

# Theatre, Science, and the Popular

## Two Contemporary Examples From Scandinavia

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### ABSTRACT

This article explores relations between theatre, science, and the popular, which have largely been overlooked by Nordic theatre studies. The aim here is to introduce and understand the variety of ways theatre may communicate science to the public, the point of departure informed by the historical development of the relations between the three concepts and Edmund Husserl's phenomenological critique of modern science. The two analytical examples are Swedish Charlotte Engelkes' and Peder Bjurman's *Svarta hål – en kvantfysisk vaudeville* (2014) and Danish Hotel Pro Forma's adult performance for children *Kosmos+ En Big Bang forestilling om universets vidundre* (2014). History of science reveals complex combinations of science and the popular in theatrical events that raises the question if the audience's understanding of the scientific subject matter itself always was – or has to be – the purpose of the popular science performance, or if it rather was – and is – about spurring interest by inspiring sentiments of wonder and reflection on science's impact on life and outlooks. Newer conceptual developments also suggest that it is not always the case that theatre is a tool for science popularisation, as a specific genre *science theatre*, but that scientific information and concepts are artistically interpreted by theatre, and not always in ways affirmative of the science. This later variant is called *science-in-theatre*. The two genres are demonstrated through the analyses of *Svarta hål* and *Kosmos+*, the claim being that the first was an ambiguous exposition of science, i.e. science-in-theatre, whereas the second established an artistically visionary affirmation, as regular science theatre.

### KEYWORDS

Charlotte Engelkes; Peder Bjurman; Svarta hål; Hotel Pro Forma; Kosmos+; Edmund Husserl; the theatrical event; science theatre; science-in-theatre; science history; popularisation; popular science; science communication.

# **Theatre, Science, and the Popular**

## **Two contemporary examples from Scandinavia**

*In memory of Professor Christopher Innes, a colleague and a friend  
who shared our interest in theatre and science*

A theatrical performance is in progress: a new scene opens with light coming up on the red curtain-set, centre stage; but this time no one enters. Our attention remains on the brightly lit set piece, which takes up half the breadth of the stage. After a while, a man's head appears over the top rim of the curtain. Then, at the left side of the curtain, a hand emerges. At the right, side another one appears. The right hand holds a cigarette. Despite the seemingly abnormal length of the arm, the man is not able to reach around the edge of the curtain and put the cigarette in his mouth.

This amusing scene is out of the Swedish performance *Svarta hål – en kvantfysisk vaudeville* (*Black Holes – a quantum-mechanical vaudeville*).<sup>1</sup> Immediately, on the sensory level, one may appreciate the comical effect of hands reaching unexpectedly far; of course, no human is able to perform such a feat. Knowing the physiological limitations of human limbs and then observing the violation of the limitations is what makes the scene funny. In terms of artistry and performance conventions, one may recognise and appreciate the scene as a comical take on a magician's act, which fits well with the variety style of the

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<sup>1</sup> Svarta Hål – en kvantfysisk vaudeville 23.9.2014.

performance. At the same time, the performance's themes of black holes and quantum-physics enhance the scene and add a symbolic layer: the knowledgeable spectator might pick up on a reference to the so-called 'spaghettification', i.e. the physical effects that differences in gravitational tidal forces would exert on an object if it were to fall into a black hole, at once compressing and stretching it into extremely elongated strands of energised material.<sup>2</sup> There is no explanation to the scene, which makes this a subtle reference. Clearly the intention is not to demonstrate the astrophysical phenomenon. Admittedly, the scene is scientifically incorrect: no one subject to spaghettification could remain alive. Rather, the scene conveys the sense of oddity that accompanies theories of black holes, 'locations' in outer space where spacetime and the laws of nature, as we know them, cease to exist. Thus, despite its scientific inaccuracy, 'the distorted man scene' does allow for a human-embodied perspective on black holes, a quality of the performance that resonates with a problem of the relationship between science and the public: when embedded in an everyday commonsensical worldview, how can one relate to abstract counterintuitive concepts of science such as black holes and dark matter?

