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The “Poetic Element” of Science

Particle Physics and the Fantastic in Irmtraud Morgner’s
Novella *The Rope*

Abstract: In her novella *The Rope* [*Das Seil*] (1973), Irmtraud Morgner questions the degree to which particle physics and its search for the elementary components of matter appear fantastic. This is accomplished through a particular literary technique. Morgner montages entire excerpts of original texts from particle physics in her novella. With this material, the text demonstrates how particle physicists rely on a “poetic element” (Morgner 1993, 141) in the production and representation of what cannot be observed, namely, invisible particles. In this way, the novella produces an effect crucial to its fantastic narrative structure: it causes the concepts of the real and the imaginary to collapse.¹

1 The fantastic side of modern physics

“Black holes,”² “red dwarfs,”³ “ghost particles”⁴ – a cursory glance at current media coverage of various branches of modern physics,⁵ such as astronomy or particle physics, gives the impression that physicists deal with fantastic things. In his *Essays on the Fantastic* [*An den Grenzen des Staunens: Aufsätze zur Phantastik*], literary critic and author Martin Roda Becher encapsulates this trend as follows:

Our deficient imagination is aided when cosmic occurrences of enormous dimensions are projected onto the topography and personnel of fairy tales: there are red dwarfs and blue giants, white dwarfs, who, like Rumpelstiltskin, are suddenly swallowed up, there are the

¹ The complete article was translated from the German by Nathan Taylor. All translations from the German and all modifications of published translations are by Nathan Taylor, unless otherwise indicated. At times it has been necessary to leave the original German phrase untranslated to avoid awkward expression.

² See for example Greene 2012.

³ See for example Skalli 2010.

⁴ See for example Grolle 2012, 117. In his article, Grolle also uses formulations such as “ghost-like particle tracks” or “ghost-like neutrinos.”

⁵ This term denotes the development of physics since the formulation of quantum theory and relativity theory at the beginning of the twentieth century. Central figures of modern physics such as Werner Heisenberg have used this term themselves. See for example Heisenberg 1959.

wide-open gates of hell into which those who aggrandized themselves all too much in their lives disappear; demonic hybrids lurk in the backdrops of the cosmic fairy-tale world.⁶ (Becher 1983, 78)

For popular-scientific accounts of astrophysical knowledge, falling back on fairy-tale plots seems obvious, given the terms used by physicists themselves such as “red dwarfs” or “blue giants.” At the other end of these efforts to popularize science is a natural science that, according to Elmar Schenkel, is gradually distancing itself from everyday reality, and for this reason seems fantastic:

What is left is the layperson’s perspective on a science increasingly alienated from everyday reality, a science that in its incomprehensible architecture exhibits signs of the fantastic in the sense of closed, labyrinthine worlds. In this sense, one can say, modifying Borges, that modern science is a branch of fantasy literature.⁷ (Schenkel 2006, 43)

Modern (natural) science, according to Schenkel, exhibits signs of the fantastic in the sense of the uncanny. Yet Schenkel approaches the “darkside” [“Nachtseite”] (Schenkel 2006, 43) of the natural sciences not only from the perspective of the layperson (Schenkel 2006, 45). To a much greater degree, he exposes “absurdities” [“Absurditäten”] (Schenkel 2006, 45) such as the presumption of “monstrous” [“monströse[r]”] black holes in the center of the universe (Schenkel 2006, 41) in the more narrow areas of study in the natural sciences themselves.

The scholarship cited here suggests an entire gamut of fantastic aspects in modern physics and the natural sciences in general. It locates the fantastic in popular-scientific portrayals as well as in texts of the natural sciences themselves and delineates various forms of the fantastic ranging from the fairy-tale-like to the uncanny. In light of the “absurdities” [“Absurditäten”] mentioned here, such as black holes, one could also include phantasms in the sense of the unreal amongst the fantastic elements of modern physics. Sociologist of science Karin Knorr Cetina has drawn attention to this type of the fantastic in her study

6 Transl. by NT. “Unserem versagenden Vorstellungsvermögen wird aufgeholfen, indem kosmische Vorgänge von ungeheuren Ausmaßen auf die Topographie und das Personal eines Hausmärchens projiziert werden: da sind die roten Zwerge und blauen Riesen, die weißen Zwerge, die wie Rumpelstilzchen plötzlich verschluckt werden, da ist das weit aufgesperrte Höllentor, in dem verschwindet, was sich zeitlebens zu sehr aufgebläht hat, und in den Kulissen der kosmischen Märchenwelt lauern die dämonischen Halbwesen” (Becher 1983, 78).

7 Transl. by NT. “Es bleibt der Blick des Laien auf eine zunehmend von der Alltagswirklichkeit entfremdete Wissenschaft, die in ihrer unverständlich gewordenen Architektur Züge der Phantastik im Sinne von geschlossenen, labyrinthischen Welten aufweist. In diesem Sinne kann man, Borges abwandeln, sagen, die moderne Wissenschaft sei ein Zweig der phantastischen Literatur” (Schenkel 2006, 43).

of laboratories, *Epistemic Cultures: How the Sciences Make Knowledge*, using particle physics and its immediate area of study as an example:

[T]hese objects [particles] are in a very precise sense ‘unreal’ – or, as one physicist described them, ‘phantasmic’ [*irreale Gegenstände*]; they are too small ever to be seen except indirectly through detectors [...]. Finally, most subatomic particles are very short-lived, transient creatures that exist only for a billionth of a second. (Knorr Cetina 1999, 48)

Due to the “vagueness” of “epistemic thing[s]”⁸ in physics, Knorr Cetina refers to the particles as “*phantasmatic* [...] occurrences” (Knorr Cetina 1999, 48; emphasis by AG).

