Re-presenting the Universe

The Cosmic Perspective and its Expressions in Carl Sagan’s *Cosmos*
[Science] has revealed to us a universe so ancient and so vast that human affairs seem at first sight to be of little consequence. We have grown distant from the Cosmos. It has seemed remote and irrelevant to everyday concerns. But science has found not only that the universe has a reeling and ecstatic grandeur, but also that we are, in a very real and profound sense, a part of that Cosmos, born from it, our fate deeply connected with it. The most basic human events and the most trivial trace back to the universe and its origins. This book is devoted to the exploration of that cosmic perspective.

– Carl Sagan, *Cosmos*³

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1. Introduction

Among the strangest things perceivable and conceivable is existence – the bare fact of the existence of the universe, of anything at all. In fact, existence is so strange that ordinary life could almost be defined as the forgetting of this strangeness. But forgetting is not always total; occasionally the ordinary world cracks open and lets a sense of wonder seep in. This might happen during a small cut in the finger, seeing a drop of blood and starting to think about the extraordinarily complex way in which the body is put together; or during a day at the beach, suddenly realizing the oldness of the sea and juxtaposing human time with geological time; or during a walk at night, glimpsing a star and remembering from high school physics how distant that star is compared to the supermarket, yet how close in comparison with the Andromeda galaxy. Wonder, in this sense, is not opposed to scientific explanation. Rather, the opposite is true: knowing science enhances wonder. This connection is at the heart of Carl Sagan’s *Cosmos*.

In the late 70s, the astronomer Carl Sagan (1934-1996), together with Ann Druyan and Steven Soter, wrote the television series *Cosmos: A Personal Voyage*. It was broadcast in the US, on PBS, in the fall of 1980. Accompanying the series, the book *Cosmos* was published. They are each others companions: the series consists of 13 episodes and the book of 13 chapters, each episode having a corresponding chapter, sharing title and theme, and often structure and wording as well. *Cosmos* attempts to convey the “cosmic perspective”, as stated in the quote by Sagan on p. 2 above; it attempts to explore and communicate, in a non-technical and poetic way, the universe as understood by modern science. The subjects covered, or touched upon, include almost all areas of science, but the emphasis is on cosmology, astrophysics, and biology. In addition to exploring the universe, *Cosmos* also explores the history of the exploration of the universe – the history of philosophy and science, the history of the exploration of the Earth and space.

But now, one can ask: what is the “cosmic perspective”, more precisely? What does it mean over and above the statement that we are “a part of [the] Cosmos”? Can it be analyzed and grasped in detail? Are there any tensions inherent within it? – As

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2 The series credits Ann Druyan and Steven Soter as co-writers, even though the title sequence displays, successively, “Cosmos”, “by Carl Sagan”, “A Personal Voyage”. The book, which lacks the subtitle, has Sagan as sole author. For these reasons, and for reasons of simplicity, I refer to *Cosmos* as Carl Sagan’s.
we shall see, the cosmic perspective can be understood to be composed of four different but related perspectives, concerning space; time; humanity and cosmic evolution; and the history of science and exploration. These perspectives operate throughout *Cosmos* and are expressed in different ways, using different techniques, and together they make the cosmic perspective. Specifically, the expressions of the perspectives involve representations on different levels and on different scales: of incredibly small and incredibly large things, of incredibly short and incredibly long time scales, of complicated biological processes and principles, of historical events and scientific methods. Many of these things and processes are (on the face of it) very much removed from everyday concerns and human affairs: they involve spatial and temporal scales (probably) impossible to encounter directly, and they lack human agency. How things so utterly other can be represented is one of the focal points of this thesis. The other focal point concerns the opposite direction of representation: representing the familiar, the Earth and humanity, in terms of things utterly other. In *Cosmos*, both kinds of representation are central, and the structure of these representations can, as we shall see, be analyzed using literary theories.

In describing my thesis in these terms I also wish to locate it in the wider context of ecocritical questions and concerns. How is “nature” represented? What is our relation to “nature”?\(^3\) However, I will not deal directly with environmental issues, even though Sagan himself was an early warns of global climate change. In fact, the threat of a runaway greenhouse effect due to excessive use of fossil fuels is discussed at the end of episode/chapter IV. But the focus of this thesis is the cosmic perspective. If *Cosmos* is devoted to an exploration of the cosmic perspective, then this thesis is devoted to an exploration of the exploration of that cosmic perspective.

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2. *Cosmos* as object of study

2.1. Material and delimitation

As mentioned in the introduction, *Cosmos* was broadcast on PBS in the fall of 1980 and simultaneously published as a book. In my analysis of *Cosmos*, I will focus as much (or approximately so) on the series as on the book. I am interested in how the cosmic perspective is represented in different ways, and this means taking into account differences in media as well. I will treat the series and the book as parts of the unitary phenomenon *Cosmos*.

An additional, but incidental, reason for analyzing both the series and the book is that *Cosmos* became a kind of media phenomenon in the 80s. Both the series and the book were public and commercial successes immediately upon their release. The series was the most popular PBS show for a decade and has reached about 500 million people in 60 countries; and the book spent at least 70 weeks on the *New York Times* bestseller list, making it the most sold science book ever in the English language until Stephen Hawking’s *A Brief History of Time* (1988). Sagan, already a famous scientist and writer of popular science books, became a huge celebrity and an icon for science and space exploration. Consequently, any reader of the book almost certainly knew about the series, and (to some extent) vice versa.

2.2. Aim and method

The aim of this thesis is to analyze and understand, firstly, what “the cosmic perspective” in *Cosmos* is; secondly, how it is expressed; and thirdly, what the ambiguities inherent within it are. In order to do this, I use concepts and theories from literary studies (and related fields), namely intermediality studies, genre theory, Russian formalism, and narratology. In chapter 3, I give short introductions to the theories and concepts that I will use. In chapter 4, the analysis of *Cosmos* begins: in sections 4.1 and 4.2, I discuss the material and contextual conditions of the possibility of expressing perspective, namely the media and genres of *Cosmos*; and in section 4.3, I discuss questions about the definition of the term “perspective”. In chapter 5, I analyze the

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four constituent perspectives of the cosmic perspective: space; time; humanity and cosmic evolution; and history of science and exploration. In chapter 6, I use narratological concepts to discuss the nature of the perspectives and the structure of the narrative situation, with a special focus on the ambiguities inherent in the cosmic perspective. In chapter 7, I summarize and discuss the results. In the appendix, I give short descriptions of the episodes/chapters and indicate which perspectives are prominent in each episode/chapter.

2.3. Previous studies

To my knowledge, there are not many studies of popular science in general, or of *Cosmos* in particular, in the field of literary studies. In fact, I have found none – although I have found a *plea*, by the literary critic John Carey, for recognition of science writing as a literary genre in its own right. There are, however, studies of popular science in related fields such as media and communication studies, sociology, and history of ideas. Mostly they focus on the societal and political aspects of popular science: questions of power, questions of the functions of popular science in the relation between scientists and the public, as well as within the community of scientists. For understanding popular science as a total phenomenon, studies of this kind are, of course, crucial. But since my focus is on the cosmic perspective itself, not on political issues or societal functions regarding it, I will not refer to these kinds of studies in the analysis.

However, even though there are no studies of popular science in the field of literary studies (to my knowledge), some of the studies in the other areas just mentioned use literary theories in their analyses. I will discuss the ones that I have found that use literary theories as a central part of their analysis.

In his article “Narrative Form and Normative Force: Baconian Story-Telling in Popular Science”, Ron Curtis analyzes the narrative structure of articles in the popular science magazine *Science* 80-86, which was published by the American Association

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7 Carey writes that writers like Carl Sagan, Stephen Jay Gould, Richard Feynman, and others “have created a new kind of late twentieth-century literature, which demands to be recognized as a separate genre, distinct from the old literary forms, and conveying pleasures and triumphs quite distinct from theirs”; in the introduction to *The Faber Book of Science*, ed. John Carey, London 1995, p. xiv. The book is an anthology of science writing, including contributions by among others Sagan and Feynman.

for the Advancement of Science (AAAS) between the years 1979 and 1986. In particular, Curtis shows how the typical stories in Science 80-86 are structured like detective stories, and he discusses the normativity embodied in this form: a particular view of science and its methods is communicated through this choice of narrative structure. However, interesting and enlightening as Curtis’s paper is, I will not use it in my analysis, for two reasons: firstly, since Curtis’s focus is on representations of scientific methods, which is not the main part of my thesis (though admittedly a part); and secondly, since the narratives of Cosmos are not structured like detective stories.

Nasser Basem Zakariya’s dissertation Towards a Final Story: Time, Myth, and the Origins of the Universe is the only study that I have found that analyzes Cosmos specifically, even though Cosmos is only one object of study among many. Zakariya analyzes and writes a history of a genre of popular science that, essentially, has as ambition to represent the history of the universe (the “final story”): from precursors in the 19th century, through writers in the 20th such as Georg Gamow, E.O. Wilson, Carl Sagan, and Steven Weinberg, to present day television documentaries such as PBS NOVA’s Evolution. The analysis of Cosmos is 19 pages long and focuses on narrative meaning. Zakariya refers to Northrop Frye and Fredric Jameson to analyze the narrative genre and protagonist of Cosmos. Specifically, the last 20 or so minutes from the last episode, which tells the history of the universe from the Big Bang to present day science and exploration, is analyzed. Zakariya asks four questions: who/what is the protagonist of the story? How does the story end? Who tells the story? To whom is the story told? Through his answers he connects the story to questions of power and society. The implied audience is humanity. The narrator is Sagan, who is a scientist and a kind of prophet. The protagonist, the hero, is a questing humanity “that seeks to uncover the secrets of the origins of the world and life”, and this humanity is equated with scientists: “scientists are the delegates of that humanity, its best and brightest, its essence.” Thus, for reasons of narrator style and hero, the genre is epic. The ending of the story depends on the future course of events – of whether we manage to construct a global, peaceful, high technological, space faring civilization and avoid self-destruction. Therefore, whether the story is a comedy or a tragedy is still an

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11 Zakariya, Towards a Final Story, pp. 189f.
open question. In my analysis, I too will discuss questions of genre (or rather genres) of *Cosmos*, though in a slightly different way than Zakariya. But rather than to disagree with Zakariya and engage in a discussion with his results, I would say that my analysis is complementary to his.