In this article, we set out to explore relations between theatre, science, and the popular, which have largely been overlooked within Nordic theatre studies.<sup>3</sup> Furthermore, science theatre seems not to be the obvious choice when popular theatre is discussed. The aim here is to introduce and understand the variety of ways theatre may communicate science to the public. Our point of departure is informed by the historical development of the relations between the three concepts and Husserl's phenomenological critique of modern science. Besides

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<sup>2</sup> Hawking 1988, 256.

<sup>3</sup> In the English-speaking world, research on theatre and science has focused mostly on drama or "science plays", see e.g. Innes 2002 and Shepard-Barr 2006. However, the history of science and interdisciplinary studies has also paid attention to the field, see e.g. *Interdisciplinary Science Review* 27:3, 2002. Later years have seen research initiatives dedicated to studies of theatre, performance, and science such as the working group Performance & Science with the Performance Studies international (<http://www.psi-web.org/about/working-groups/>) and the PARS – Performing Astronomy Research Society (<https://parsnetwork.org/>).

*Svarta håll*, we use Danish Hotel Pro Forma's adult performance for children *Kosmos+ En Big Bang forestilling om universets vidundre (Cosmos+ A Big Bang performance about the Wonders of the Universe)*<sup>4</sup> as an analytical example. We will relate the analysis of the two performances to the genres *science-in-theatre* and *science theatre*, respectively. Based on the history of science communication through theatre and other kinds of performance, we claim that contrary to the obvious pedagogical aim of making science understandable to the general public, the purpose was/is rather to spur interest in science by inspiring sentiments of wonder and/or reflection on science's impact on life and outlooks. We will also consider newer conceptual developments, suggesting that it is not always the case that theatre is merely a tool for science communication, but that scientific information and concepts are used by theatre for artistic reasons, and not always in narratives affirmative of the science.

## A THEORETICAL FRAMEWORK

Our theoretical framework consists of the conceptualisation of the two genres, *science theatre* and *science-in-theatre*. The Danish communication theorists Tatiana Chemi and Peter Kastberg understand science theatre in terms of its communication between performance and audience:

[A] platform on which dramaturgical tools are used to convey (typically natural) science content to audiences of non-experts. From a theatrical perspective, Science Theatre can be seen as a patchwork genre that fuses humanistic-dramaturgical epistemology with natural science epistemology and content. Science Theatre is a hybrid theatrical phenomenon, based on the theatre's historical leaning towards pedagogical (re)presentations and inclination towards applications in educational settings.<sup>5</sup>

In this sense science theatre is applied theatre with the explicit purpose to teach the audience – often children or youngsters – about science, e.g. physics, ecology, genetics, and psychology, and its societal implications.<sup>6</sup> Contrary to this

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<sup>4</sup> *Kosmos+* 6.2.2015.

<sup>5</sup> Chemi and Kastberg 2015, 54-5.

<sup>6</sup> Science theatre as a practice is well established in the Nordic and Baltic countries. Today, there are several independent science theatre companies like the Danish Videnskabsteatret; others like Kunskapskabarén in Lund is