2 Particle physics in Morgner’s prose

Precisely such accounts of the fantastic side of particle physics form the starting point of Irmtraud Morgner’s literary engagement with this discipline. The novels and stories of this author, who gained popularity as a feminist and socialist writer in the German Democratic Republic and also in the Federal Republic of Germany in the 1960s and 1970s, have previously been analyzed with regard to their portrayal of gender discourses and socialism.⁹ These analyses have overlooked the fact that Morgner is one of many authors – like Hermann Broch, Bertolt Brecht, and Friedrich Dürrenmatt – who have intensively engaged with modern physics.¹⁰ Beginning in the 1960s, Morgner developed an interest in the basic research of particle physics. As archival documents make clear, Morgner, who lacked any particular educational background in the natural sciences, was employed as a laboratory assistant for several months at the *Forschungsstelle für die Physik hoher Energien* [Research Center for High Energy Physics] in Zeuthen,

⁸ This concept comes from Hans-Jörg Rheinberger who defines it as follows: “They [epistemic things] are material entities or processes – physical structures, chemical reactions, biological functions – that constitute the objects of inquiry. As epistemic objects, they present themselves in a characteristic, irreducible vagueness” (Rheinberger 1997, 28).

⁹ See for instance Lewis 1995, von der Emde 2004, Westgate 2002 and Wölfel 2007.

¹⁰ My dissertation, entitled *Literarische Realitätsprüfung des Phantastischen: Teilchenphysik und Poetik in Irmtraud Morgners Prosa* [Literary Reality Checks of the Fantastic: Particle Physics and Poetics in Irmtraud Morgner’s Prose] (Freiburg i. Br.: Rombach, 2017) examines Morgner’s prose texts in their relation to particle physics, an aspect that has not yet been systematically analyzed. In contrast to Morgner’s work, the authors mentioned and their literary treatments of modern physics have been widely researched. See for example Emter 1995.

near Berlin.¹¹ The center in Zeuthen was among the few research institutes of the GDR that participated in internationally-oriented basic research in the field of particle physics.¹² As a laboratory assistant at the institute, Morgner was part of a large venture to explore “what holds the world together at its innermost.”¹³ During her time at the institute, Morgner collected textual materials, including a research report and additional publications by physicists who worked there, from which she interpolated long excerpts as montages in many of her prose texts. Indeed, many of her most notable novels, for instance *Rumba to an Autumn* [*Rumba auf einen Herbst*] (1992), *Wedding in Constantinople* [*Hochzeit in Konstantinopel*] (1968), or *The Life and Adventures of Trobadora Beatrice as Chronicled by Her Minstrel Laura* (2000) [*Leben und Abenteuer der Trobadora Beatriz nach Zeugnissen ihrer Spielfrau Laura* (1974)], feature fictional particle physicists who come up with publishable lectures that borrow from this textual source material in particle physics. Morgner montages the excerpts in the narrative texture of her prose in such a way that particle physics’ search for invisible elementary components of matter appears to be fantastic. At the same time, the fantastic aspect of the (re-)construction of reality in particle physics, demonstrated by means of its textual excerpts, is functionalized for the fantastic poetics of Morgner’s prose.¹⁴

3 Particle physics and the fantastic in Morgner’s novella *The Rope*

At the center of the novella *The Rope*, published in 1974 in an anthology of prose texts by GDR authors, is a dispute about the ontological status of a “scandalous occurrence” (Morgner 1993, 137):¹⁵ one day Professor Barus, the director

11 Morgner’s hitherto undiscovered biographical connections to this field were brought to the fore with the help of the holdings of the German Literary Archive [Deutsches Literaturarchiv] in Marbach my dissertation (Gencarelli 2017, 15–26).

12 For a history of the institute see Stange 2001.

13 Even today, the institute, which after 1990 was fused together with the DESY Hamburg, still advertises with this Goethe quotation: “Was die Welt im Innersten zusammenhält” (DESY 1998).

14 The fundamental ideas in the following analysis of the novella *The Rope* were developed elsewhere in the context of an essay published in the proceedings of the conference *Tendenzen und Perspektiven der gegenwärtigen DDR-Literaturforschung* (Würzburg, October 2013). Cf. for this Max 2016. See also Gencarelli 2016.

15 The English translation of the novella cited in this essay is that of Nancy Lukens (Morgner 1993), entitled *Third Fruit of Bitterfeld: The Tightrope*. The expansion of the title to include *Third Fruit of Bitterfeld* is due to the fact that Lukens’ source text for her translation is the

of an institute for particle physics, gets word that his colleague, the physicist Vera Hill, has supposedly made the journey between her home and the research institute by "walking on air" ["gehend in der Luft"] (Morgner 1993, 138). This is what the local residents attest in a complaint that two of their "delegates" (Morgner 1993, 140) deliver to the institute director. The professor, however, believes their "claim" (Morgner 1993, 138) to be a "figment of the imagination" ["Erfindung"]¹⁶ (Morgner 1993, 141).¹⁷ When he subsequently confronts the physicist about the incident, she states that she made her way to work on a "rope" (Morgner 1984, 218)¹⁸ making use of "time saving shortcuts" (Morgner 1993, 142). However, the assertion of the physicist contradicts the act of "walking on air" attested to by the residents, who do not report anything about the aid of a rope. Because this "scandalous occurrence," whether "walking on air" or on a rope, is never part of the narrated story but merely an object of the characters' "suspicion[s]," "claim[s]" (Morgner 1993, 138), or "allegation[s]" (Morgner 1993, 142), the reader cannot decide whether it is real or fictitious within the world of the story. At the end of the novella, however, the body of the physicist Hill is nonetheless found "shattered on the lawn in front of the public library" (Morgner 1993, 142).

Scholars have mostly focused on Morgner's novella as an example of her asserted central theme, the oft-cited "the entry of woman into history".¹⁹ In this respect, many studies have called attention to the tragedy of Hill's life: The male dominated field of science forces the female physicist to bridge the gap between her professional work and her housekeeping duties by the risky act of

novella with this title that Morgner montages, nearly unaltered, in her novel *The Life and Adventures of Trobadora Beatrice as Chronicled by Her Minstrel Laura* (hereafter abbreviated as *Beatrice*) as the text of the writer and protagonist Beatrice. In what follows, I also draw on Karen R. Achberger's English translation of the novella (Morgner 1984). All longer citations from the novella are additionally cited in the German original in the footnotes.

16 The meaning of fiction in the sense of a "figment" [*Erfindung*] is central to the concept of fiction, as is well known. See Japp 1995, 595.

17 "Erfindung" (Morgner 1973, 155).