Of the other analyses in Zakariya’s dissertation, one in particular is relevant as well. It focuses on PBS NOVA’s *Evolution*, and here Zakariya uses concepts from the narratologist Seymour Chatman to analyze the structure of the story in the episode “Great Transformations”. This episode relates the evolutionary history of the Earth, and in order to describe how 4.5 billion years of history can be compressed into a few minutes of discourse time, Zakariya distinguishes between “pivotal” and “lesser” events.¹² Thus, applying this to the cosmic story (the history of the universe from the Big Bang to present day humanity), pivotal events are such events as fusion of lighter elements into heavier ones, creation of organic molecules in interstellar clouds, etc. The distinction between pivotal and lesser events is, I believe, valuable for understanding the structure of these kinds of stories, but I would like to make a small modification: the crucial distinction is between pivotal and lesser *kinds* of events. For example, fusion of lighter elements into heavier ones are indeed pivotal events, but not *every* fusion reaction is a pivotal event; rather, it is this *kind* of event (together, admittedly, with the fact that many such reactions did in fact occur) that is pivotal. I will return to this distinction in section 5.3, when analyzing the cosmic story in *Cosmos*.

### 2.4. Defining “popular science”

Before we enter the theory chapter, we need a definition of popular science. In his book *Mellan nytta och nåje: Ett bidrag till populärvetenskapens historia i Sverige*, Johan Kärnfelt describes and analyzes the history of the emergence of popular science as a genre in Sweden. In the introductory chapter, Kärnfelt discusses popular science in general and refers to discussions in relevant academic fields (communication studies, sociology, history of ideas). As a point of departure, he discusses the so-called “standard account” of popular science: the idea that the arrow of communication is a simple one, leading from the specialists to the laypersons. On this account, first there is intra-scientific research and literature; then, once the results have been established,

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¹² Zakariya, *Towards a Final Story*, p. 255. The terms “pivotal” and “lesser” are, as Zakariya says in the footnote, “a simpler, more straightforward re-casting of Seymour Chatman’s ‘kernel’ and ‘satellite’ events.”
the new knowledge is popularized, i.e. made accessible for non-specialists. But as critics have pointed out, this is a very simplified, often even misleading, account.\textsuperscript{13} However, since Kärnfelt quotes theorists concerned with the emergence of popular science in a historical perspective, which is not immediately relevant here, only one point will be made that puts the standard account in some doubt: rather than just explain accepted theories, popular science can be controversial; an author can try to argue for her/his controversial view on some subject. As Zakariya shows in his dissertation, this is the case with the Russian-American physicist Georg Gamow.\textsuperscript{14} It is also the case with Carl Sagan.

So how is popular science to be defined? I agree with Carey that (written) popular science ought to be recognized as a literary genre in its own right, and such a position indicates something about my view of the genre. However, making a too rigid definition would be counterproductive and misplaced, since the purpose of making a definition (here) is to bring into view the object of study and to say something about the main features of the genre. The features that I wish to highlight are the following: firstly, the subject matter is, somehow, taken from \textit{science}; secondly, the genre is non-fiction; and thirdly, the form and language is not that of the technical paper, book, or dissertation, but \textit{aesthetic and/or pedagogical} (vaguely put). This definition is imprecise and pragmatic, but I believe that it captures roughly the works labelled as popular science.

Though even with this qualifying and questionary note, two things need to be commented on. Firstly, the borders separating popular science from the essay, for instance, are not clear with this definition – and perhaps productively so. One difference between popular science and the essay, though, discussed in section 4.2, is that an implied authorial I is more pronounced in the essay than in popular science. But again, the differences and boundaries are not absolute. Secondly, making \textit{non-fiction} one of the distinguishing features begs the question of what this term means. Answering this in a short way, or indeed in any way, is not an easy task.\textsuperscript{15} And this is so not least because defining non-fiction means, among other things, defining fiction as well, which by itself is a subject of huge debate within literary studies. For reasons of scope, I will


\textsuperscript{14} Zakariya, \textit{Towards a Final Story}, chapter 2.

not enter into this debate. Instead, I will refer to the literary theorist Dorrit Cohn’s definition in her book *The Distinction of Fiction*. She defines fiction as *nonreferential narrative*. In the theory chapter, I will discuss the narrative part (though not Cohn’s definition); here, I wish to focus on the nonreferentiality. In fiction, according to Cohn, a work “creates the world to which it refers by referring to it”. In other words, there is no claim made by a fictive work to correspond to some external reality. But in non-fiction, there is such a claim – though *exactly* in what way, depending among other things on genre, is a huge question which I (regrettably) cannot discuss here. The point I wish to make is that in the genre of popular science, there is a claim for some kind of correspondence between the narrated world and external reality. Again, *exactly* what this correspondence relation is is not clear; but as we shall see in chapter 6, the inexact nature of this relation is part of popular science itself.

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3. Theories

In this chapter, I discuss four theoretical fields: intermediality studies, genre theory, Russian formalism, and narratology. Needless to say, all of these fields are large and complex, and I make no claims to give full accounts of them or to have understood them fully. What I do is to pick out certain themes and, using the theories, make some points that will be of help in the analyses.

3.1. Intermediality studies

The cosmic perspective is realized concretely, otherwise we would (of course) not be able to perceive or conceive it. Cosmos exists both as television series and as book, and differences in medial expression is something that can be studied in intermediality studies. “Intermediality studies” is a relatively new term, and as the word “intermediality” suggests, it studies what can happen between media, or at the meeting points of media, when different media relate to one another in some way. In the introduction to an anthology about narrative in different media, Marie-Laure Ryan discusses definitions of “medium” and quotes two from Webster’s Dictionary: 1. “A channel or system of communication, information, or entertainment”; and 2. “Material and technical means of artistic expression”. Both of these senses suggest, though in slightly different ways, that a medium is something that acts as a means of conveying something else, and both senses are relevant here.

Since I need a way of describing the differences between Cosmos as television series and Cosmos as book, I will define some concepts loosely based on Webster’s senses. I use the term simple media to refer to images, sounds, and words (approximately sense 2), and the term complex media to refer to combinations of simple media. Thus speech, for instance, is a combination of sounds and words; a moving image is a combination of many images in rapid succession; music is sound organized in certain ways; etc. Simple and complex media are always realized concretely in technical

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19 The concepts are also, in part, inspired by Lars Elleström’s elegant model of mediality, developed in his article “The Modalities of Media: A Model for Understanding Intermedial Relations”, in Media Borders, Multimodality and Intermediality, ed. Lars Elleström, Houndmills 2010. The reason I’m not using and discussing his model is that it is too detailed for the purposes of this thesis; discussing it thoroughly would lead too far astray. My definitions are pragmatic and developed for this thesis.
media, things such as television, the Internet, books (basically sense 1). One could say that a technical medium is a fusion of simple and/or complex media and a material substrate – for example, words together with ink and paper comprising a book.

Since the differences in media are so large in the series and in the book, a question that must be discussed is how medium specific the content of Cosmos is. The answer depends on the specific content of the sequence one wishes to study, but my general position is this: in both the series and the book, language is the main medium. Consider the following words:

Some 15 billion years ago, our universe began with the mightiest explosion of all time. The universe expanded, cooled, and darkened. Energy condensed into matter, mostly hydrogen atoms, and these atoms accumulated into vast clouds, rushing away from each other, that would one day become the galaxies.20

These words begin a sequence that describes the story of cosmic evolution, a story that is absolutely central in Cosmos. The basic argument for language being the main medium is that the meaning of the quoted words cannot be expressed using images and music alone. Images and music do affect the expression of the story – in ways that will be explored in chapter 5 – but they cannot tell the story by themselves.

3.2. Genre theory

But in shaping a work,21 not only media are important: equally important is genre. So what is genre? Spontaneously, we would perhaps say that genres are classes and that the function of genre is to make classifications. But as theorists have pointed out, there are problems with this view. For instance, are there really such classes? And if there are, do works “belong” to them? What about hybrid works; are they members of many classes?22 But rather than to discuss these problems, I will use the book Genre by the literary theorist John Frow to discuss four points relevant for analyzing Cosmos: the function of genre; the ontological status of genre; hierarchies of genres within a work; and effects on genre by individual works.

First of all, the function of genre is not primarily classificatory, but rather com-

20 Episode XIII, “Who Speaks for Earth?”, (37:18-37:40) (minutes:seconds-minute:seconds). From now on I will refer to page numbers and time intervals of Cosmos in the main text.
21 I use the word work to refer to things that are constructed by simple and complex media and realized in technical media, i.e. such things as texts, television series, and so on.
municative – or more precisely, metacommunicative. What this means is the following. Through a work, something is communicated – in the case of Cosmos, cosmic evolution and the ideals of science (among other things). But through the genre of Cosmos, something is communicated about the work – about how it should be interpreted. This is crucial for understanding the truth claims that a work has. For instance, in a work of fiction, things can be asserted without being asserted as true outside the confines of the work. But in the case of Cosmos, things are more complicated: the status of its truth claims depends, in part, on the kinds of truth claims made by the genre of popular science.

Secondly, as Frow argues, in being metacommunicative works use genres rather than “belong” to them.23 Ontologically, this means that genres, instead of being classes, are patterns: “Genre, we might say, is a set of conventional and highly organised constraints on the production and interpretation of meaning.”24 The genre of a text is signaled in different ways, using different cues. Cues can be either internal, belonging to the text, or external, standing somewhere outside the text but referring to it. Again, Frow: “The cues that I encounter are metacommunications, then, specifying how to use the text, what one can expect to happen at different stages, and what to do if these expectations are not confirmed [...].”25 Furthermore, cues, like readers, are always socio-historically situated, and therefore the amount of information needed to understand them varies greatly. For a person lacking the right kind of socio-historical knowledge, references that a work makes to a genre can be missed, in which case the work will be misunderstood.