genre, science-in-theatre is aimed at adult audiences and integrates science into the art of theatre in complex ways; famous examples would be Michael Frayn's play *Copenhagen* (1998) and Tom Stoppard's *Archadia* (1993). In understanding science-in-theatre we modify the concept originally launched by chemist-turned-dramatist Carl Djerassi referring to dramatic theatre using "fiction to smuggle scientific facts into the consciousness of the scientifically illiterate public,"<sup>7</sup> i.e. art with a pedagogical aim, to suggest that the aim might not be quite as clear-cut as he suggests: compare the abovementioned science plays for example. Rather than merely communicate science, these plays employ scientific principles and worldviews for their own dramaturgical purposes.<sup>8</sup> Furthermore, we adhere to science writer and theatre leader Philip Ball's expansion of science-in-theatre to also include visual and physical theatre; as he argues "in experiments [such as the Curies' discovery of radium's ghostly luminescence] there is the essential element of theatre: a moment of sheer wonderment."<sup>9</sup> In our analyses we employ the theatre scholar Willmar Sauter's model of theatrical communication encompassing levels of the sensory, the artistic, and the symbolic, which allows for assessments of the full experiential and interpretational potential of the event.<sup>10</sup> Although originally developed for analysing text-based science-in-theatre, we apply Liliane Campos' strategies of representing science in theatrical performance suggesting three variants, not necessarily exclusive to each other but often complementary: 1) through metaphor and intertextuality, by which "scientific metaphors [...] do not simply hijack scientific concepts to tell human stories" but "they are also a way of conveying them *through* human stories"<sup>11</sup>; 2) through theoretical knowledge and embodied experience, e.g. in terms of investing the narrative or spectator point-of-view with epistemological uncertainty or exploring phenomenological

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affiliated with universities, and others again perform science spectacles as part of activities at museums, e.g. AHHA's science theatre in Tartu.

<sup>7</sup> Djerassi 2002.

<sup>8</sup> For discussions of *Copenhagen* and *Arcadia*, see Innes 2002 and 2011.

<sup>9</sup> Ball 2002.

<sup>10</sup> Sauter 2008.

<sup>11</sup> Campos 2013, 298.

divergence between the body as scientific construct and object and the subject's experience of the body;<sup>12</sup> and 3) through scientific imagination and theatrical form in the ways that key patterns and structures of scientific thought and experiment may translate into dramaturgy and scenography.<sup>13</sup> We take these strategies and their examples as points of departure and adopt their concepts to the analysis of the performances; this means that our notion of the strategies may deviate somewhat from Campos' conception, and that they also may adapt to science theatre. Whilst to some extent Campos' analysis is focused on theatre's critical potential towards science, we are as much interested in the absence of critique. Almost by definition, science theatre is dramaturgically affirmative towards its subject matter, whereas science-in-theatre, as Campos shows, can be subversive.

By introducing the genre, science-in-theatre, we expand the notion of how science may be presented to the public. Campos' three strategies along with Ball's employment of visual and physical theatre formats are attempts at overcoming or addressing the problem of communicating abstract scientific information and theories to non-experts, a problem which we find is already implied in the phenomenologist Edmund Husserl's critique of modern science.

### **RECONNECTING SCIENCE TO THE LIFEWORLD**

In his *Crisis of the European Sciences and Transcendental Phenomenology*, Husserl raised the problem of the exact sciences having estranged themselves from the public by epistemologically and ontologically losing connection to the lifeworld experiences of people; the sciences had lost themselves to processes of theoretical mathematical abstraction without considering the existential relevance or ethical implications of their discoveries.<sup>14</sup> This critique is still relevant today not only in terms of how science is conceived as practice and a way of establishing knowledge about the world, but also as it follows that the natural sciences face a continuing challenge regarding how to communicate its findings

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<sup>12</sup> Ibid., 300-01.

<sup>13</sup> Campos 2013, 302-3.

<sup>14</sup> Husserl 1970, 3-14.

to the public, especially in a time when scepticism towards science and science illiteracy increases, and religious fundamentalism and anti-scientific politics are on the rise.<sup>15</sup>

In Husserl's understanding, the concept of 'lifeworld' (*Lebenswelt*) stands for the subject's intuitive knowing of the surrounding, everyday world that is pre-given and established through recurrent experience:

[T]he lifeworld, for us who are wakenly live in it, is always already there, existing in advance for us [...] always somehow interested subjects [...] as horizon. To live is always to live-in-certainty-of-the-world [...]. [The lifeworld consists of a] naive experiential self-evidence, the certainty of coming to know, through seeing, touching, feeling, hearing etc., the same thing through its properties, through 'repetition' of the experiences.<sup>16</sup>