18 Here I follow the translation from Karen R. Achberger since she more precisely translates the central motif of the novella, namely, the rope. Nancy Lukens translates "Seil" as "tight-rope." The latter term's proximity to the metaphor of tightrope walking, however, is misleading with regard to a crucial aspect of the novella: the central occurrence of the novella, that is, the physicist Vera Hill's movement through air, is a dubious event in the fiction of the novella. Resolving this fantastic occurrence through allegory in the sense of a balancing act between profession and childcare, an allegory often cited in the Morgner scholarship (see Lewis 1995, 144–150), is challenged by the novella itself; for this reason, the term "rope" is more fitting.

19 Transl. by NT. "Eintritt der Frau in die Historie." Morgner herself used this phrase in interviews to describe the central theme of her prose. See for instance Walther 1973, 49.

“walking on air,” causing the death of the female subject.²⁰ Consequently, the novella’s “scandalous occurrence” has been interpreted as an allegory for the proverbial *walk on the tightrope* which has to be performed by the single mother and scientist Hill under conditions of patriarchal society. However, this interpretation of the novella misses several central issues of Morgner’s text. First of all, the fantastic event of the novella cannot be explained in terms of the allegorical *walk on the tightrope* alone, since the delegates do not testify to the existence of the rope, but only the act of “walking on air.” The very title of the novella, *The Rope*, draws attention to this contradiction. Moreover, the novella itself plays with the metaphorical and literal meanings of “walking on air.” While the local residents report an actual act of “walking on air,” the institute director dismisses their claim as groundless *speculation* in the figurative sense of “lofty rambling” [“Luftwandelei”]²¹ (Morgner 1973, 150). Therefore, the novella itself undermines the merely allegorical interpretation of “Luftwandelei.” Secondly, by interpreting the fantastic event in terms of allegory alone, the complex structure of the fantastic in the novella cannot be adequately described. Until the dramatic turning point at the end of the novella and beyond, it is not clear whether the fantastic event is just a product of the imagination of the protagonists (a “figment of the imagination” as initially claimed by the director of the institute), or actually took place within the narrated world. This moment of hesitation about the real or imaginary status of the fantastic event within the story is central to Tzvetan Todorov’s definition of the fantastic as a narrative structure.²² However, the novella undermines Todorov’s concept of the fantastic – and this is the third aspect overlooked in interpretations of the novella – by incorporating excerpts from actual texts of particle physics into its discourse on the fantastic.

20 See Jeremiah 2003, 46–47; Lewis 1995, 144–150, Stawström 1987, 99–101; Wölfel 2007, 113–118.

21 By using figurative phrases such as “Luftwandelei,” the novella makes use of a conventional technique in fantastic literature. According to Tzvetan Todorov, the first feature of fantastic texts “is a certain use of figurative discourse. The supernatural often appears because we take a figurative sense literally” (Todorov 1975, 76–77). The novella intensifies this technique by leaving open whether the figurative or literal meaning of the expression is valid. [Translator’s note: The German expression the professor uses here, “Luftwandelei,” not only signals “walking on air” but also carries an implication of lofty speculation. To capture both the literal sense of “walking on air” and the figurative sense of airy speculation, “Luftwandelei” has been translated here as “lofty rambling.”]

22 See Todorov 1975, 157.

3.1 Investigations of fantastic matter

The dispute about the ontological status of the fantastic event is situated at an institute dedicated to “researching the atomic structure of matter” (Morgner 1993, 137). Physics in general can be considered *the* yardstick for definitions of the fantastic insofar as it provides information about the putatively real or unreal in terms of accordance or discordance with natural laws.²³ In the novella particle physics, in this case embodied by the professor *and* director of the institute, emerges as an authority for defining what is physically real or unreal. Thus Professor Barus places his “investigat[ion]” of “the *matter*” (Morgner 1993, 140; emphasis by AG) reported by the delegates in relation to the particle physics research on the “atomic structure of *matter*” conducted at his institute. Indeed, as the institute director reads the “written charges” (Morgner 1993, 138) submitted personally by the delegates, he simultaneously delivers a polished academic lecture on the probing of matter in particle physics – this lecture in particular can be traced back to actual text excerpts from the aforementioned research reports of the Research Center in Zeuthen:²⁴

When the two men alluded verbally to the scandalous occurrences and presented him the written charges, the professor said: ‘In investigating the structure of matter, it is especially important to study the high-energy interaction between elementary particles. Here we are dealing with those excitations which are least perturbed by secondary effects and hence allow the deepest insight into an elemental process that actually takes place in nature [...].’ [Barus]²⁵ stopped [...]. In any case, it would require considerable effort to refute the claim that a female staff member of his institute was walking on air across town twice a day on weekdays.²⁶ (Morgner 1993, 137–138)

23 A central reference point for the definition of the fantastic is a narrated event’s contradiction of given presumptions about reality, especially the contradiction of natural laws of physics. See Todorov 1975, 41; Durst 2010, 29.

24 (Instituts-)Jahresbericht 1963 der Forschungsstelle für die Physik hoher Energien der Deutschen Akademie der Wissenschaften zu Berlin [(Institute) Annual Report 1963 of The Research Center for High Energy Physics of the German Academy of Sciences in Berlin], Zeuthen, 9 January 1964, Archive of the IfH, 23.

25 In her translation of the novella, Nancy Lukens refers to the version of the text that Morgner montages in her novel *Beatrice* under the name *Third Fruit of Bitterfeld*. Morgner modified her novella only insofar as the institute director is no longer named “Barus” but “Gurnemann.” In this essay, I refer to the former proper name of the professor since this follows the first publication of *The Rope* as an independent text in the aforementioned anthology. See Morgner 1973.

26 “Als die beiden Männer die skandalösen Begebnisse in Worten andeuteten und das anschuldigende Papier aushändigten, sagte der Professor: ‘Bei der Untersuchung der Struktur der Materie kommt der Erforschung der hochenergetischen Wechselwirkung von Elementarteilchen besondere Bedeutung zu. Hier hat man es mit reinen Wechselwirkungen zu tun, die

Here, the professor engages in a routine practice that he “acquired in the course of his tenure as director,” namely the “ability to speak while reading” (Morgner 1993, 138). In order to gain time, he performs two tasks simultaneously, namely reading and speaking. In the situation with the local residents, his remarkable stunt serves as a rhetorically manipulative trick to distract the delegates through inaccessible academic prose and sidetrack them from their complaint.²⁷ The institute director uses the time gained through his trick to search for an argument to support his thesis that the “scandalous occurrence” is a “figment of the imagination.” Even if a seasoned physicist finds it easy to refute the act of “walking on air” as a physically impossible event, he still cannot, despite having “gained time by talking,” think of “a convincing argument” (Morgner 1993, 139).

