroll 2012: 154)

In this case, the actual message as expressed through IT is more important than its potential to reveal some aspect of the scientists' personalities. This kind of IT has less emotional revelation than the FDS in 7.1. One of the most obvious indicators of this is the dual attribution of the IT. The fact that both scientists are mentioned points to the focus on the outward world (professional recognition) rather than on the possible shared inner world.

The chief difference between the two examples lies in the dramatizing properties. The pervasiveness of dramatization in Public Discourse and the relative lack of the dramatizing properties in Private Discourse make dramatization a potential logical point of separation between the two categories of presented discourse.

### 7.2.2. Insights for Writers

Writing popular science has become increasingly important because of the pressure researchers and scientific institutions experience from policymakers, grant-providing agencies, and the public itself to make their findings comprehensible to lay audiences. As a result, there is a demand for how-to manuals, which among other things, offer specific strategies for producing clear prose (see, for example, Barton 2010, Dennis 2010, Bowater and Yeoman 2013). However, their insight into language is limited. My analysis, on the other hand, offers to provide the missing linguistic perspective on the subject, especially when it comes to the handling of multiple voices.

The understanding of the presentation of discourse is rather marginal in many of the how-to guides, with the notion of presented discourse equated with quoting. At the same time, the works of Dennis (2010: 18) and Sackler (2014: 8-10) acknowledge the vital role scientists play in making science relatable. They also demonstrate a concern that the public does not always see the members of the scientific community as “warm” (Sackler 2014: 10). The recognition and the concern, however, do not result into more reliable information on the presentation of the voices of scientists.

My findings could be easily converted into a series of practical steps that can remedy this situation. Firstly, dramatization of dialogue does not have to take up a lot of room. My data shows that in the quest for conciseness, among other things, the writers opt out for NPSA or a combination of NPSA and other forms of Public Discourse to introduce dialogue. Consider example 7.3. with a dialogue constructed primarily using NPSA (*italicized*) with an inclusion of FIS (underlined):

7.3. Far from rejoicing, the older scientist screwed up his brow and *expressed his doubts that the nucleus contained any sort of special, non-proteinaceous substance. Miescher had made a mistake, surely. Miescher protested, but Hoppe-Seyler insisted on repeating the young man's experiments—step by step, bandage by bandage—before allowing him to publish.* (Kean 2012: 20-21)

Secondly, revealing hypotheses and important scientific advancements through Private Discourse achieves a certain level of intimacy with both the issue at hand and the scientist presenting it. Consider example 7.4. There are no revelations of Orsted's inner world; instead the reader gets a chronologically accurate glimpse into the thought process that leads to the discovery

7.4. Ørsted had thought of a clever way to demonstrate the hypothetical connection between the two: He would build an electrical circuit, and then run the current next to a compass and see if its needle was deflected from true north by the running electricity. (Carroll 2012: 121)

Mastering the presentation of hypotheses as creative insights introduced through Private Discourse is an effective way to establish a connection between the reader and the scientists.

Thirdly, it is important for writers to use IS rather than alternatives such as narration when using language creatively. Attributing a particularly effective use of language, such as figurative language, to a scientist and allowing him/her to take credit for its creativity shows scientists as capable communicators who understand the needs of lay people and are able to relate to them.

My approach to the task of writing popular science is different from the existing methods because I argue that the features usually attributed to narration (explanations, presentation of hypotheses and discoveries) should be fulfilled by the presented voices of scientists. The reason for sharing the burden of delivering information between the writer and the presented voices is grounded in the issue of trust. Myers (2003: 273)

wrote that popularization, among other matters, “involves the active construction of believable ...identities” and that “people assess messages...in terms of ... trust”. Sackler (2014) laments that “Trust has been a largely neglected topic in the science of science communication” (8). In general, though, he echoes Myers’ (2003) message in asserting that “people trust those who they think are like themselves”. Both agree that trust implies not only professional competence but also the ability to relate a message effectively. Using the multiple voices of the scientific community rather than the one voice of a narrator is more productive. It shows the scientists not as abstract entities in the margins of the social construction of the scientific knowledge but as active participants in this process who care about their work being understood and accepted by the public.