Thirdly, since works use genres for metacommunicative purposes, in most cases several genres are invoked. And in invoking several genres, authors can play with the expectations of the audience and alter the meaning of the work. But mostly there is one genre that is the dominant one. A work can be primarily a tragedy, for instance, but use comical genres as well, making a hybrid. Another way of making a hybrid could be to use narrative genres in non-fictive works (as Cosmos does); in such a case the work would be primarily non-fictive but draw on the resources of fictional genres as well. Thus, the hierarchy of genres within a work is important for its meaning: a primarily non-fictive work that makes use of fictive genres is something quite differ-

24 Frow, Genre, p. 10.
25 Frow, Genre, p. 104.
ent from a primarily fictive work that makes use of non-fictive genres.

Fourthly, and finally, not only do works use genres, but genres are themselves affected by works: individual works affect, to varying degrees, the genres they are using. For instance, tragedy was not the same genre after *Hamlet* as it was before. The same is true for *Cosmos*: it was quite popular and influential, shaping, to some degree, the future form and content of the genre of popular science.

### 3.3. Russian Formalism

Using these concepts, the primary genre of *Cosmos* can be said to be popular science. However, *Cosmos* uses literary genres and techniques as well, and a central concept of the Russian formalists, defamiliarization, is particularly relevant. But using the Russian formalists to analyze something that, at first sight, is perhaps not thought of as literature in the strict sense might seem counterintuitive, since the Russian formalists were primarily interested in what makes a literary work literary. In the words of Roman Jakobsen: “The subject of literary scholarship is not literature in its totality, but literariness (*literaturnost*), i.e., that which makes of a given work a work of literature.” But as we shall see in chapter 5, defamiliarization is at work in *Cosmos*.

Defamiliarization was introduced in 1917 by Victor Shklovsky in the paper “Art as technique”. It was his answer to the question of what constitutes literariness. Shklovsky contrasts poetic speech with prose, which for him is “economical, easy, proper”, i.e. in the service of direct communication. The aim of prose is to communicate information as effectively and unambiguously as possible. For this reason, the ideal way to refer to something in prose would be to do it in a standardized way, since that would save both time and mental effort. But this kind of speech leads to an automated perception of the world. To break automism – to hinder direct communication – poetic speech is needed. Poetry, at its best, is precisely that kind of speech which enables the reader to see the world anew, as though for the first time. In ordinary life we tend to get familiar – too familiar – with the things and people surrounding us. We tend to forget what the world is really like, what it actually feels like to be alive. Therefore, the function of poetic speech is to make familiar things unfamiliar – to de-

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26 Frow, *Genre*, p. 17.
familiarize them. The defamiliarization is, for Shklovsky, literariness, what makes literature literature.

But how is this done concretely? How does one make something unfamiliar? If one could answer this question in a general way, by describing a particular technique, then that technique would become standardized and thus unable to achieve its aim. The concept of defamiliarization is inherently dynamic: what is defamiliarizing today may be automated tomorrow. Thus the concept of the dominant was introduced by Boris Eichenbaum and Yury Tynyanov. A given text may contain many different elements, even prosaic ones. But it is the dominant quality that gives the text unity and determines what kind of text it is. This also introduces history into view, since different kinds of elements dominate literary texts in different periods. The point is that whatever the dominant is at a given time, it is that which makes it a literary text, as distinct from other kinds of discourse such as science, philosophy, and politics. As one can see, this has clear affinities with the concept of primary genre discussed above. But there is a difference: the dominant is that which makes a literary work literary, whereas primary genre is something that can be non-literary as well.

The use of the concept of defamiliarization in analyzing Cosmos will not only illuminate Cosmos; it will have as side-effect to question the conception of science as an automizing discourse and the scientific world view as prosaic and devoid of beauty and wonder. In addition, the discussion of Sagan’s attempt to represent infinity, discussed in section 5.2, will question the claim that a technique or idea necessarily becomes familiarized when used repeatedly.

3.4. Narratology

The step from Russian formalism to narratology is not far. Both movements are interested in questions of form and structure, and the work of some formalists, such as Vladimir Propp’s, is narratological as well. But the narratological concepts to be employed in analyzing Cosmos are of a later date and concern the role of the narrator

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29 Shklovsky, “Art as technique”, pp. 20ff.
31 In saying this, I am not claiming that the Russian formalists necessarily saw science as automizing and prosaic, even though Shklovsky, for example, seems to have seen algebra as the quintessential automizing discourse (Shklovsky, “Art as Technique”, p. 20). But whatever the views of different formalists, there certainly are people who view science in this way, and it is against their view I argue.
32 Erlich, Russian Formalism, pp. 249ff.
rather than literariness. I will discuss some of the key concepts in Gérard Genette’s influential Narrative Discourse. In this book Genette introduces several important narratological concepts, primarily for the purpose of analyzing Marcel Proust’s A la recherche du temps perdu, but, as he states in the preface, the tools developed are applicable to other narratives as well. 33 The three basic concepts are tense, dealing with time, and mood and voice, dealing, in the different but related ways, with the role of the narrator. In my analysis, I will use Genette’s concepts mainly for discussing Sagan’s role as narrator; thus, I will use the concepts of mood and voice, but not that of tense.

But first of all, some preliminary notes on usage of words. One could ask whether it is legitimate to call Sagan a narrator, since what he relates in Cosmos are not just narratives in a traditional sense, but many things, for example representations of astrophysical and molecular processes. But we need words for the facts, events, and processes that he relates: the word representation will be used for representations of individual facts, event, and processes, while narrative will be used for combinations of representations with connectives that suggest connections, such as “and”, “then”, etc. 34 Thus, representations and narratives are on the same logical level, the level of the diegesis, which is Genette’s term for the narrated world. Finally, I use the word Sagan to refer to Sagan’s persona (in the series) and the implied author of Cosmos. When I say “Sagan says” I mean the persona or the implied author, not Sagan himself.

Now, to return to Genette: he defines mood as “regulation of narrative information”, 35 i.e. what information the narrator relates to the audience. He distinguishes between two basic modalities of mood – distance and perspective –, but it is not necessary for my purposes to go into the details of these; my use of the concept of mood restricts itself to the observation that in constructing a story, a narrator has to make choices about what information s/he wishes the audience to apprehend.

Voice is related to mood, but whereas mood mainly deals with the construction of

34 There is an ongoing discussion about how to define “narrative”. H. Porter Abbott defines it in the following way: “the representation of an event or a series of events” (Abbott, The Cambridge Introduction to Narrative, Cambridge 2002, p. 12). This is an inclusive definition similar to mine, but where he has “events”, I have facts, events, and/or processes. Furthermore, I use representation for a single such thing, where he uses narrative even for single events. His use is plausible if one allows only events, but calling a representation of a fact or a process a narrative might be stretching the word a bit too much. But so is perhaps using narrative for combinations of facts. However this may be, my definitions are again pragmatic, developed so that I can talk about the diegesis of Cosmos.
35 Genette, Narrative Discourse, p. 162.
the narrative in terms of information, voice deals with the relation of the narrator to
the narrative, i.e. more explicitly with the role of the narrator. Of the many different
aspects that one can discuss here, I will discuss two: the participation in the diegesis
by the narrator; and the attitude of the narrator towards the diegesis.

Firstly, Genette distinguishes between different types of narrators in their relation
to the narrative and the diegesis. Those that are part of the narrative they are telling
are called homodiegetic narrators, and those that are not are called heterodiegetic
narrators. Furthermore, narrators that are part of the diegesis are called intradiegetic
narrators, whereas narrators that are not are called extradiegetic narrators.36 I will
call the relationship that a narrator has with her/his diegesis diegetic relationship. In
the analysis of Cosmos, I will discuss what kind of a narrator Sagan is.

Secondly, what I would call the attitude or stance of the narrator with respect to
her/his narration: Genette discusses this in terms of emotive function (a term with
which he is somewhat dissatisfied), testimonial function, and ideological function. He
also refers to it as the narrator’s affective, moral, and intellectual relationship with
her/his narration. Instead of these somewhat circumstantial terms, I would like to de-
fine the term narrational attitude, modeled on what is called a “propositional attitude”
in philosophy. Suppose that we have a sentence, called q, and suppose that we have a
person, called S, who believes that q is true; then belief is a propositional attitude. A
propositional attitude is something that relates a subject to a proposition, and in the
process it creates a new proposition. If we call a propositional attitude in general f,
then the general case would be denoted fS(q). This sounds abstract but is actually quite
concrete. If q = “The sun is a star”, and S = Daniel, and f = belief, then fS(q) would be
read: “Daniel believes that the sun is a star.” We can call this sentence q’. Thus, we
can write: q’ = fS(q) = “Daniel believes that the sun is a star.” In the same way, we
define narrational attitude as something that relates a narrator to her/his narration: the
affective, moral, and intellectual stance that s/he takes towards the diegesis.

Now, to get a unified concept of voice, v, we combine diegetic relationship with
narrational attitude; in effect, we say that voice is composed of a diegetic relationship
and a narrational attitude. We can then express a work, w, as a narrator, S, modifying
her/his diegesis, d, with her/his voice, thus: w = vs(d). Concretely, in the case of Cos-
mos, we have the work Cosmos, in which Sagan, the narrator, modifies the diegesis

36 Genette, Narrative Discourse, p. 248.
through his diegetic relation to it, and through the affective, moral, and intellectual
stance that he takes towards it (the narrational attitude).

One can ask what has been gained in using this mathematical or logical notation.
Is it not just a strange way of writing something that can equally well be said using
just words? My answer to this is yes, to a large extent. But not entirely. It is true that
\( w = \nu_s(d) \) is not a mathematical function in the strict sense. But in writing the relations
involved in this way, their structure becomes clearer. The logical notation is thus pri-
marily used for reasons of clarity. This is perhaps not apparent now, but in chapter 6
the logical notation will be used again, and hopefully it will be clearer then.
4. Media, genres and perspective

In this chapter we turn to our attention to *Cosmos* more fully. In sections 4.1 and 4.2, we return to the material and contextual conditions of the possibility of expressing perspective – media and genres – but in a more concrete way than in the theory section. In section 4.3, definitions of the crucial term “perspective” are discussed.

4.1. Media of *Cosmos*

Which media are present in *Cosmos*? Not surprisingly, the television series is more complex medially than the book. The series is realized in the technical medium of the television (and, nowadays, the computer). All three basic media – images, sounds, and words – are present, and they are combined to produce complex media such as moving images, sound effects, music, and speech (both embodied and disembodied). This can be contrasted with the book, in which only two of the basic media are present: images and words. And because of the lack of the dimension of dynamical time in the technical medium of the book, there is an almost complete lack of complex media. Thus, the series and the book display differences with respect to media.