The lifeworld is generated through the subject's bodily lived experiences of phenomena, e.g. what a human being can – and, as in the case of the scene with *Svarta håll's* spaghettified man, *cannot* – do in terms of intentional embodied perception and volitional action. Not only does this empirical, first person perspective form the basis of subjective ways of knowing, as the life-world is socially and culturally shared by individuals, but – and this is Husserl's point – it is also the epistemological foundation of the science that humans produce. Especially in communicating with the general public, it seems imperative that science takes, as its premise, the lifeworld experiences and the insights obtained by everyday activities, practices and perceptions; science cannot reject and replace the lifeworld with theory as an objective, hence truer, way of knowing the world. Obviously, science must function through abstraction, which ensures the precision in describing phenomena by adhering to the specialised language of any given discipline; but abstraction is also a reduction of phenomena leaving out the empirical, experiential qualities and aspects that contribute to human meaning-making. Hence, in summation, what Husserl advocates is science, which is able to combine objective and subjective knowledge. As a conse-

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<sup>15</sup> Cf. e.g. *Moyers & Company. Neil deGrasse Tyson on Science Literacy (Part Two)*, Billmoyers.com 24.1.2014, <http://billmoyers.com/episode/neil-degrasse-tyson-on-science-literacy/> (1.7.2017).

<sup>16</sup> Husserl 1970, 343.

quence, science may start to prove itself more relevant and meaningful to the non-experts of the general public.

In this way, one may think of science that communicates its knowledge and discoveries by relating to the lifeworld experience of its audience, i.e. allowing for, or representing an embodied first-person view of phenomena, employing a strategy of *exposition*. This strategy or genre is often referred to as ‘popular science’. Before we turn to the performances, we will define more closely what is meant by popular science, what its purposes and social effects are, and – not the least – how theatre throughout science history has been employed to popularise science and the intentions behind it. This will provide a backdrop for better understanding of our two performance examples as a continuation of a tradition of popular science communication.

## **POPULAR SCIENCE AND ITS RELATION TO THEATRE**

The English word ‘popular’ stems from the Latin ‘populus’ *the people*. According to the Merriam-Webster Dictionary, ‘popular’ has two contemporary colloquial meanings that may guide us in understanding the relationship between science and the people; that of “relating to the general public” and that which concerns communicative formats “suitable to the majority: as *a*: adapted to or indicative of the understanding [...] of the majority.”<sup>17</sup> From science’s point of view, ‘the popular’ most of all relates to making its results accessible and comprehensible while observing facts. Today, conveying scientific information to the general public typically means employing ‘popular science’, which is basically defined as “[s]cientific information for non-professionals that do not aim to train them to become professionals.”<sup>18</sup> The term ‘popular science’ often denotes a genre or mode of address used by science journalists, writers, or scientists themselves, which is found in a variety of media formats, such as books, journals, newspapers, digital media, TV– and, we might add, theatre. Furthermore,

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<sup>17</sup> “Popular.” *Merriam-Webster Dictionary*, <https://www.merriam-webster.com/dictionary/popular> (21.6.2017).

<sup>18</sup> Eriksson 1994, 219. Our translation.

popular science often contextualises science within culture, e.g. its impact on cosmology, concepts of rationality, outlook on life etc.<sup>19</sup>