Focusing on the voices of scientists, the thesis also reveals the importance of the reader’s voice, and not the covertly presented voice of the reader-in-the-text, as proposed by Thompson (2001), but the voice of a very specific reader-character, which I label “the fictionalized reader”. The move from a generalized real-life audience to a specific fictional reader-character is a significant shift in the approach a writer may take. It goes against the commonly accepted suggestions to potential writers that they need to learn as much as they can about the real people whom they will be addressing. My findings urge the writers to imagine a reader who fits the book just like any other character would.

This approach to readers can help alleviate some of the anxieties the potential writers might feel in connecting with the public; as some writing manuals suggest, scientists who venture into the field of popularizations must undergo drastic changes in their attitudes toward the lay public (see, for example, Barton 2010: 103-123, Bowater

and Yoman 2013: 85-90). It might be useful for the writers to realize that they have an option of constructing a fictionalized reader with whom they can feel at ease.

### **7.2.3. The Fictionalized Reader**

Presented discourse in popular science, when analyzed for its dramatizing potential reveals just how powerful fictionality, can be as an engagement mechanism. I suggest that the use of fictionality extends beyond the creation of characters to the shaping of the reader. Numerous studies have been devoted to the examination of reader engagement strategies (for a sample of different approaches see Fu and Hyland 2014; Lewin and Perpignan 2012; Hyland 2001, 2005, 2009, 2010; Martin and White 2005), and all of them assume the reader to be an entirely real, albeit generalized, participant in a communication created by the text's author. According to such analyses, the author and the reader exist in opposition to the text's actants, who are entirely or to a certain degree products of the author's imagination or perception. Thompson's (2001, 2012) idea of the reader-in-the-text acknowledges the tentativeness of the reader, but it ends there.

This thesis proposes to take the idea further and shows that in popular science the authors create fictionalized readers alongside fictionalized scientists. In both cases presented discourse is used as the chief mechanism for fictionalization. By fictionalizing the reader, the authors take more control of their audience than the current research suggests (see chapter 6 section 5). Attributing presented discourse to a reader (a specific, imagined reader-character rather than a generalized audience), produces for the real reader an effect of interacting with another character in the book

who represents the lay public. Thus popular science creates an interactive space where the voices from both sides communicate.

#### **7.2.4. Celebrating Science**

The thesis confirms the celebratory nature of popular science proposed by Bucchi (1998) by adding the presentation of discourse to the arsenal of the celebratory language. Bucchi (1998: 14) declares that to celebrate science is to highlight and “strengthen” its achievements. The thesis suggests that this goal is achieved not only through narrated statements about the scientific advancements, as Bucchi (1998) implies, but also through the use of the certain forms of presented discourse. In chapter 5, I demonstrate how Private Discourse may be employed to create positive hypotheses that portray scientists as having the right ideas more often than being wrong.

I conclude in chapter 5 that using presented discourse to such an end produces an idealized picture of scientists. In other words, these are fictionalized scientists-characters whose ideas almost always find empirical proof. Populating a book with such characters might, at a first glance, appear to be unsubtle. However, those who come to writing popular science from the field of the professional scientific writing should not find this idea too alien. As Harre (1994) points out in his analysis of the professional scientific publications, the narrative and character-creating conventions they follow are not that different from the celebratory discourse Bucchi (1998) finds to be the *modus operandi* of popular science.