But in spite of these medial differences, there are similarities as well, particularly concerning the narrative structures and thematic contents. As mentioned in the introduction, the 13 episodes and the 13 chapter correspond to each other. Sometimes the structures differ, so that sequences come in different order in the series and in the book (for example, in chapter X), and sometimes a sequence in the series is omitted entirely (for example, the cosmic calendar at the end of chapter I). But mostly the structures are the same, and the same is true for the wording. And again, both the titles and the themes are identical. The book is also richly illustrated, with most of the images taken directly from the series.

4.2. Genres of *Cosmos*

Given these similarities in structure and content, one can ask if the series and the book use the same genres. One important difference is in subtitle: the series is called *Cosmos: A Personal Voyage*, while the book is called simply *Cosmos*, without subtitle. Why? During the 60s and 70s, there were two highly successful series in Britain, produced by the BBC, that had the same format: 13 one hour episodes with a charismatic
person giving his (they were both male) “personal view” of some subject. There was
Kenneth Clark’s Civilisation: A Personal View, which covered Western civilization
and its achievements, focusing on artists and scientists such as Michelangelo, Beetho-
ven, and Einstein;37 and there was Jacob Bronowski’s The Ascent of Man: A Personal
View, which centered around crucial events and inventions in human cultural evolu-
tion such as agriculture, architecture and engineering, and science.38 When the TV-
station KCET contacted Sagan about doing a series about science, the explicit precu-
 sor mentioned was The Ascent of Man.39 The “authored documentary”, of which is the
“personal view” documentary series could be said to be a subgenre, is recognized as a
genre at BFI Screenonline, the British Film Institute’s online encyclopaedia of British
film and television. It is defined as “a genre that at its core attempts to turn serious
scholastic debate into informative entertainment by the power of the presenter’s per-
sonality and on-screen presence”.40 Civilisation and Ascent of Man are mentioned as
important examples, and clearly Cosmos would qualify as well.

But does the difference in subtitle between the series and the book make a differ-
ence in genre? Possibly, at least slightly. One could ask “how much” – if one will al-
low degrees in genre – the series and the book are works of popular science; and a
possible answer is that the book is more a work of popular science than the series. The
presence and charisma of Sagan, and the personal in “a personal voyage”, make the
series tend towards the essayistic more than the book does – even though, as men-
tioned above, the words in the series and in the book are at times identical. The schol-
ar Emma Eldelin, in her article about the essays of the Swedish astronomer and au-
thor Peter Nilson, writes, about the essay form in general, that

esayists and researchers on the essay form often emphasize that the essay allows,
even encourages, a personal touch. The personal is of course about the freedom
to choose one’s material and the way in which one presents it, but it is also, im-
portantly, about the fact that there is an “I”, a personality, in the essay.41

Such an I is very much present in the Cosmos series, but it is mostly absent in the
book, though certainly not entirely. And if one could say (as I think one can) that in

39 Spangenburg and Moser, Carl Sagan, pp. 94f.
40 Entry “Authored Documentary” in www.screenonline.org.uk. Entry written by Anthony Clark. Ac-
cessed 2012-05-11.
41 Emma Eldelin, “Vid tänkandets gränser: Om Peter Nilsons essäistik”, in Samlaren: Tidskrift för
svensk litteraturvetenskaplig forskning, 2008, p. 245. The translation is mine. Italics in the original.
popular science, the I is more absent (though almost never entirely) than in the essay, then the book is more a “pure” work of popular science than the series.

Another aspect of the “personal voyage” is that it differs from Clark’s and Bronowski’s “personal views”. The reason for this is most likely that a major theme of the series is the “ship of the imagination”, a space ship in which we (the audience) travel with Sagan and view the wonders of the Cosmos. But the term “voyage” is suffused with more layers of meaning than the imaginary voyages with the ship: a metaphor used throughout the series/book is that of *space as an ocean* and *humanity* (or those humans who explore the Cosmos) *as travelers*. In episode/chapter VI, “Travelers’ Tales”, for instance, Sagan explicitly connects the explorations of the Earth in earlier centuries with our present and (Sagan hopes) future explorations of space. Yet another voyage is the voyage in *time* that *matter* has been making since the Big Bang, evolving from hydrogen atoms to ever more complex forms and finally to consciousness, as discussed at the end of the last episode/chapter, “Who Speaks for Earth?” For these reasons, the genre of *travel literature* is relevant as well. This is most evident in the series, but the book refers to travels and journeys extensively as well. In *Travel Writing: The Self and the World*, the literary scholar Casey Blanton discusses the evolution of travel writing from its beginnings in antiquity to the present. He argues that as the places of the Earth have become more and more known, there has been a shift in emphasis from the places visited to the traveler’s reactions and reflections.42 Commenting on the present situation, he writes: “The new travel books are not our guides to places remote; nowhere is remote anymore.”43 In this regard, Sagan can partly be seen as a traveler of old: space is still remote, and he aims to show us its wonders. But he is partly a modern travel writer as well, since he wants to convey, as part of the cosmic perspective, the attitudes of science, a sense of wonder before the Cosmos.

Finally, the genre of epic poetry, specifically the *creation myth*, is used. This is evident not least in the many quotes included in the book: at the beginning of each chapter, there are about three or four quotes (a total of 47 throughout the book). Of these, about 1/3 are taken from creation myths of different peoples (and the rest from individual ancient and modern writers). Additionally, in chapter X, “The Edge of Forever”, Sagan quotes five ancient creation myths from around the world (pp. 257f). Many references to creation myths are made in the series as well. Sagan is clearly

43 Blanton, *Travel Writing*, p. 29.
suggesting a continuity between the creation myths of old and the ambitions and
world view of modern science, akin to the continuity between travelers of old and the
modern exploration of space. In fact, he states this connection explicitly. In chapter X,
after quoting the five myths, he writes: “These myths are tributes to human audacity.
The chief difference between them and our modern scientific myth of the Big Bang is
that science is self-questioning, and that we can perform experiments and observa-
tions to test our ideas.” (p. 258)

This is, of course, not an exhaustive list of the genres to which Cosmos refers; but
I would argue that they are the most important ones. And allowing for fuzziness, pop-
ular science is the primary genre, with essay and authored documentary (for the se-
ries) not far behind.

4.3. Defining “perspective”

If media and genres are the conditions of the possibility of expressing perspective,
then the next question is what perspective is. What does “perspective” mean? This is
not a question to which a simple answer can be given. Sagan’s definition in the quote
on page 2 above is not very precise, yet this is the closest he comes to an explicit de-
finition in Cosmos. In fact, it is precisely this lack of a rigorous definition that is, in
part, responsible for the dynamism of Cosmos.

Since a rigorous definition of “perspective” is lacking in Cosmos, the different
meanings that this term has in ordinary language are imported along with it. And
“perspective” is a rich term. In the OED (the Oxford English Dictionary), about 13
senses, not counting phrases or compounds, are listed for the noun “perspective”.
Some of them are not in currency anymore, and others are not relevant here, but six of
them are relevant, namely the following:44

1. A picture drawn or painted according to the rules of perspective; spec. a pic-
ture (esp. a theatrical backcloth) appearing to enlarge or extend the actual
space, or to give the effect of distance.
2. A visible scene; a view or prospect, esp. an extensive one.
3. The appearance of viewed objects with regard to relative position, distance
from the viewer, etc.
4. A particular attitude towards or way of regarding something; an individual
point of view.
5. The true understanding of the relative importance of things; a realistic sense

44 www.oed.com, accessed 2012-05-04. The definitions are quoted verbatim, but the enumeration is
mine.
of proportion.
6. A mental view, outlook, or prospect, esp. into the future; an expectation or anticipation.

Let us try to sort these out. First of all, they can be classified into two categories, as being either perceptual (relating to visual perception) or conceptual (relating to attitudes and concepts): senses 1-3 are perceptual, senses 4-6 are conceptual. Secondly, we can see that there is a sort of tension, or ambiguity, within each of these categories, a shifting back and forth between subjective and objective: senses 1 and 3, 4 and 6 concern the subjective, whereas senses 2 and 5 concern the objective. Thirdly, and finally, there is another kind of ambiguity, regarding the one doing the perceiving/conceiving and the things perceived/conceived: a perspective is either a point from which something is perceived/conceived (senses 3, 4, 6); or a perspective is that which is perceived/conceived (senses 1, 2, 5). The first can be called a point of view, the second a view. Clearly, a point of view is not the same kind of thing as a view, yet both of these senses are inherent in the complex concept of perspective.

These distinctions can be summarized in two tables of possibility, the first one regarding the point of view, the second one regarding the view:

<table>
<thead>
<tr>
<th>The point of view is:</th>
<th>Subjective</th>
<th>Objective</th>
</tr>
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<tbody>
<tr>
<td>Perceptual</td>
<td></td>
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<tr>
<td>Conceptual</td>
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</tbody>
</table>

Table 1

<table>
<thead>
<tr>
<th>The view is:</th>
<th>Subjective</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceptual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conceptual</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2

Now, the point of these tables is not to suggest that Sagan distinguishes between these different senses and puts the representations and narratives in the appropriate boxes – rather, the point is precisely that he does not do it. And in not doing it, these senses are, willingly or not, imported into Cosmos (if my analysis is correct).

But admittedly, in invoking the terms “subjective” and “objective”, one can ask if any progress has been made. Are these terms not as problematic as “perspective” it-
self? – In elucidating these terms, I would like to refer to the philosopher Thomas Nagel’s discussion in his book *The View from Nowhere*. Nagel argues that objectivity, rather than being “the truth” or “the absolute”, is a term that, firstly, is *differentially defined* in relation to subjectivity, and secondly, allows of *degrees*. Thus, given three points of view, $A$, $B$, and $C$, it is logically possible $A$ is objective in relation to $B$ but subjective in relation to $C$. Ontologically, objectivity is more like “a method of understanding”:

To acquire a more objective understanding of some aspect of life or the world, we step back from our initial view of it and form a new conception which has that view and its relation to the world as its object. In other words, we place ourselves in the world to be understood. The old view then comes to be regarded as an appearance, more subjective than the new view, and correctible or confirmable by reference to it. This process can be repeated, yielding a still more objective conception.\(^{45}\)

I use Nagel’s definition because I think that it is useful in understanding the cosmic perspective; it captures some of the dynamics involved. However, as the attentive reader will see, there is a tension between this concept of objectivity, which stresses its differentiability, and the fifth sense above: “[t]he *true* understanding of the relative importance of things; a realistic sense of proportion”. But, as we shall see, this tension is inherent in the cosmic perspective as well.