The reasons for this only become clear if one treats the actual particle physics subject matter of the director’s lecture, beyond its maneuver of distracting the delegates, as relevant to the line of argument. For the content of the speech on particle physics and the report of “walking on air” become intertwined in a particular way through the simultaneous reading and speaking. This seems evident in how the elaborate trick of the institute director is narrated: the particle physics speech is presented as a digression – in the sense of the rhetorical figure that goes by this name – from the delegates’ “written charges [*Papier*].”²⁸ The moment the institute director receives the “written charges,” he immediately begins his lecture (see the quote above) and thereby postpones addressing the actual issue of the “scandalous occurrence” itself.²⁹ The professor pauses three times while speaking. In these pauses, the narrator reports what Barus has just read in paraphrase or indirect speech, as for instance with “the claim that a female staff member of his institute was walking on air across town twice a day on weekdays” in the example above. Only with the continual explanations of the institute director

durch Nebeneffekte am wenigsten gestört werden und daher den tiefsten Einblick in einen in der Natur wirklich vorkommenden Prozeß erlauben [...]’ Barus verstummte [...]. Jedenfalls war die Behauptung, werktags liefe eine Mitarbeiterin seines Instituts zweimal über den Ort, nur mit Aufwand widerlegbar” (Morgner 1973, 149).

²⁷ The delegates’ reaction demonstrates that the trick is not ineffective. At one point, the novella suggests that their faces were “contorted with respect and suspicion” (Morgner 1993, 139). Nevertheless, the institute director fails to dissuade them from demanding compensation for the damages incurred through Hill’s purported “walking on air.”

²⁸ Hans Esselborn understands digression as a “[r]hetorical figure of divagation from the direct course of speech or narrative” (Esselborn 1997, 363).

²⁹ The fact that the circumstances in the delegates’ report are deferred until the pause in speech is illustrated in the following parallel passage: “As he read [the delegates’ report] through the lower lenses, he spoke: ‘Since the study of the structure of particles [...]’” (Morgner 1993, 138; added by AG).

do the delegates’ “written charges” unfold; and it is not “the abundance of material” [“Fülle des Materials”] (Morgner 1973, 151; translation modified) that unfolds but only what is filtered through Barus’ reading glasses. The complete circumstances of the complaint are presented only at the end of the lecture on particle physics and, moreover, are presented only in curtailed paraphrase (see Morgner 1993, 140). Thus the reader is not only temporarily distracted from the actual circumstances through the excursus (here used as a synonym for digression);³⁰ rather, the particle physics speech is placed in the foreground.³¹ Insofar as the excursus in the scientific prose of particle physics takes priority over the issue at hand – the report about the “scandalous occurrence” – it proves to be constitutive for the analysis and cannot simply be ignored.³²

Central, therefore, is the intertwining of these two issues through the professor’s trick. With the help of this intertwining, he not only outwits the delegates; he also outwits himself to an even greater degree: after he finishes both reading the written documents and delivering his speech on particle physics at the same time, he no longer dismisses the “scandalous occurrence” as ungrounded speculation, as he does in the beginning, but proves in fact to be fascinated by the “absurd report” (Morgner 1993, 139):

Professor [Barus] could no longer resist the allure of the detailed claims [...]. [A]lthough he was already in an excited state from the absurd report [...]. What pleased him most was the supernatural aspect of the alleged phenomenon.³³

(Morgner 1993, 139; translation modified)

30 Esselborn points out that the Latin terms “excursio” and “digressio” are closely related and “im Gebrauch manchmal auch identisch [in use sometimes also identical]” (Esselborn 1997, 363).

31 The communicative situation in this narrative sequence suggests this as well: the professor hardly interacts with the delegates, which is why their presence is forgotten at times. Moreover, they themselves never speak directly; instead, they refer to their written report (see Morgner 1993, 138).

32 While scholars have frequently addressed the novella (see Wölfel 2007, 113–118; Jeremiah 2003; Lewis 1995, 144–150; Strawström 1987, 99–101), the function of the professor’s lecture on laboratory practices in particle physics has not yet been investigated.

33 “Professor Barus konnte sich den Reizen, die von den detailliert geführten Behauptungen ausgingen, nicht länger entziehen [...]. Obgleich ihn der absurde Bericht bereits in einen angeregten Zustand versetzt hatte [...]. [A]m besten gefiel ihm der überirdische Aspekt des behaupteten Phänomens” (Morgner 1973, 152).

To misread the professor's "excited state" as merely erotic arousal would be to underestimate the professor's intelligence and the role of particle physics.³⁴ Due to the professor's simultaneous speaking and reading, it seems to be ambiguous to which of the "detailed claims," those of the professor or those of the delegates, the passage above refers. It is obvious that not only the delegates' "absurd report" is meant here because the above passage directly follows the elaborations on particle physics and the complete paraphrase of the delegates' report is offered only later. There is, moreover, good reason to read the "detailed claims" as a reference to the lecture on experiments in particle physics since only the latter, and not the complaint of the delegates, is elaborated upon in detail and in the "abundance of material." Additionally, the formulation "excited state" harks back to Barus' lecture in which, shortly before, he speaks of the "excited states of mesons and nucleons" (Morgner 1993, 139; translation modified).³⁵

Through the professor's trick, both the professor as character and the implicit reader become aware of a structural similarity between the read and spoken word, and the trick thus comes to serve an epistemological function: the phrase "supernatural aspect of the alleged phenomenon," with which the professor distances himself from his earlier remarks about the delegates' groundless fabrications, aptly describes both the "alleged phenomenon" of the delegates' report as well as the subject matter of the particle physics lecture, namely, particles that are considered to be elementary components of matter. Particles are *unobservable* entities that require a whole series of experimental procedures in order to appear at all, that is, in order to become a "phenomenon." This is why Professor Barus, after identifying the "investigat[ion] [of] the structure of matter" as his object of study, highlights the necessity of studying particles under controlled laboratory conditions:

Although it is not yet possible to attain the high energy levels of cosmic rays with artificial particle accelerators, the artificially accelerated or produced particles are preferable for use in these experiments to those produced by cosmic rays, since their natural and initial energies are unambiguously identifiable.³⁶ (Morgner 1993, 138; translation modified)

34 The narration of Barus' trick constantly carries with it these sorts of erotic connotations (i.e. "allure," "excited state"). For instance, the professor uses the time gained through his trick to ponder Hills' appearance and his affair with her (Morgner 1993, 140–141). These aspects of the novella, while certainly crucial for a gender-theoretical reading, do not however explain why the source material in particle physics is cited at such length.