With regard to the notion of popular science as science made accessible to the general public,<sup>20</sup> it grew out of an increasing specialisation of the natural sciences at the end of the eighteenth century, out of which emerged modes “to address scientific findings differently to specialist and popular audiences.”<sup>21</sup> As such, popular science denotes the difference in language and power-relations between scientists and non-scientists. Thus, according to Jonathan R. Topham, popular science has not merely served as a means of straight-forward popularisation, i.e. the process of making something available to laypeople: at first, popular science was used to establish science as a community that kept out non-professionals by situating them as passive recipients, who would rather support the work of the professionals than try to become scientists themselves. Subsequently, it became a means to commodify and sell science to the people through the book, the lecture, the exhibition etc. Later still, it was also used by scientists to develop and promote new ideas and paradigms to their non-peers. Science historian Richard Whitley is critical of the term ‘popularisation’, claiming it maintains the hierarchical dichotomy between science and the general public. Instead, he suggests using ‘exposition’, i.e. conveyance, to describe the process of making science information available.<sup>22</sup> For our analyses we employ the term exposition as it may include both genres and the representational strategies, both those affirmative and critical of science.

With regard to science’s connection to theatre, its history, at first, does not include popular science: in the sixteenth century lecturers at the universities sought theatricality to improve their teaching. Thus, Chemi and Kastberg define anatomical theatres as the early forerunners of science theatre: “Its provenance may draw on a scientific epistemological tradition and its modern cradle might

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<sup>19</sup> Brier et al 1997, 215-16.

<sup>20</sup> For a brief overview of the etymological development that led to the concept ‘popular science’, see Topham 2016, 6-11.

<sup>21</sup> *Ibid.*, 9.

<sup>22</sup> Whitley 1985, 12.

be Teatro Anatomico di Padova in Italy. [...] The idea was that, by making use of some dramaturgical tools, science could be disseminated and taught more effectively.”<sup>23</sup>

The practice of lecture as a performative demonstration of anatomy, and later physiology and surgery, was maintained until the late nineteenth century. However, the general public was not involved in this kind of knowledge dissemination. The audience was limited to students and noblemen.

The discussion of science popularisation, or exposition, starts when the audience changes: it is no longer limited to a rather homogenous group of students, but people of different social backgrounds, some of them well educated and some of them just curious. The eighteenth and nineteenth centuries are the times when books became cheaper and more easily accessible; the lecture was no longer used merely for transmission of information, but shifted its purpose to generating interest in science and/or some scientific competency. In order to keep the audience engaged, the lectures needed to be entertaining. Science exposition changed and became popular science. The language was more accessible, sometimes by simplification,<sup>24</sup> but most of all the lectures had to deliver information in the most interesting form.

Those who popularised science introduced new techniques and developed the popular format, often using visual techniques to grab the spectators' attention. In the late seventeenth century through to the eighteenth and nineteenth centuries, popular lectures evolved into more or less elaborate spectacles; some of the techniques were rather simple and included only visualisations, for example in the case of John George Wood, a British clergyman, author, and populariser of natural history, who enriched his lectures with large freehand sketches of creatures<sup>25</sup>, while others introduced theatrical performances in order to combine education with amusement. John Henry Pepper, manager of the Royal Polytechnic Institution in London, for example, was a populariser

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<sup>23</sup> Chemi and Kastberg 2017, 57.

<sup>24</sup> Stephen Hilgartner in Topham 2016.

<sup>25</sup> Lightman 2007, 168.

offering spectacular evening lectures using optical projection apparatus, magic lanterns, for vivid illustration and even creating illusion, the famous “Pepper’s ghost”<sup>26</sup>, as well as staging elaborate demonstrations of technological and scientific innovations, involving physical phenomena such as “light, electricity, heat, magnetism, pneumatics, acoustics, and chemistry.”<sup>27</sup> The programme was diverse and infused with regular musical and theatrical performances<sup>28</sup>, attracting large audiences from different social backgrounds.<sup>29</sup> While Pepper added theatre to the repertoire of the Polytechnic, others introduced science lectures in the theatre; one of these popularisers being the French entrepreneur, showman, and magician Henri Robin. Having attended the Polytechnic’s lectures in 1852, he adopted the magic lantern and Pepper’s ghost for his own magical shows, and later on, in 1863, when installing his own theatre Théâtre-Robin in Paris, devised spectacular lectures on astronomy that were as instructive as they were amusing.<sup>30</sup>