Finally, before turning to the cosmic perspective, a note on usage of terms. Instead of the circumstantial expression “perceive/conceive”, I use *apprehend*. When someone either perceives or conceives something but it is not relevant which of it is, then that person *apprehends* something. The parallel words are *apprehension* (for perception/conception) and *apprehender* (for perceiver/conceiver). Thus, when an apprehender apprehends an apprehension, either perception or conception or both are involved.

5. The cosmic perspective

The cosmic perspective can be decomposed into four perspectives: space; time; humanity and cosmic evolution; and history of science and exploration. As with “perspective”, the “cosmic” in the cosmic perspective is somewhat ambiguous. The OED lists three senses relevant here. “Cosmic” can mean: immensity in scales; the order of the universe; and of extra-terrestrial origin. All of these senses are present in the cosmic perspective, but immensity is emphasized in the first two perspectives, while order is emphasized in the last two perspectives. The extra-terrestrial origin of things is present throughout: part of the cosmic perspective is precisely the realization that the Earth itself, and everything on it, is of extra-terrestrial origin.

5.1. Space

In exploring the space perspective, I choose a sequence from the first chapter/episode, “The Shores of the Cosmic Ocean”.

In the television series the sequence stretches from the beginning (immediately following the title sequence) and 25 minutes or so on (02:51-29:30). The sequence begins with a shot of a breaking wave at sea, and accompanying it we (the viewers) hear the main theme of Cosmos, a piece called “Heaven & Hell, Pt. 1” composed by the Greek composer Vangelis. This piece recurs through the series as a leitmotif, signaling a sense of wonder and awe before the Cosmos. We then see Sagan walking at a cliff by the sea, giving a kind of prologue to the series. The first words set the tone:

The Cosmos is all that is or ever was or ever will be. Our contemplations of the Cosmos stir us – there is a tingling in the spine, a catch in the voice, as if a distant memory, of falling from a great height. We know we are approaching the grandest of mysteries. [03:12-03:37]

Sagan goes on to speak about the Cosmos and about science, stating the two main subjects for the series: the Cosmos as understood in modern science; and science and humanity in their quest to understand and explore the Cosmos. We are invited to join Sagan in his “ship of the imagination”, a ship which, “unfettered by ordinary limits on speed and size, [...] can take us anywhere in space and time.” (06:25-06:39) Sagan holds a dandelion seed between his fingers and lets it go. The scene switches and we

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see, against the backdrop of interstellar space, a lit computerized version of the seed go by (06:40-07:00). We understand that this is the ship of the imagination.

As we see the ship go by, we hear Sagan’s voice: “Before us is the Cosmos on the grandest scale we know.” (07:04-07:10). And as the phrase ends, the scene again switches and we see a view of patches of light in three-dimensional structures against a dark background. We learn that they are galaxies in interstellar space, and we realize that we are now inside the ship, looking out. With this shot we begin a journey that will eventually, 22 minutes later, take us back to the Earth. It is a journey that takes us simultaneously through space and spatial scale: from “half-way to the edge of the known universe” (07:45-07:49), to a tree on the planet Earth; from the largest known structures to human sized objects. On the journey we see galaxies, different kinds of stars, imaginary planets, and the planets of our own solar system.

In the book the sequence spans 11 pages (pp. 2-12). By and large, the same perspective is conveyed and the same journey is made, even though the differences in media make its expression different, and even though the ship is not mentioned. But the language is still much the same: accompanying the view described above, the patches of light in three-dimensional structures, we hear Sagan saying:

> Before us is the Cosmos on the grandest scale we know. We are far from the shores of Earth, in the uncharted reaches of the cosmic ocean. Strewn like sea froth on the waves of space are innumerable faint tendrils of light, some of them containing hundreds of billions of suns. These are the galaxies, drifting endlessly in the great cosmic dark. In our ship of the imagination, we are halfway to the edge of the known universe. [07:04-07:49]

In the book, the corresponding paragraph reads:

> From an intergalactic vantage point we would see, strewn like sea froth on the waves of space, innumerable faint, wispy tendrils of light. These are the galaxies. Some are solitary wanderers; most inhabit communal clusters, huddling together, drifting endlessly in the great cosmic dark. Before us is the Cosmos on the grandest scale we know. We are in the realm of the nebulae, eight billion light years from Earth, half way to the edge of the known universe. [p. 5]

The ship is not mentioned; rather, it is replaced by a counterfactual statement: “From an intergalactic vantage point we would see”, i.e. we are to imagine ourselves at an intergalactic point in space, viewing the galaxies. For this reason, it could be called an

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47 I quote these passages at length to give a sense of the poetic language of Cosmos, and to give an example of similarities and differences between the series and the book.
imaginary perceptual view (even though it is not entirely imaginary since the text is accompanied by images of galaxies), as opposed to the tangible view from the ship. However, the view from the ship is not real either: it is a sequence of computer simulations and pictures. Thus, it could be called a simulated perceptual view, or even an illusory one, since such a view of the universe is most likely a physical and cognitive impossibility. But however it is done, what we are perceiving is the vastness of space.

Associated with, but conceptually distinct from, the view is the point from which the universe is viewed. In the sequence we are analyzing, as well as throughout Cosmos, there are two fundamental points of view, most obviously apparent in the series: the viewer’s and Sagan’s. In the series, the point of view is constantly switching between these: we see the Cosmos directly, and then we see Sagan seeing the Cosmos. This enables the viewer to see Sagan’s reactions to the Cosmos: awe and wonder. It also raises questions about the objective and subjective. The direct point of view, seeing galaxies, structures, and stars, could be thought of as more objective, since the view is shown, so to speak, directly, as though the viewer perceived the universe as it really is. But on the other hand, Sagan’s point of view could be thought of as more objective, since he embodies the authority of science. And this raises further questions about what it actually is that we are seeing: the results of science, which are always in principle fallible;48 or the methods and attitudes of science, which are (basically) not. If the fallible nature of science is taken to its logical end, then the images we see will perhaps soon be outdated; but Sagan’s point of view, that of the scientist and her/his methods and attitudes, will not. In the book, this switch between points of view is not possible to the same extent, but the switch between the imaginary perceptual point of view and Sagan’s reactions is still possible: even though we do not see Sagan’s facial expression and hear his voice, we still “hear” his authorial voice in the text.

If we turn to the conceptual aspects of the terms, another difference in view and point of view is possible to see. This difference can be heard in the following passage:
“A galaxy is composed of gas and dust and stars – billions upon billions of stars. […] But from afar, a galaxy reminds me more of a collection of lovely found objects – seashells, perhaps, or corals, the productions of Nature laboring for aeons in the cosmic ocean.” (p. 5) The first sentence is general: it explains what galaxies are made of,

48 Sagan makes this point repeatedly, for example in episode XIII: “[Science’s] only sacred truth is that there are no sacred truths” (48:05-48:09); “Science is not perfect. It’s often misused; it’s only a tool. But it’s the best tool we have: self-correcting, ever changing, applicable to everything.” (48:49-49:02)
thus referring to an objective view of the world. The second sentence is more subjective, referring to Sagan’s personal view. But there is an even more interesting point to be made about the second sentence: in it we see defamiliarization at work. At first sight, one might think that the opposite is the case: Sagan familiarizes galaxies by relating them to objects found on the Earth. But when that has been done, the familiar is instead defamiliarized: the objects of Earth are produced by “Nature laboring for aeons in the cosmic ocean”. This connects Earth to space and defamiliarizes the ordinary. In fact, the whole journey – from the leap into the ship of the imagination from a shore on Earth, to the Cosmos on the grandest scale we know, and back to Earth – is defamiliarizing. Upon our return, as though greeting aliens, Sagan says: “Welcome to the planet Earth – a place with blue nitrogen skies, oceans of liquid water, cool forests, soft meadows, a world positively rippling with life.” (28:49-29:03/p. 12)\textsuperscript{49} We see our everyday surroundings, as well as the planet Earth, as we have never seen them before, as though from space.

Thus, to conclude: we can see that if we abstract from what has been said, the space perspective can be seen to be composed of two components:

- apprehending the vastness of space; and
- apprehending the Earth as though from a point in outer space.

5.2. Time

In exploring the time perspective, I choose two sequences from episode/chapter X, “The Edge of Forever”. The subject is cosmology – the study of the nature and structure of the universe as a whole. Time is only one aspect of this; but it is a crucial aspect, and the episode/chapter are good for understanding the time perspective.

In the first sequence (00:48-10:42/pp. 246-252), we are again in the ship of the imagination, but the primary focus this time is not space, but time. Following some preliminary thoughts by Sagan on the origins of questions about infinity and eternity, the sequence begins with a short exposition of the Big Bang and the early universe: the universe exploded, expanded, cooled, etc., and then the largest (then known) structures formed: the galaxies. An overview of different kinds of galaxies is then

\textsuperscript{49}The book has “a place of blue nitrogen skies” and an “and” between “cool forests” and “soft meadows”; apart from that, the words are identical.
given. In the series, this sequence is described and simultaneously shown using computer simulations and pictures; in the book, words and accompanying pictures do the telling. Following that, time, in the guise of rotating galaxies, is illustrated using computer simulations: we see dots representing stars, rotating about a centre, creating galactic patterns, and then simulations of colliding galaxies. In the book, the same simulations are described in words (not images). Immense amounts of time are conjured up through these simulations: we see rotating dots forming a spiral pattern, and we hear Sagan saying: “A billion years is here compressed into a few seconds.” (06:04-06:08) Later, we see a simulation of our own galaxy, the Milky Way. We learn that the Sun takes 250 million years to complete one revolution. Almost a minute later (from 10:25), we see a large dot representing the Sun; we see it go in and out of spiral arms, and we learn that during its lifetime, it has completed 20 revolutions (09:30-10:42).