35 "angeregten Zustände von Mesonen und Nukleonen" (Morgner 1973, 152).

36 "Obwohl man mit künstlichen Teilchenbeschleunigern noch nicht die hohen Energien der kosmischen Strahlung erreichen kann, sind die künstlich beschleunigten oder erzeugten

Insofar as the properties of natural particles are, as we can deduce *ex negativo*, unidentifiable, "artificial particles" must be generated through experiment. Thus with the help of the "artificial particle accelerators" mentioned, "cosmic radiation," that is, the natural radiation of particles from space, can be replicated in the laboratory. This, however, does not solve the problem of the particles' unidentifiability. On the contrary, all further experimental procedures must account for this problem. With this in mind, Barus continues in the second part of his speech:

Since the study of the structure of particles is carried out essentially by means of scattering experiments, we must also know the exact nature of the particle emitted. Thus the hydrogen bubble chamber which contains only protons as scattering centers is the best-suited detector of particle tracks in scattering experiments.³⁷ (Morgner 1993, 138–139)

In his remarks here, the institute director again addresses a whole series of problems with experimental practice that result from the unidentifiability not only of natural particles but also of those particles created artificially: if the "structure of particles" is identifiable in "scattering experiments," that is, in collisions made to occur between accelerated particles and target particles, one must now take the unidentifiable "nature of the particle emitted" into account. In order to eliminate uncontrolled collisions with unknown particles, the professor recommends the "hydrogen bubble chamber" because it contains only known protons as "scattering centers." The hydrogen bubble chamber thus serves a double purpose. On the one hand, the apparatus, filled with liquid hydrogen, provides target particles for a ray of accelerated particles directed into the apparatus, allowing accelerated and collider particles to interact with each other. On the other hand, it acts as a "detector of particle tracks" and thus serves to make the interactions visible. By explaining that particles merely leave "tracks" in the detector, the institute director emphasizes the fact that particles remain invisible to the human eye even after they are created and represented in the experiment. The experimental design, however, does not end with this implied visualization of particles in the detector. In the third part of his speech, the professor extensively discusses the complex reconstruction and identification of particle tracks on photographs from the detector:

Teilchen denen der kosmischen Strahlung für solche Untersuchungen vorzuziehen, da bei ihnen Natur- und Anfangsenergie eindeutig bestimmt sind" (Morgner 1973, 149).

37 "Da die Untersuchung der Teilchenstruktur im wesentlichen durch Streuexperimente erfolgt, ist es darüber hinaus notwendig, die Natur des gestoßenen Teilchens genau zu kennen. Daher besitzt die Wasserstoffblasenkammer, in der nur Protonen als streuende Teilchen vorhanden sind, die besten Eigenschaften als Teilchen- und Spurendetektor bei Streuexperimenten" (Morgner 1973, 150–151).

Frau Doktor Hill's department³⁸ is studying films of the interaction between positive pions with 4 GeV energy in hydrogen bubble chambers. Currently she is dealing with two-armed events. First, she calculates the geometry on the computer. Then the events are studied for completeness with the help of a probability test, using the so-called Fit-Program.³⁹ (Morgner 1993, 139)

In order to identify particles using their photographed tracks, a complex procedure with many reconstructive steps is necessary. In this procedure, the problem of finding evidence for the existence of invisible particles remains. Drawing on a broader knowledge of experimental practices in particle physics, one could, in the context of this passage, add that a particular type of particle, namely neutral particles that are not electrically charged, complicates the analysis of "scattering experiments." If the "Fit-Program," for instance, is meant to test whether particles retain their charge in collision, and if this is what leads to the conclusion that neutral particles have been created,⁴⁰ then it becomes clear that the identification of natural particles does not rest on observable "tracks" but on the mathematical calculation of their possible effects on other particles. In this way, these neutral particles not only make the identification of particle tracks laborious and complicated; they are also difficult to detect themselves. Barus addresses this explicitly when he speaks of the "disadvantage in the fact that neutral particles leave no tracks" (Morgner 1993, 139). We can conclude from the professor's lecture that in order to solve the problem presented by these and other unobservable particles, experimentation in particle physics resorts to complex tricks and ploys to create, visualize, and reconstruct invisible particles.

Against the backdrop of these observations, Barus' description of the "supernatural aspect of the alleged phenomenon" can be understood more precisely with regard to particle physics. Particles exhibit a "supernatural aspect" insofar as they are fictitious things in more than one respect: prior to the implementation of experimental procedures, particles are fictitious in the sense that

38 Morgner modified the original text passage from the research report of the Institute in Zeuthen at this point in Barus' lecture. Along with the formulation that the professor uses to describe Vera Hill's tasks, Morgner truncated the original passage on the evaluation of the photographs from the bubble chamber and shifted the tense from the simple past to the present.

39 "Die Abteilung von Frau Doktor Hill untersucht Filmaufnahmen der Wechselwirkung von positiven Pi-Mesonen mit 4 GeV Energie in Wasserstoffblasenkammern, augenblicklich beschäftigt sie sich mit den zweiarmigen Ereignissen. Zuerst wird die Geometrie auf der Rechenmaschine gerechnet. Dann werden die Ereignisse mit Hilfe des Wahrscheinlichkeitstests, dem sogenannten Fit-Programm, auf ihre Vollständigkeit untersucht" (Morgner 1973, 151–152).