In Pepper’s case it may seem that showmanship may have taken the upper hand of science exposition. However, right from the beginning in the late seventeenth century, as Jessica Riskin points out,<sup>31</sup> the public lecturers were quite aware of what they were doing. The Englishman, Joseph Priestley, formulated the pedagogical principle behind most of the spectacles in a call for a national education in natural science in the late eighteenth century:

[T]he curiosity and surprise of young persons should be excited as soon as possible; nor should it be much regarded whether they properly understand what they see, or not. It is enough, at the first, if striking facts make an impression on the mind, and be remembered. We are, at all ages, but too much in haste to understand [...] the appearances that present themselves to us.<sup>32</sup>

The employment of spectacle emphasised the importance of *seeing* phenomena in demonstrations; the empirical was thought of as pivotal to Enlightenment

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<sup>26</sup> Ibid., 167-68; 202-5.

<sup>27</sup> Ibid., 210.

<sup>28</sup> Ibid., 200-1.

<sup>29</sup> Ibid., 206-8.

<sup>30</sup> Vanhoutte and Wynants 2017.

<sup>31</sup> Riskin 2016, 45.

<sup>32</sup> Priestley 1779-1786, x.

epistemology. Hence, as Riskin points out, there is an interesting connection to ‘amusement’ established under the influence from French in the changing meaning of the adjective ‘amusing’ over two centuries (1690s to 1890s), from negatively denoting “To cause to ‘muse’ or stare; to confound, distract, bewilder, puzzle” to positively designating the captivating effect on the “one who amuses agreeable.”<sup>33</sup> This effect of agreeable sensual manipulation in the science spectacles seeded the learning interest, as pointed out by the English populariser Adam Walker: “the philosophical mind can draw amusement from every object that passes before it.”<sup>34</sup> One might want to bear this observation in mind while turning ones attention to contemporary performances.

### **SVARTA HÅL – AN AMBIGUOUS PARODY**

*Svarta håll* is a comical spectacle that puts fundamental questions about the nature of the cosmos and human everyday life to the acid test of live music, singing, dancing, acting, and physical acts carried out by five performers, the actors Charlotte Engelkes and Lindy Larsson, and the show’s own three-man band, The Dark Matters, who shifted with effortless equilibristics between the different forms of artistic expression. The performance was centred on what the performer could do to bring scientific concepts into theatrical play by means of artistic skilfulness and the use of simple objects, in a sense, the same approach Woods used for his science lectures.

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<sup>33</sup> Riskin 2016,,45-6.

<sup>34</sup> Cited in *ibid.*, 46.



In its artistry, *Svarta Hål*'s *mise-en-scène* drew on an array of older popular genres: vaudeville, variety show, cabaret, burlesque, and magic show. Like most of these formats, *Svarta hål* was not an event with a continuous linear narrative but had a structure of separate numbers, songs, skits, dances, and acts of object theatre, making for a varied programme, not entirely unlike the structure of the spectacles Pepper had presented. A thematic frame of black holes and other astronomical, astrophysical, and quantum-physical topics held the numbers together. These topics



Figure 1: Charlotte Engelkes as Mrs. Big Bang (standing on the shoulders of Lindy Larsson) and Erik Nilsson as Interviewer. Photo: Mats Bäcker. Courtesy: Charlotte Engelkes/Astarte Productions

were sometimes explicitly referenced in the numbers as scientific theories and discoveries, compare the science lecture, or they were merely hinted at in the text, in the use of objects, and by personification, e.g. of a black hole or planet; most often the science evolved into humorous metaphors, cf. Campos' first strategy of representing science.

No psychological characters appeared, only easily recognisable types or personas such as Pluto – the ex-planet, Dark Matter, and Miss Big Bang. In creating these personas, the performers made the most of their physical appearances and technical skills, e.g. balancing on the shoulders of another, playing a musical instrument, or executing a whirling dance.