But immense as these amounts of time are, they are not infinite. In fact, they are nowhere near infinity. The question of whether the universe is infinite in time is considered in the second sequence (45:31-56:30/pp. 259-262, 265-267). At the beginning of the episode/chapter, the history of the universe since the Big Bang was, as we saw, referred to and briefly sketched. Now the question is raised whether the Big Bang was not the absolute beginning, but merely the latest one in a series of Big Bangs – whether we live in an oscillating universe, where expansion is followed by contraction and a new Big Bang, followed by expansion, and so on indefinitely. That would be true temporal infinity, not just immensity. The present state of knowledge (at that time) does not allow a determination of what kind of a universe we inhabit, but the possibilities are entertained and described – an oscillating one, creation upon destruction upon creation, infinite in time; or one in which the Big Bang was a singular event and the expansion goes on forever, the universe ultimately becoming barren and lifeless, “a thin cold haze of elementary particles” (47:08-47:13), in effect an end of time.

When it comes to representing infinite time, the primary medium used, even in the series, is words: Sagan walks and talks. Perhaps this is not surprising: the amounts of time represented even in the simulations of galaxies discussed earlier is, again, nowhere near infinity, however large in human time scales. Words may be the best medium for conveying some kind of apprehension, however far from the real thing, of infinity. Why is that? Because the recursivity of thought is what allows us to

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50 In the book, though, there is a painting attempting to do it.
do it, and because recursivity is perhaps best conveyed using language. Recursivity is the possibility of creating new elements out of old ones indefinitely – for example, a new number can always be generated by adding the number 1 to a given number (hence there is no biggest number). By utilizing this property of thought in the right way, a special kind of sensation, approaching vertigo, can be created – possibly the closest thing to apprehending infinity that finite beings like us will ever achieve. Sagan utilizes this property at the very end of the episode/chapter (55:10-56:07/pp. 265ff): he says that if our universe is closed – if there is enough matter and energy in it to make it an oscillating universe – then there is a “strange, haunting, evocative” possibility. It is possible that our entire universe, every living being, planet, star, and galaxy, is but an elementary particle in a much larger universe; and that that larger universe is but an elementary particle in an even larger universe; and so on indefinitely. And the same would hold for every elementary particle in our universe: each particle contains an entire universe; and within those universes there are elementary particles, and each elementary particle in those universes contain entire universes; and so on indefinitely.

Through this possibility, Sagan puts our universe, and the planet Earth, in a possibly infinite hierarchy of universes, as well as in a possible temporal infinity. To refer to the discussion in the previous section, this is, again, defamiliarizing: in ordinary life, we think in time scales of hours, days, months, years. But a further aspect of defamiliarization is possible to discuss here. As we saw in the theory chapter, the Russian formalists argued that a defamiliarizing technique can become familiarized, automated; if it becomes convention, then it loses its ability to defamiliarize. But Sagan’s infinite hierarchy of universes at least raises the possibility of an exception to that rule: perhaps infinity can never be automated; perhaps our cognitive faculties are such that this kind of recursivity, approaching infinity, is inherently defamiliarizing.

But however that may be, to conclude and abstract, we can see that paralleling the space perspective, the time perspective is composed of two components:

*apprehending the (possibility of) infinite time; and*

*apprehending the Sun and the Earth in galactic time scales.*
5.3. Humanity and cosmic evolution

In exploring humanity and cosmic evolution in the cosmic perspective, I choose a sequence from the last chapter/episode, “Who Speaks for Earth?”. The sequence (37:18-41:49/pps. 337f), which I will refer to as the evolution sequence, tells the story of cosmic evolution, from the Big Bang to present day humanity. It is actually part of a longer sequence that continues to the end of the episode/chapter, but the ending will not be discussed until the next section. As discussed in section 2.3, Zakariya analyzes this sequence (and the longer sequence of which it is a part) in Towards a Final Story. But instead of analyzing, as he does, the communicative situation – who tells what to whom – I will focus on how the story is told. In doing this, I will discuss both the structure of the story and how it is expressed medially.

In spite of medial differences between the series and the book, there is a common structure to the story; the wording in the series and the book are very close, at times identical, and the structure of the story is the same. In understanding this structure we use the distinction between pivotal and lesser kinds of events discussed in section 2.3. In the evolution sequence, 15 billion years of cosmic evolution is compressed into 4 minutes and 30 seconds. How is something like that possible? A lot of things happened during those 15 billion years, but the category of pivotal kinds of events allows Sagan to relate it. What are these events? The Big Bang; condensation of energy to matter; accumulation of matter to clouds of gas, leading to galaxies; onset of thermonuclear reactions (= birth of stars); fusion of heavier elements from lighter ones; formation of new generations stars, rich in heavy elements; creation of organic molecules in interstellar clouds of gas; creation of the Sun and the solar system; origin of self-replicating molecules on Earth (= the origin of life) and onset of Darwinian evolution; emergence of one-celled organisms; emergence of multicellular organisms; colonization of land by animals; evolution of mammals, primates, and humanity. Thus, we see how intimately connected we, humans of the present, are with the Cosmos: “Star stuff, the ash of stellar alchemy, had emerged into consciousness.” (41:26-41:32) But of course, these pivotal events beg the following question: pivotal to whom? In a narrative situation, an event is only pivotal retrospectively and in relation to the narrator and her/his concerns. If the narrator were a bacterium, say, the transition from one-celled organisms to multicellular organisms would not be pivotal. Thus, even though the cosmic story is presented as a single story, it is narrated by a human
being and centered around kinds of events pivotal for the emergence of humanity.

But even though there is a common structure to the different medial versions of the story, different media still produce different effects. The medial differences between the series and the book make the evolution sequence different in the two technical media, since the book only utilizes words, while the series uses all the possibilities of television: music (one of the two most important leitmotifs, “Alpha” by Vangelis), disembodied narration (Sagan’s voice, charged with a sense of awe), series of still and moving images (film shots, animations, photographs, paintings). But in spite of this, the main medium for telling the story, as I argued in section 3.1, is language: images and music alone could not convey the cosmic story. Thus, in both the series and the book, language carries the burden of telling the story. But if so, what do the music and images do that the text alone cannot? What do they add to the text? The images in the evolution sequence are taken from earlier episodes; therefore, they could be said to function *metonymically*: they refer to those other episodes, putting them in a new light. They also function metonymically in another way: for instance, an image of galaxies represents not only those galaxies, but (metonymically) galaxies in general, the interconnectedness of all things through the laws of nature, the beauty of the Cosmos, awe and wonder. In addition, they appeal to the “desire to witness” the universe and the history of the Cosmos, of which Zakariya speaks in the context of another documentary. The music, finally, is metonymical as well: being a leitmotif of the series signaling awe, it refers to those moments and feelings. In addition, the piece itself is structured in a crescendo-like fashion, building up to the climactic moment of the emergence of humanity. For these reasons, the images and music heighten the emotional impact already inherent in Sagan’s poetic language.

In these ways, the cosmic story is told. Structured around pivotal kinds of events, related through poetic language and metonymically charged images and music, the evolution sequence tells the story of cosmic evolution producing humanity out of hydrogen atoms. Thus, this part of the cosmic perspective can be seen to be composed of two components:

*apprehending humanity from the point of view of cosmic evolution; and
apprehending the history of cosmic evolution.*

51 Zakariya, *Towards a Final Story*, p. 258.
5.4. History of science and exploration

In exploring the history of science and exploration in the cosmic perspective, I choose themes and sequences from three chapters/episodes: III, VI, and XIII. The first two deal with the personality traits and social circumstances suitable for conducting science and exploration in the right kind of way (according to Sagan), while the third is the continuation of the evolution sequence discussed in section 5.3.

In episode/chapter III, “The Harmony of the Worlds”, the life and times of Johannes Kepler are discussed. Kepler (1571-1630), a German mathematician, astronomer, and astrologer, was the one who deduced the true orbits of the planets of the solar system (ellipses) using Copernicus’s ideas of a heliocentric system and Tyco Brahe’s observational data. In the episode, Kepler’s life is dramatized, with Sagan’s voice-over narration relating the story. Kepler is presented as a pivotal figure in the history of science and exploration; in one scene, he is shown teaching mathematics to uninterested children, and we hear Sagan saying: “One pleasant summer afternoon, with his students longing for the end of the lecture, he was visited by a revelation that was to alter radically the future course of astronomy and the world.” (32:21-32:33)

The social circumstances of Kepler’s time are presented as detrimental to science – there were wars, religious fervor, bigotry – but Kepler is a presented as a hero who, through perseverance and refusal to partake in the shameful behavior of his contemporaries, manages to uncover some of the secrets of the universe. In this way, he is presented as a role model: independent, courageous, uncorrupted, intelligent, passionate, imaginative yet respectful of facts.

If Kepler shows us the way for struggling in unjust and unwise social circumstance, then the case of 17th century Holland, dramatized and discussed in episode/chapter VI, “Travelers’ Tales”, is presented as a kind of role model for later societies. It was a “rational, orderly and creative society” (12:06-12:10) which embraced the ideals of the European enlightenment more than any other at that time. Because of geopolitical circumstances, the “economic survival of [Holland] depended on its ability to construct, man and operate a great fleet of commercial sailing vessels.” (12:14-12:23) Some of these expeditions were, as Sagan admits, less benign, being exploitative in character; but there were also noble motives: “The Dutch were also motivated by a powerful scientific curiosity and a fascination with all things new.” (13:18-
13:25) The Dutch society was appreciative of scientists: Holland was the nation to which thinkers fled from more repressed parts of Europe. As mentioned in section 4.2, Sagan explicitly connects these early explorations of the planet Earth with our present (and possibly future) explorations of space. Thus, Kepler and Holland are shown as precursors of the right kinds of attitudes and ambitions for present day scientists, human beings, and societies. Here we see quite clearly the normative thrust of Sagan’s narrative: true science and exploration is like Kepler and Holland.

But the full thrust of the moral aspect of Sagan’s words is not realized until the final chapter/episode, the continuation of what I called the evolution sequence discussed in section 5.3. The continuation can be called the \textit{morality sequence}, and the switch to it from the evolution sequence occurs in the middle of a sentence: “We are a way for the Cosmos to know itself. We are creatures of the Cosmos and have always hungered to know our origins, to understand our connection with the universe.” (41:43-41:56) The switch occurs at 41:49, with “and have always hungered to know our origins”. The morality sequence is an apology for science and exploration conducted in the right way, with the purpose of understanding the world; and for a universalist ethics, recognizing the unity of humanity and arguing against sexism, racism, and nationalism. As in the evolution sequence, the images and music are metonymically charged: they are taken from earlier episodes of \textit{Cosmos}, thus referring both to the series itself – letting us see earlier sequences in a new light, putting them in a unified story of cosmic evolution and universal ethics – and to such things as the unity of humanity, the joy of understanding, and a sense of wonder before the Cosmos.