40 In this context, see Kundt and Lanius 1964, 266.

they are "assumed" things.⁴¹ Because they remain inaccessible to the human eye without experimental apparatuses, their existence can initially be postulated only hypothetically. When, in a next step, particles are created using experimental apparatuses, they are fictitious in the sense of something formed or shaped [*etwas Gestaltetem*].⁴² For instance, they leave behind evidence of their existence in the apparatus of the particle detector and in this way prove to be formed [*gebildet*] or shaped [*gestaltet*] by an optic medium. Notwithstanding the variety of experimental procedures that tackle the difficulty of visualizing unobservable particles, particles in themselves remain fictitious in the sense of imagined or envisaged things.⁴³ Indeed, to the extent that they are created and made visible in apparatuses, they leave evidence of their existence; but this evidence is nothing more than "tracks." Particles are thus not objects of empirical observation in themselves; they are, rather, generated only through apparatuses. The fact that particles in themselves are only accessible in and through the imagination is illustrated in particular through the neutral particles mentioned several times in the professor's lecture (Morgner 1993, 151, 152). Since neutral particles leave no visual indication of their existence at all, they exist solely in the imagination. Such particles, as well as fictive-imaginary particles in general, approximate fiction in the sense of a "figment of the imagination [*Erfindung*]" (141).⁴⁴ It is precisely in this sense that the lecture of the institute director converges with the delegates' report on the "scandalous occurrence." The fantastic event no longer stands diametrically opposed to the events of particle physics – the interactions between particles are also distinctly referred to as "events" (Morgner 1993, 139) – along the lines of an unreal phantasm over here and physical reality over there. Rather, both events are connected by a fictive-imaginary moment. The institute director firmly distinguishes between this moment and a phantasm removed from reality. For by finding pleasure in *both*

41 According to Uwe Japp, the terms "assumption" and "hypothesis" belong within the spectrum of meaning of the concept of fiction, though he classifies these terms as "pragmatic fiction" as opposed to literary fiction (Japp 1995, 40).

42 Japp in particular emphasizes these semantic components of fiction in the sense of "Bildung" and "formation [*Gestaltung*]" (Japp 1995, 48).

43 According to Löttsch, the concept of fiction (more precisely: the Latin *factio* or *factum* and the verb *fingere*) encompasses the "activity of forming [*Bildens*], of composing [*Dichtens*], of representing [*Vorstellens*], of designing, and therefore the product of this activity, the fabrication, the fictitious assumption, the *imaginative* construction" (Löttsch 1972, col. 951; emphasis by AG). On the overlaps and differences between the concepts "fictitious" and "imaginary," see Stierle 2001, 380–381.

44 As already mentioned, the meaning of fiction in the sense of a "figment" [*Erfindung*] is central to the concept of fiction. See Japp 1995, 595.

“alleged phenomen[a]” through his trick of reading and speaking, the professor treats neither the act of “walking on air” nor the invisible particles as mere “lofty rambling [*Luftwandelei*],” that is, as groundless fantasizing. By intertwining the events of particle physics with the fantastic event of “walking on air,” he comes to a broader understanding of their similarities. In another passage he thus comes to specify the fictive-imaginary “aspect” as follows:

To be sure, [Barus] did not deny a *poetic element* to scientific thinking, but he did not think Hill any more gifted than himself, because neither could get along without sensory *auxiliary constructions*.⁴⁵ (Morgner 1993, 141; translation modified, emphasis by AG)

Not only must physicists be as “gifted” as artists; with the help of their imagination they design “sensory auxiliary constructions [*sinnliche Hilfskonstruktionen*]” – particles – that enable knowledge of the real. “In investigating the structure of matter,” that is, for their exploration of the real, particle physicists rely on imaginary “auxiliary constructions” since particles themselves are accessible only through imagination. However, as Barus’ lecture illustrates, particles are treated as real entities in the epistemic practice of particle physics; specifically, as the smallest material components of the real. The necessary recourse to imagination applies to Hill’s scientific task in particular since she works at this intersection of the real and the imaginary. Her task, as the professor explains in the third part of his speech, is to reconstruct and identify particle tracks in the photographs from the particle detector. Hence, she reconstructs the real “tracks” that particles leave behind in an apparatus and from this extrapolates the fictive-imaginary components of the real. The scientific activity of both particle physicists involves a “poetic element” to the extent that they must imagine unobservable particles with the aid of fantasy. If the institute director determines that neither he nor Hill can forego the products of imagination, then, starting from the assumption of this “poetic element” of particle physics, he also treats Hill’s act of “walking on air” as an imaginary “auxiliary construction.” Therefore, one can conclude on a textual level exceeding the perspective of the protagonists, that the fantastic is not a phantasm removed from reality but an imaginary “auxiliary construction” for the exploration of the real.

The novella, however, does not end on this definition of the fantastic. Rather, it collapses the distinction between reality and imagination entirely: when the professor asks the physicist about the “scandalous occurrence,” Hill makes use of an

⁴⁵ “Barus sprach zwar wissenschaftlichem Denken das *poetische Element* nicht ab, hielt aber die Hill nicht für begabter als sich, weil beide sinnlicher *Hilfskonstruktionen* nicht entraten konnten” (Morgner 1973, 154; emphasis by AG).

"auxiliary construction" but one that functions differently than Barus expects: "[S]he explained to him that without the time saving shortcut on the *rope*, she would not be able to complete her postdoctoral study by the agreed date" (Morgner 1993, 142; translation modified).⁴⁶ While the institute director declares the act of "walking on air" to be an imaginary "auxiliary construction," the physicist, by contrast, employs only the rope as such. The fact that Hill paraphrases the act of "walking on air" as a "rope trick [*Seiltrick*]" (Morgner 1984, 218), makes clear that the "rope trick" is not meant to be taken literally. For in its meaning as a ruse or ploy, "trick" implies the act of faking [*fingieren*]. The rope is therefore an aid used to link the act of "walking on air" to a vivid but imaginary *concretum*. Hill thus uses the "rope trick" as a *mental bridge* [*Denkbrücke*] through which she attempts to make her balancing act between profession and family tangible to the institute director.⁴⁷ With regard to the ontological status of the fantastic event, Vera Hill's act of "walking on air [*Luftwandeln*]" would thus be real (within the fiction of the novella) and the rope simply a fictitious "auxiliary construction." This would also explain why the local residents do not see the "auxiliary construction," the rope, and simply report Hill's "walking on air." Yet the ending of the novella and its drastic turning point contradicts this resolution of the fantastic event:

[Barus] spoke earnestly and at length with her about the unreality of this means of transportation. On the following day Vera Hill lost her balance on her way home. The lamp-lighter discovered her body, shattered on the lawn in front of the public library.⁴⁸

(Morgner 1993, 142)

46 "[S]ie erklärte [ihm], ohne den zeitsparenden Weg über *das Seil* die Habilitation nicht zum vereinbarten Termin fertigstellen zu können" (Morgner 1973, 157; emphasis by AG).