The performers' costumes also carried symbolic significance. All were dressed in black and often contrary to their gender. Some of them changed costumes to create their personas. All of them were missing one sock, or wearing mismatching socks, a subtle reference to a number about the well-known mys-

tery of socks lost in the laundry. The black costumes and cross-dressing were reminiscent of 1920s Berliner *cabarets* and *burlesque shows*, which underscored the playful attitude and atmosphere of the performance. While the all-pervading black –the stage space was also black (except for the red curtain) – could denote the cosmos, black holes, dark matter etc., the cross-dressing might have been seen as a subtle metaphor on Niels Bohr’s principle of complementarity:<sup>35</sup> light is to be considered as both a particle and a wave, until observation makes it appear as either of the two; hence, the cross-dressing figures were potentially both genders.

*Svarta hål* employed object theatre extensively. Everything that appeared on stage was manipulated by the performers, its meaning fluctuating: ping-pong balls attached to a dress became the solar system; a trombone and a trumpet, stuck through the opening in the stage curtain-set, became a pair of interacting suns; and parasols spun into disks of matter gathering around black holes. As Roland Barthes pointed out: “there is always a meaning which overflows the object’s use.”<sup>36</sup> The audience may have perceived all such transformations on different levels: as skilfulness, an amusing act, a humorous illustration, or a parody of the science; it depended on the spectator’s knowledge, experience, education etc.

Most numbers were little concerned with scientific information and only related loosely to theories and concepts, emphasising instead the oddities of human affairs by using science as metaphor, or creating, through embodiment, a dissonance between concept and lifeworld, which made one appreciate the problems of communicating scientific concepts.

At one point, Larsson started a new number, playing with a ping-pong bat with a ball attached to it on a short rubbery string. As made clear by his song, he embodied or impersonated Pluto, “once a planet now an asteroid.” After some time, Engelkes joined him representing the solar system. With eight white balls attached to her dress by long strings, she performed a whirling dance,

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<sup>35</sup> Bohr 1928.

<sup>36</sup> Barthes 1988, 182.

which made the balls fly round her like the planets round the sun. Pluto had been separated; he was no longer in the company of the other planets because his status of a proper planet had been revoked. Actually the International Astronomical Union had demoted Pluto to a dwarf planet in 2006 much to the outrage of the general public, who had had their accustomed view of the solar system disrupted.<sup>37</sup> Pluto's song told about the changes to his life: his self-esteem was low, he felt misunderstood.<sup>38</sup> The chorus of the song summarized his situation: "In space you are minor, when you are small, size has it all." The ping-pong ball, bouncing rapidly and erratically, emphasised Pluto's agitation and anxiety. Engelkes' perfect whirling movements were a contrast to it: without any imbalance or hesitation, she spun throughout the entire song completely unaffected by Pluto's protests. The movement provided the spectator's appreciation of her skill, her mastery of the whirling technique, while at the same time, it was the very technique that made the theatrical representation of the solar system possible. In the context of the song, the symbolism may have extended beyond the solar system to other systems that are insensitive to external factors. It could be seen as the scientific community who changed the status of Pluto in order to "describe the Solar System as it really is, not as we would like it to be"<sup>39</sup>, but it could even connote other social systems. The lyrics and the devise of personification enacted by Larsson may have turned Pluto into a metaphor of minorities and other social groups (women, children, LGBTQI, etc.) marginalised or excluded by the ruling system. This connects science as metaphor with everyday-life, and possibly with political implications.

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<sup>37</sup> "Pluto fights back" 2006.

<sup>38</sup> It is interesting to note that the matter about Pluto's status had opponents refer to the heavenly object as if it was a living entity: protesters called for saving Pluto (<http://www.savepluto.com>; 1.7.2017) or accused the IAU of being "Planet Killers" (<http://blog.seattlepi.com/thebigblog/2011/03/12/protest-to-reinstate-pluto-as-a-planet/>; 1.7.2017). Mike Brown, the astronomer whose discovery of another solar-system-outer-rim object had caused Pluto to be demoted, accepted the assigned killer role by publishing a book on how he killed Pluto. Brown 2010.