But now, one might ask: is this really a switch at all? Does not the continuity between the sequences suggest that cosmic evolution and morality are inseparable? Even though there is an ambiguity here, I still claim that cosmic evolution and morality are conceptually distinct in \textit{Cosmos}. To be sure, humanity is a product of cosmic evolution; but there is no choice for us, or for any humans, in this. It is just a fact of the universe. But in morality, in pursuing science and exploration in the right way, there \textit{is} a choice. And here Sagan makes an appeal to human nature. It is in our nature to wonder about the origins of humanity and the world; however, not everyone pursues these wonderings; thus, choosing science and exploration means affirming one’s deepest humanity, and therefore also the connection to the Cosmos.

To summarize and abstract, this part of the cosmic perspective deals with indi-
vidual and socio-historical preconditions for exploring the cosmic perspective. Thus:

affirming the values and behavior of true science and exploration; and

apprehending the history of true science and exploration.

5.5. Four perspectives?

Having analyzed the perspectives, a question that needs to be asked is: why four perspectives? Are there any arguments for this number, and for these perspectives in particular? Or are they just a product of the imagination of the author of this thesis? – I would argue that even though Sagan does not explicitly enumerate the perspectives, they are not just figments of my imagination either. Saying that the cosmic perspective is composed of four different but related perspectives is a reading; but it is, I would say, a justified reading. In the appendix, I spell out the themes and sequences in the episodes/chapters and refer them to the appropriate perspectives. For reasons of scope, though, the spelling out is quite short; but a detailed analysis would, I believe, arrive at the same results. Even though there most likely are other ways of analyzing and structuring the themes of Cosmos, I would argue that understanding the cosmic perspective as composed of these four perspectives is the most natural and appropriate way.
6. The cosmic perspective?

We have seen that the cosmic perspective is complex, composed of four different perspectives. As the previous chapter indicates, each perspective involves both a point of view (an apprehender) and a view (an apprehended). On numerous places, we have also touched upon possible ambiguities inherent within the cosmic perspective. Now we can ask: can these ambiguities be grasped more clearly? Can they be systematized? In this chapter, concepts analyzed and outlined in earlier chapters are used to approach these questions. In effect, we take a step back and consider the nature of the perspectives and the structure of the narrative situation.

The first ambiguity arises when we consider the ontological status of the perspectives. Sagan presents the perspectives as though they were there prior to him, i.e. as though they were not constructed by him in writing *Cosmos*. Basically, Sagan is presented as a guide relating an independently existing content. This is, of course, a common strategy in fiction and non-fiction alike: the narrator presents the narrative as though it already existed as a story, ready to be told by whoever is fortunate, perceptive, and able enough to find it and tell it. To quote theorist Hayden White: the story is “presented as ‘found’ in the events rather than put there by narrative techniques.”

Concretely, the perspectives are constructed, as we have seen, using techniques like defamiliarization, metonomy, etc.; and this is true independently of the truth of the perspectives, where such questions are relevant (for instance, whether time is infinite). What is at stake here are not the answers to the philosophical and scientific questions, but rather how these questions and answers are represented. Even more fundamentally, in constructing the perspectives Sagan has made several choices regarding what kinds of facts, events, and processes to include and represent. Therefore, the concept of mood is relevant: Sagan is a narrator regulating what information to relate to the audience. If we use the logical notation suggested in section 3.4, we can write perspective \( p \) in the following way:

\[
    p = m_S(x_1, x_2, \ldots, x_n),
\]

where \( m_S \) is mood (performed by Sagan) and \( x_1, x_2, \ldots, x_n \) are representations and narratives of the facts, events, and processes that Sagan includes. Again, this formula is

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not a mathematical function in the strict sense; rather, it means that \( m \) modifies \( x_1, x_2, \ldots, x_n \), thereby creating \( p \). Or more concretely, Sagan constructs a perspective by choosing, and deciding how to represent, a number of facts, events, and processes. The ambiguities discussed earlier can therefore be expressed in the following way: \( p \) is ambiguous because Sagan does not present it as constructed; the exact nature of \( p \), and the status of truth claims within it, are left unexplained.

But in response to this, one can ask: does this really make \( p \) ambiguous? Is it not common for authors to leave the natures of their narratives unexplained? – Perhaps so. But the ambiguity arises because of the primary genre of \textit{Cosmos}: popular science. By being popular science, \textit{Cosmos} is making metacommunicative claims, claims about how it should be read. Specifically, and importantly, some of these claims regard the question of truth. If \textit{Cosmos} were a work of fiction, then the audience would know that \textit{Cosmos} was not making truth claims. But \textit{Cosmos} is not fiction; it is popular science, and the relation that popular science has to truth is also (by and large) the relation that \textit{Cosmos} has to truth. So what is popular science’s relation to truth? Ambiguous. It lies somewhere between fiction and truth, its exact nature unspecified. Popular science appeals to the authority of science, which is the truth claimer \textit{par excellence}; but at the same time, popular science is not “real” technical science. It is a simplification, an adaptation into understandable language. Therefore, it does not quite have the truth claiming authority that “real” science has. Thus, popular science is science – but not quite. It is ambiguous in its relation to truth, and its ambiguity is also \textit{Cosmos}’s.

This ambiguity, the second one, is an ambiguity in \( x_1, x_2, \ldots, x_n \), i.e. in the nature of the representations and narratives of facts, events, and processes. But it is not only the nature of the representations and narratives that is unclear; so is the nature of the facts, events, and processes of science itself. As we saw in section 5.1, the results of science – the theories and observations – are presented as ever changing, always open for questioning. Only the method is beyond doubt – the only sacred truth of science, as Sagan says in the last episode (48:05–48:09), is that there are no sacred truths. Therefore, when we see a representation of a molecular process, for instance, what is unclear is both the representation’s relation to the technical knowledge \textit{and} that knowledge’s relation to reality. Thus, the unclear nature of \( x_1, x_2, \ldots, x_n \) is double: the representations’ relation to the technical facts; and the technical facts’ relation to reality.

So far, we have discussed two ambiguities: in \( p \), and in \( x_1, x_2, \ldots, x_n \). But the per-
perspectives alone do not make *Cosmos*: Sagan is a narrator relating the perspectives, and he takes affective, moral, and intellectual stances on their contents. This brings us to the concept of voice. As explained in the theory chapter, the concept of voice employed here is composed of a diegetic relationship and a narrational attitude. The narrational attitude – wonder, awe, universalist ethics, affirmation of science – is straightforward enough.\(^{53}\) Instead, the primary site of the third ambiguity is the diegetic relationship. In structuring the question, we again use logical notation. We write the four perspectives with indices on \(p\), thus: \(p_1, p_2, p_3, p_4\). We then have:

\[
w = v_S(p_1, p_2, p_3, p_4),
\]

where \(v_S\) is Sagan’s voice and \(w\) is the work. This is an expression for the work *Cosmos*. What we are considering now is \(v_S\).

In asking about Sagan’s diegetic relationship with *Cosmos*, we are asking what kind of a narrator he is. Is he intradiegetic or extradiegetic, i.e. is he a part of the narrated world or not? Is he homodiegetic or heterodiegetic, i.e. is he a part of the narrative or not? Here we must be very precise in what we mean by “narrated world” and “narrative”. If the narrated world is the Cosmos, then yes, Sagan is part of the narrated world – not least since a major theme of *Cosmos* is that human beings are fundamentally part of the Cosmos. But if the narrated world is Germany in Kepler’s time, then the answer is no. So far, there is no basic ambiguity; the answers are relatively straightforward. But when we ask about the narrative, things are not so simple. Suppose, for instance, that the narrative is the cosmic story. In *Cosmos*, the cosmic story is the scientific account of the world, including explanations of the existence of life and humanity. In regard to the content, Sagan is a part of the narrative, since he is a human being. But in regard to the form – the structure of the narrative situation – it is not entirely clear what he is, since he acts like a narrator relating an independently existing story (as discussed above). In other words, the cosmic story is presented as objective, as being there independently of whether Sagan narrates it or not. Sagan is a conveyor, conveying an objective view, and in conveying it, he is objective. But cru-

\(^{53}\) However, one could of course do a *symptomatic* reading, not taking Sagan’s stances at face value, but seeing them as symptoms of something unthought or consciously concealed, for instance an institutionalized power relation (such as science’s power over knowledge). Even though I have at times referred to *Cosmos’s* relation to the authority of science, and will do so again in what follows, my reading is not primarily a symptomatic one, since it does not relate the ambiguities found in the cosmic perspective to theories of power relations.
cially, objectivity is about having a certain distance toward the object in question. Therefore, the less Sagan is part of the narrative, the more objective he is. And conversely: the more objective he is, the less part of the narrative he is. Here, then, is the ambiguity: Sagan is clearly part of the Cosmos, of the narrated world; but at the same time, in narrating the cosmic story, he is at least one step outside it, relating it as though from the outside. This is the ambiguity discussed at the end of section 4.3: the tension between objectivity as differentially defined in relation to subjectivity on the one hand, and objectivity defined as the “true understanding of a view” on the other.