The findings of this thesis correspond with Harre’s (1994: 86) observations about the nature of scientific writing and show that popular science authors do not so

much invent the personae of the idealized scientists as slightly exaggerate the norms of the professional texts as Harre (1994: 86) interprets them. For instance, Harre (1994: 86) calls the actant in a professional narrative a “hero”. He goes on to say that this hero follows three predictable stages: first, he “presents a hypothesis”, then he tests the hypothesis and obtains empirical support, and finally the hero presents the results of his experiments as proof for the initial hypothesis. Any negative results or problems with the experimental proof are not an option. Having presented this scenario, Harre (1994: 86) dismisses it as a “tale”, “fiction”, and a “bit of theater”. He also notes that any professional scientist would recognize it as such, but would nevertheless follow these conventions in professional publications.

Perhaps labeling such presentation of science “fiction” is somewhat suspect in the professional circles, but it is entirely acceptable in popular writing. It shows that the scientific community is already, inadvertently perhaps, using fictionality to their advantage. Popular science authors are doing the same. In fact, my research suggests that successful authors deliberately focus on the positive hypotheses and have developed certain verb patterns for signaling to the reader when a hypothesis will be proven correct (see chapter 5, section 2, subsection 1).

The only real discrepancy between the way Harre (1994: 86) suggests hypotheses are introduced in the professional publications and my findings on the subject are in the presentation. While I show that Private Discourse is the favoured method for introducing hypotheses, Harre (1994: 86) claims the opposite is true; he writes that a hypothesis “is never presented as the result of an act of creative genius or even just plain guesswork”. However, the use of Private Discourse suggests that these are some of the ways scientists come up with their hypotheses.

### **7.3. Limitations of the Thesis and Future Research**

The size of the corpus and the predominantly qualitative nature of this research should be acknowledged as limitations to the general application of its findings. Compared with other studies of presented discourse, particularly with Semino and Short's (2004) comprehensive analysis, the implications of this thesis appear less significant. At the same time, it is useful to bear in mind the general lack of large-scale studies dealing with presented discourse in non-fiction and especially in popular science. With this disclaimer, I am aware of the specific limitations of my work and will address them accordingly.

Firstly, the corpus of the narratives analyzed is rather small and representative of only ten contemporary authors. It included 100 narratives of discovery amounting to about 30,000 words. The number of the total occurrences of presented discourse is 193. That translates into an approximation of an average of two occurrences of presented discourse per narrative. The average length of a stretch of presented discourse is 35 words. While such a small corpus might pose challenges for establishing solid guidelines for the role of presented discourse in popular science, it does supply a sample that easily lends itself to a manual, primarily qualitative analysis. With the goal of the thesis being to draw more attention to presented discourse in popular science and to point out fiction-like elements in these texts created by presented discourse, the qualitative approach focusing on a small number of texts and occurrences proved effective. I believe I was able to identify certain tendencies that a larger and/or automated study might have missed. For instance, the large-scale, quantitative study of Semino and Short (2004), while attending to function, contributed, in my opinion, more



to the investigation of the forms presented discourse takes in fiction and non-fiction.

My own approach, on the other hand, favours the qualitative and functional side.

Another limitation of my study is imposed by the nature of the books analyzed. The majority of the books were published in the last five to six years, with only two books representing older texts. While the focus on the recent publications was intentional, it did limit the scope of the analysis and left out insight that could be gained from earlier authors. At the same time, it was my goal to draw on the bestsellers of the last few years because I wanted to explore presented discourse as it is employed in the latest texts and in the process possibly reveal some practical advice for the future writers based on the currently successful examples. In that, the comprehensiveness of the study was sacrificed in favour of the potential practical implication of the research.

It is possible that some will regard the decision to examine only the texts that appeared in book form as a shortcoming. My answer to this particular objection would be that already the majority of presented discourse studies concerned with popular science choose to analyze newspaper or magazine articles and texts written for online media. A study that contributes to the so far rather small pool of research on popular science books is covering an area that appears somewhat neglected. From the practical point of view, a lot of aspiring writers aim to produce books. While starting with an article or a blog might be a more realistic endeavour (as the writing manuals point out; see, for example, Barton 2010), the demand for advice on how to produce a book-length text remains strong.