47 For instance: "After work, when she had done the shopping, picked up her son from kindergarten, fixed supper, eaten, drawn pictures of cars and other items requested by her son, bathed him and tucked him in bed with a fairytale, also done dishes or laundry, or mended a hole or chopped wood, and had carried coal briquets up from the basement, then she was able, with the tightrope trick, to be back at her desk thinking about invariances by about 9:00 P.M. Without the trick, an hour later" (Morgner 1993, 142). ["Wenn sie nach Arbeitsschluß eingekauft, den Sohn aus dem Kindergarten geholt, Abendbrot gerichtet, gegessen, Autos und andere Wunschbilder des Sohnes gemalt, ihn gebadet und mit einem Märchen versehen ins Bett gebracht, auch Geschirr und Wäsche gewaschen oder ein Loch gestopft oder Holz gehackt und Briketts aus dem Keller geholt hätte, könnte sie mit Seiltrick gegen einundzwanzig Uhr am Schreibtisch über Invarianzen denken, ohne Trick eine Stunde später" (Morgner 1973, 157).]

48 "Barus sprach lange inständig zu ihr über die Unrealität der Verkehrsverbindung. Amendtags verlor Vera Hill die Balance. Der Laternenanzünder entdeckte ihren Körper zerschmettert im Vorgarten der Volksbücherei" (Morgner 1973, 157).

These last sentences present the death of the physicist as an undoubtedly real event and thereby turn the culmination of an uncertainty about the undecidability between the imaginary and the real into the novella's actual "scandalous occurrence:" though Barus continues to believe in the "unreality" of the female physicist's movements through air, Hill dies traveling "by air" between her place of work and her home. The formulation that Hill "lost her balance" and that her body was found "shattered" seems to suggest that she must have lost her balance walking along the rope as a sort of tightrope walker. According to this logic, what would count as real is Hill's act of walking on the rope and not the local resident's claim of "walking on air" without a rope. But precisely the seemingly negligible evidence of the rope, upon which nothing less than the title of the novella rests, contradicts such a reading. If the rope were a real-within-the-fiction "auxiliary construction," then the residents of the town would have seen not only Hill's "garters" (Morgner 1993, 140) but – above all – the rope. Even an allegorical reading of the ending of the novella – which would bring the vacillation to an end – is dubious for it would take neither the act of "walking on air" nor the rope literally, and for this the text plays too repeatedly and conspicuously with the question of whether the literal or figurative meaning of "*Luftwandlei*" and of "rope trick" is meant.⁴⁹ If one were nevertheless to read the end of the novella allegorically, its last sentences would lead such a reading *ad absurdum*: Physics (embodied by the professor) would consequently deal a death blow to art (in the figure of the tightrope walker Hill) wherein the former convicts the latter of unreality. But this conclusion is not plausible for a narrative that aims to show, through an excursus on particle physics and its investigation of the material components of reality, that the fantastic is precisely *not* an unrealistic phantasm. In short: the stunt with the rope is the trick that suspends the "scandalous occurrence" in an inner-fictional tension between the real and the imaginary.

3.2 Fantastic and realistic devices

The novella thus presents *both* its central tricks, that is, the stunt with the rope and the professor's rhetorical stunt, as artistic devices [*Kunstgriffe*] and thereby

⁴⁹ As already mentioned, the local residents take the "*Luftwandlei*" literally and speak of "walking on air" while the institute director initially dismisses it in its figurative meaning as lofty fabrication. The situation is similar with Vera Hill's "rope trick." Hill uses the rope as a rhetorical trick which Barus subsequently takes literally.

draws attention to its artistic or literary technique.⁵⁰ On the level of plot, it is primarily a question of the *rhetorical* devices that the characters require. Through his excursus, the professor wants to distract the delegates with the disciplinary prose of particle physics, and gain time by simultaneously reading and speaking; Hill utilizes the rope as an "auxiliary construction" in order, in a very real sense, to build a mental bridge for the director. The artistic devices function in exactly opposite manners: the "rope trick," whether real or verbal, creates a short cut and saves time, while the digression on particle physics takes a detour and prolongs time. Along with these pragmatic functions,⁵¹ the artistic devices are meant to serve an epistemological purpose as well: Hill wants to give Barus a leg up with her "rope trick;" by simultaneously reading and speaking, the institute director brings thought into an "excited state." On the formal level, the particle physicists' tricks are *poetic* devices. The "rope trick" is a fantastic device to the extent that it brings the real and the imaginary into tension with one another, a tension that remains irresolvable even after the novella ends. The excursus on particle physics is, on the contrary, a realist device. The excursus on empirical-physical reality disrupts the direct trajectory of the narrative by interpolating real bits of text from the field of particle physics into *The Rope* as "reality particles," as it were.

The parallelization of both artistic devices allow for certain conclusions about the fantastic narrative structure of the novella. According to its conventional definition, the fantastic conflicts with the real and does so insofar as it contradicts physical laws of nature.⁵² In the novella, however, the fantastic is structured more complexly, precisely because it takes the physically real as a central reference value for fantastic discourse and incorporates it in the form of an excursus on particle physics. The example of particle physics makes clear that the investigation of the physical components of reality cannot dispense with a fictive-imaginary element. What is more: knowledge of the structure of physical reality proceeds through fiction, namely, through fictive-imaginary particles. In this way, the imaginary and the real are inextricably bound to

50 Shklovsky's concept of technique leads in this direction: "By 'works of art,' in the narrow sense, we mean works created by special techniques designed to make the works as obviously artistic as possible" (Shklovsky 1965, 8). The term that Shklovsky uses here, "priëm," has been translated elsewhere as "device." See Shklovsky 1990.