Thus, returning to the whole of Cosmos, represented by w, we can write it in the following way (where the index i on p in the first formula indicates that it is either of the four perspectives):

\[ p_i = m_S(x_{i1}, x_{i2}, \ldots, x_{in}), \text{ and} \]

\[ w = v_S(p_1, p_2, p_3, p_4). \]

Using these formulae, we can say that the ambiguities in Cosmos are ambiguities in \( x_{i1}, x_{i2}, \ldots, x_{in} \), in \( m_S \) (and therefore in \( p_i \)); and in \( v_S \) (and therefore in \( w \)).
7. Conclusion

In this thesis, I have analyzed Carl Sagan’s television series and book *Cosmos*. My starting point was Sagan’s phrase “the cosmic perspective”, as given in a passage from the introduction where Sagan more or less states the authorial intent:

[Science] has revealed to us a universe so ancient and so vast that human affairs seem at first sight to be of little consequence. We have grown distant from the Cosmos. It has seemed remote and irrelevant to everyday concerns. But science has found not only that the universe has a reeling and ecstatic grandeur, but also that we are, in a very real and profound sense, a part of that Cosmos, born from it, our fate deeply connected with it. The most basic human events and the most trivial trace back to the universe and its origins. This book is devoted to the exploration of that cosmic perspective. [p. xii]

In a way, one could say that I took the phrase “the cosmic perspective” very literally and analyzed the series and the book from the perspective of it. I showed that the phrase is more complex than this passage perhaps suggests, and that there are ambiguities inherent within it that are not spelled out in *Cosmos*. Specifically, the cosmic perspective is composed of four different but related perspectives – space; time; humanity and cosmic evolution; and history of science and exploration – and there are ambiguities – philosophical problems neither stated nor analyzed – in the construction and conveyance of these perspectives. I used theories from literary studies (and related fields) to analyze the perspectives: intermediality studies; genre theory; Russian formalism; and narratology. It was in using these theories, in particular genre theory and narratology, that the ambiguities were detected and analyzed.

An important issue is what kind of significance and consequences these ambiguities have. An author not commenting on the construction of her/his narrative is not uncommon. But again, when it comes to non-fictive genres this question is perhaps more relevant to pose – or at least relevant in other ways. Popular science appeals to the authority of science, and for that reason its ambiguities are potentially powerful and in need of careful scrutiny. Zakariya analyzes some of them in his *Towards a Final Story*. But even though I do recognize the importance of analyzing the political and societal aspects of popular science, they have not been the focus of this thesis.

Another interesting issue concerning the ambiguities is their productive aspect. Perhaps *Cosmos* is dynamic, in part, precisely because of its ambiguities. Perhaps there are deep ambiguities inherent in the cosmic perspective itself – or at least in the
current understanding of it, given the current state of scientific and philosophical understanding, in our culture, of ourselves and the universe. If so, then the cosmic perspective and its expressions become a site for exploring that understanding, a site for philosophical inquiry about the nature of perception, knowledge, and truth. And as we have seen, literary theories can be used in such analyses.

But this thesis has not only used literary theories for analyzing a work in a genre not traditionally seen as literary. Equally much – or approximately so – it has been an attempt to show the literary character of the language and narrative structure of *Cosmos*. Even though I focused as much (approximately) on the series as on the book, I stated that language is the main medium of *Cosmos*; and if we restrict our discussion to *written* popular science, we can refer again to John Carey.⁵⁴ In chapter 2, I quoted a plea by Carey for popular science writing to be recognized as a literary genre in its own right. I share Carey’s position. Not only can literary theories be used to analyze popular science; equally, popular science writing ought to be recognized as is a literary genre itself.

Thus, here one can see important sites for future research. It would be interesting and important to analyze more works of popular science using literary theories; and equally, to analyze popular science as a literary genre. A further question is the relation between these kinds of analyses: what, exactly, is the difference between analyzing a text using literary theories, and analyzing a text as a literary text? Would using literary theories to analyze, for instance, Stephen Hawking’s *A Brief History of Time* make it a work of literature? What would be needed for a recognition of it as literature? What are the boundaries of literature? These questions have internal, formal aspects as well as external, societal aspects. In this thesis I have focused on the internal aspects, but analyzing these questions in larger contexts would inevitably include questions of literary canon formation, questions of status and hierarchies of different genres of literature, in academic institutions and in the culture at large. Of the more formal questions, the distinction between fiction and non-fiction, specifically in the context of the essay form and popular science, is in need of analysis. Another interesting question, which Eldelin lists as an important research question, is to chart the

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⁵⁴ One reason for this restriction is that, tautologically, only *written* popular science can be *literary*. Pictures and music can of course be artful, creative, etc., but not literary. Another reason, a more personal one, is that, in the final analysis, it is *literature*, the written word, that I am most interested in; and it is, primarily, to written popular science that I intend to return in future studies.
boundaries between the essay form and popular science. And all of these questions can be seen in the context of representations of the universe and “Nature”. How is the non-human represented in these genres? How are human beings and affairs represented in terms of, or in the context of, the non-human?

The literary character of the language of *Cosmos* is perhaps most apparent in its narratives and in its use of defamiliarizing techniques. In *Cosmos*, Sagan attempts to both represent and re-present the universe. The Earth and humanity, our everyday surroundings and our life-world, are presented as though for the first time, as though from a point in outer space. And in trying to represent infinity using the recursivity of thought, Sagan is perhaps doing something that is inherently defamiliarizing for finite beings like us. Existence is truly and utterly strange, yet this is often forgotten in everyday life. As *Cosmos* shows, science can be used to defamiliarize us, to shake our perceptions and conceptions. In the cosmic perspective, nothing is as strange as ordinary life.

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8. References

8.1. Printed material


Root, Robert L., Jr., “Naming Nonfiction (A Polyptych)”, in *Collage English*, 2003:
Vol. 65, No. 3.


### 8.2. Visual media


### 8.3. Internet resources

*BFI Screenonline (British Film Institute)*, www.screenonline.org.uk.

*MBI (Museum of Broadcast Communications)*, www.museum.tv.

Appendix: Themes and perspectives of *Cosmos*56

I. “The Shores of the Cosmic Ocean”
In the series, there are four basic sequences. 1. (02:50-07:01) Sagan gives a kind of prologue to the series, he speaks about the Cosmos and about *Cosmos*. Here, all four perspectives are present in Sagan’s words. 2. (07:01-29:30) We travel with Sagan through space and spatial scale. This sequence belongs primarily to the *space* perspective, and secondarily to the *history* perspective, since it is an imaginary journey in a ship, thereby suggesting a kind of continuity to earlier explorers. 3. (29:30-52:50) The ancient Alexandrian philosopher Eratosthenes, as well as philosophy and science in an historical perspective, are discussed. This sequence belongs primarily to *history*. 4. (52:51-57:50) Sagan displays and discusses the cosmic calendar, which compresses the history of cosmic evolution to one year (thereby putting things into a humanly comprehensible scale). This belongs primarily to *time* and *evolution*. In the book, there are three basic sections, and they correspond to the three first sequences in the episode (the cosmic calendar is left out): 1. p. 4f, all perspectives. 2. pp. 12, *space*. 3. pp. 12-21, *history*.

I discuss this episode/chapter at more length than the others because it is a kind of expository episode/chapter and contains the seeds of much to come.

II. “One Voice in the Cosmic Fugue”
In this episode/chapter, themes of evolution and life are explored. Evolutionary principles – on geological, historical, and molecular time scales – are discussed and illustrated. Both the life on Earth and the possibility of life elsewhere in the Cosmos are examined. The primary perspective throughout is *evolution*.

III. “The Harmony of the Worlds”
In this episode/chapter, modern astrology, ancient myths, and the life and times of Johannes Kepler are discussed. The focus is on scientific method and finding a scientifically justifiable attitude towards the Cosmos. Thus, the primary perspective is *history*.

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56 For brevity, I refer to the perspectives as *space*, *time*, *evolution*, and *history*. 

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IV. “Heaven and Hell”
This episode/chapter is about the solar system. It covers historical and popular misapprehensions of the nature of the bodies of the solar system, and additionally, Soviet expeditions to Venus. The primary perspectives are evolution and history.

V. “Blues for a Red Planet”
In this episode/chapter, the planet Mars – very dear to Sagan’s heart – is explored. Again, evolution and history are the primary perspectives, since the focus is on historical ideas of Mars and on previous and future explorations of it.

VI. “Travelers’ Tales”
This episode/chapter deals with modern explorations of the solar system and of historical explorations of the Earth, centered around Holland in the 17th century, suggesting a continuity between historical explorations of the Earth and modern explorations of space. The primary perspective is history.

VII. “The Backbone of Night”
This episode/chapter is a kind of turning point in the series. It is the middle episode/chapter, and where many of the earlier have focused mostly (but not exclusively) on history, from now the focus is mostly (but not exclusively) on physical and astronomical principles and processes. But in this episode/chapter, the primary perspective is still history: scientific method is discussed in the context of philosophy in ancient Greece.

VIII. “Travels in Space and Time”
In this episode/chapter, interstellar and intergalactic travels are discussed, specifically in the context of Einstein’s theory of relativity, since this theory makes possible, given sufficiently advanced technology, travels to other stars and galaxies within a single human lifetime. The primary perspectives are space and time.

IX. “The Lives of the Stars”
In this episode/chapter, the chemical elements and their origins in thermonuclear reac-
tions in stars are explored. Incredibly large numbers – and infinity – are also discussed. The primary perspective is *evolution* (since the creation of the elements is a crucial part of cosmic evolution), with *space and time* as secondary.

**X. “The Edge of Forever”**

In this episode/chapter, cosmology is discussed. The basic questions of cosmology concern the nature, large-scale structure, and origin of the universe, and in discussing these questions, Sagan suggests a continuity between ancient creation myths and modern cosmological theories. Immense spatial and temporal scales are discussed. Additionally, in discussing cosmology, cosmic evolution is a natural part. Thus, here all four perspectives are focused.

**XI. “The Persistence of Memory”**

In this episode/chapter, intelligence on Earth, most specifically human intelligence, and cultural evolution are discussed. The primary perspective is *evolution*.

**XII. “Encyclopaedia Galactica”**

In this episode/chapter, the focus is on the search for extraterrestrial intelligence, as well as on the possibility of extraterrestrial intelligence. Again, a continuity with history is suggested: in the 19th century, Jean Francois Champollion (1790-1832) decoded the Egyptian hieroglyphs; today, the SETI (Search for Extra-Terrestrial Intelligence) institute is trying to find messages from alien civilizations. The primary perspectives are *history* and *evolution*.

**XIII. “Who Speaks for Earth?”**

In the final episode/chapter, elements from earlier chapters are combined to create a climactic conclusion and a plea for peace, wisdom, science, and exploration. Again all four perspectives are present, most conspicuously in the final long sequence (the evolution sequence + the morality sequence): the history of the universe since the Big Bang is told – the *space, time, and evolution* perspectives – and an apology for science and exploration is given – the *history* perspective.