The language of the corpus—only books written originally in English were considered—is also in some ways a limiting factor since it means that no translated texts were examined. It is possible that the different tendencies for the use of presented

discourse would have been uncovered as a result of an investigation that included texts translated into or from English rather than only texts written in English.

The above limitations, however, could be overcome by future research. In fact, each of the limitations has potential for becoming a starting point of a new study. Firstly, expanding the corpus to include more samples from a greater variety of authors would be a step in the direction of testing whether the present findings are, in fact, representative of popular science as a genre. Adding to such a study more authors from the twentieth century and the nineteenth century would offer a historical perspective alongside the current trends. An even broader extension of the present work would be to consider other non-fiction book-length genres in terms of fictionality, expanding the analysis to include elements other than presented discourse.

Comparing the use of presented discourse in popular science books with the other forms of popular science media—especially with online articles and blogs—might present further insight on the idea of the fictionalized reader. For instance, it appears that the popular science books use a range of presented discourse forms that include both Public and Private, direct and indirect discourses to fictionalize the reader (see Table 6.1. in chapter 6). It is possible that the length constraints of articles and blogs impact the writers' choices in favour of the space-saving, indirect forms. This assumption is predicated on the finding of this thesis that NPSA are some of the most prominent means of characterization for the scientists—the characters who are afforded the most space in the narratives—while the fictionalized reader appears only outside the narratives, where the authors are not attempting to tell a complete story in quite such a confined space.

Secondly, considering texts that have originated in languages other than English has potential for examining presented discourse as it passes through what House (1997: 99,79) calls a “cultural filter”—a notion that original text gets adjusted through the translation process “in order to capture cultural shifts” that may result from “the differences in communicative preferences, mentalities, and values”. There is evidence (see, for example Kranich 2009, 2011) to suggest that a cultural filter is used in German translations of popular science that originated in English. Kranich’s (2009, 2011) research focuses on the differences in modality (hedging in particular); however, the reach of a cultural filter may be more extensive based on its definition. It is possible that presented discourse and the characterization of scientists associated with it are also influenced.

In her observations on the field of popular science in translation, Kranich (2009: 27) notes that the differences associated with a cultural filter are less notable in popular science texts translated from English “because of the prestige status of the English language”, which causes a “convergence of communicative norms in the genres where English is particularly dominant, such as popular scientific writing”. To extend this assumption would be to suggest that popular science that is translated into English is likely to lose some of the communicative conventions of the originals. A study examining both popular science translated into and from English, I believe, would offer some valuable insight on the nature of presented discourse and especially on its character-creating properties.

## 7.4. Conclusion

In essence, this thesis is an acknowledgement of the social consequences of popularization. The importance of popular science as texts that raise awareness about the practitioners of science becomes evident in the analysis of presented discourse and fictionality. The thesis strengthens the view of popularization that rejects the notion of a strict divide between professional and popular science. It attempts to showcase the fictionality of popular science as a unifying means between the two rather than as the point of divergence (as the traditional definition of fictionality suggests it might be).

In terms of linguistics, the thesis confirms the importance of considering the presentation of discourse outside the realm of literary fiction. As this work demonstrates, popular science as a borderline genre uses presented discourse in ways uncommon for fiction yet not conventional for non-fiction either. At the same time, the underlying idea behind the function of presented discourse in fiction remains intact in popular science. As Fludernik (1993: 64) summed it up, presented discourse aids in the reader's "creative reconstruction" of a world produced by the text. Fludernik's (1993: 64) statement is about "the fictional world" coming into existence in a real one. This thesis shows that through the presentation of discourse the opposite is also possible: a real world can take on fictional characteristics. Thus the real world of science becomes reconstructed as a forum where a lay reader can learn from, and about, a great number of great scientists.

The discourse presentation of scientists reconstructs the world of the scientific community as a human space but also projects back into it an image of a scientist the public wants to see. In that, popular science, and the narratives of discovery in

particular, can be seen as social constructs that potentially shape the personae of the very people they present.

## LIST OF PRIMARY TEXTS

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