51 With their respective tricks, both particle physicists attempt to confront a dual burden in their everyday lives. Barus faces the dual burden of his role as director of the institute and his profession as a researcher; Hill faces the dual burden of her profession and raising children.

52 See note 23.

one another in particle physics. In multiple ways, *The Rope* thus sublates any dichotomy between the real and the imaginary: the trick with the rope is a fantastic device that leaves open whether the “scandalous occurrence” is real or fictitious within the story so that the opposition between the two must ultimately be surrendered. This conclusion is made all the more plausible through the excursus on particle physics, a science which collapses this dichotomy as well, since it investigates fictive-imaginary things that it affirms as foundational components of physical-material reality. And not only does the content of the textual material from particle physics sublate the boundary between reality and fiction; through the montage of real text elements into the fictional text, the realist or precisely the documentary technique also transcends this distinction. The excursus on particle physics is thus integrated into the novella, on the higher level of a structural similarity to the fantastic, insofar as both particle physics and the fantastic inextricably bind the real and the imaginary to one another and thereby subvert the boundary that separates them. This conclusion can be illustrated through the metaphors of the path at play in the text’s artistic devices, namely, the bridge shortcut and the prolonging detour: the fantastic device offers a direct path to the sublation of the dichotomy between the real and the imaginary in literary fiction whereas the realist-documentary device leads, via a detour through particle physics, to the same outcome; the difference is that the latter subverts this dichotomy by means of textual material concerning empirical-physical reality. The ironic thing about these artistic devices, therefore, is that they turn the novella *The Rope* into a fantastic narrative with an excursus on the seemingly fantastic concept of reality at stake in particle physics.

3.3 The epistemological potential of the novella

By montaging actual text passages from particle physics, whose concept of the real turns out to be fantastic, the novella aims to extend the text-immanent vacillation between the real and the imaginary beyond the boundaries of the fictional text and into the extra-fictional reality of the reader. It becomes clear that Morgner favors a form of the fantastic that transposes the concepts of the real, the fictitious, and the imaginary into one another – or, as Gerhard Bauer puts it: “A favorite technique of advanced literary fantasy is the disarrangement of concepts” (Bauer 2000, 256). With its disarrangement of concepts, Morgner’s text no longer fulfills the conventional definition of the genre of the fantastic,

as developed for instance by Tzvetan Todorov.⁵³ Robert Stockhammer articulates this for twentieth-century fantastic literature in general: “In the twentieth century, there is no longer any fantastic literature that *adheres to Todorov’s definition* – or, if such literature still exists, then it is evidently not at the height of its time” (Stockhammer 2000, 25; emphasis in original).⁵⁴ Stockhammer attributes the end of fantastic literature as defined by Todorov to the blurring of the “basal distinction between [...] ‘the real’ and ‘the imaginary’” (Stockhammer 2000, 24),⁵⁵ that is, to the fact that “reality itself [...] has become fantastic” (Stockhammer 2000, 25).⁵⁶ On the one hand, however, Morgner’s novella demonstrates that an advanced literary fantastic still exists – and even Stockhammer still assumes that a “contemporary modern literature with [...] fantastic aspects” (Stockhammer 2000, 25)⁵⁷ exists. On the other hand, the fantastic in *The Rope* indeed stands at the “height of its time” as the novella illustrates how the real becomes fantastic through the example of a physical “reality science.”⁵⁸

In this way, *The Rope* sets itself apart from the observations of literary and cultural studies as well as those in the sociology of science on the fantastic objects that particle physicists study. For the novella generates a distinct knowledge of the fantastic in particle physics by offering a glimpse into the poetic side of knowledge production in the field. Insofar as the novella focuses on the importance of “figment[s] of the imagination” in the physical exploration of reality, it achieves an “epistemological dimension” [“epistemologische Dimension” (Klinkert 2010, 21)]. Literature in general, and this applies to Morgner’s novella in particular, “does not normally produce scientifically-valid, new knowledge of the world, but it can engage with existing knowledge and scientific principles to

53 According to Todorov, the uncertainty of a reader about inner-fictional actuality is a central aspect of the literary fantastic (Todorov 1975, 157).

54 Transl. by NT. “Es gibt im 20. Jahrhundert keine phantastische Literatur mehr, *die Todorovs Bestimmung entspricht* – oder wenn es sie noch gibt, so ist sie offenbar nicht auf der Höhe ihrer Zeit” (Stockhammer 2000, 25; emphasis in original).

55 Transl. by NT. “basale Unterscheidung zwischen [...] ‘Realem’ und ‘Imaginärem’” (Stockhammer 2000, 24).

56 Transl. by NT. “Wirklichkeit selbst [...] fantastisch geworden ist” (Stockhammer 2000, 25).

57 Transl. by NT. “zeitgemäße moderne Literatur mit [...] fantastischen Zügen” (Stockhammer 2000, 25).

58 I borrow this term from Holger Wille, who uses it to describe physics in general (Wille 2003, 343).

generate a meta-knowledge” (Klinkert 2010, 21),⁵⁹ as Klinkert puts it. The epistemological potential of Morgner’s prose text can be seen in the fact that the novella attributes a different type of the fantastic to particle physics than do the scholars cited above, namely, a version of the fantastic that cannot be grasped with the language of the uncanny (e.g. “monstrous” black holes), of the fairy-tale-like (e.g. “red dwarfs”), or of phantasms (e.g. “ghost particles” as “fantasmatic occurrences”). Morgner’s novella offers the reader the knowledge that the fantastic side of particle physics, and by extension fantastic literature as well, cannot be dismissed as unreal “*Luftwandelei*,” in the sense of groundless speculation or phantasm, but rather that the “figment[s] of the imagination” in particle physics and in the literary fantastic alike may be considered as “auxiliary construction [Hilfskonstruktion]” that underwrite knowledge of the real.

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⁵⁹ Transl. by NT. “Literatur erzeugt in der Regel kein wissenschaftlich valides, neues Wissen von der Welt, doch kann sie in der Auseinandersetzung mit vorhandenem Wissen und wissenschaftlichen Prinzipien ein Metawissen erzeugen” (Klinkert 2010, 21).

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