<sup>39</sup> Professor Iwan Williams, chair of the IAU planetary panel, cited in "Pluto loses its status as a planet" 2006.

Another scene engaged more directly with the Husserlian crisis of estranged abstract science. It played out as a science lecture on dark matter. Lindy Larsson entered the stage wearing a female dress. He stood by the red curtain and stared at the audience. He seemed angry. Charlotte Engelkes entered, bypassed Larsson, took the centre stage, and started the lecture. She told the audience that most of the matter in the universe is made up of dark matter. While she spoke, Larsson repeatedly shouted “haalloo” as if to catch her attention, but she appeared neither to hear nor see him. Larsson, personifying dark matter, remarked that even though people know that he exists nobody sees him. In desperation, he made funny movements in front of Engelkes, all of which became grotesque. The audience laughed. She finished her lecture and left the stage.

On the sensorial level of communication the audience saw what was invisible to Engelkes’ scientist. Thus, using the device of embodiment – or on the symbolic level, personification – the scientific theory of dark matter was enacted in a way that related to the audience’s lifeworld, a double situation of the audience empirically knowing through seeing and Engelkes’ scientist theoretically knowing without seeing. Just as the Pluto number, the Dark Matter scene might have made science appear arrogant as it remained enclosed in its abstract theorising, not susceptible to how it is perceived by the general public.

We have now seen how *Svarta hål* established astronomical, quantum- and astrophysical phenomena as thematic references, either using these as metaphors for human affairs, or embodying the dissonance between science concepts and lifeworld. *Svarta hål* is comical science-in-theatre. Its whimsical playfulness could be enjoyed for its artistry, while the humour was more intellectually challenging in its ambiguity and edginess; after all, who was the laugh on? Was it really on science for demoting Pluto, or being unable to see dark matter, or, as Husserl claimed, for having allowed itself to become estranged to the lifeworld of the audience? Or was it on the audience for their willingness to make science a laughingstock at a time when science is needed

more than ever? These questions were left unresolved for the spectator to make up his/her own mind.

As we shall see *Kosmos+* did not present such ambiguity; instead, it embraced science in order to expand our perspective on existence.

### **KOSMOS+ – AN EMBODIED COSMIC CHALLENGE<sup>40</sup>**

*Kosmos+* was launched with the explicit ambition that every performance should inspire at least two boys and girls in the audience to become scientists.<sup>41</sup> Adults and children in the company of each other could expect a performance that would convey scientific information about the universe as well as evoke its wonders, in other words, *science theatre*. The theme was the Cosmos but the addition of the plus sign could also make one expect something more. *Kosmos+* might very well be science theatre, but it does not, by default, follow that art is compromised. It is our claim that the artistry of *Kosmos+* lies in the way scientific knowledge is given theatrical form through the interplay of scenography and spoken text, i.e. Campos' third strategy.

The performance took place on a conventional theatre stage, using video and image projections to create cosmic vistas. Spectators were placed frontally facing the stage. The use of two huge translucent screens, one placed in front of the other, allowed for fascinating and engaging 3D effects, produced by different elements of the same image being projected onto each screen. Similar to the title sequence in the classic TV series *Star Trek*, the performance began with stars growing out of the vanishing point of the image and slipping diagonally to the edges of the screens, some of them even continuing onto the walls of the auditorium and beyond the spectator's field of vision. On the sensory level, it created an immersive notion of being sucked into the cosmic scenery. A soundtrack of ambience and techno music emphasised the nature of the different cosmic phenomena, whether serene or violent, and produced a corporeal impression that both children and adults could relate to; one had the sense of really facing the immensity of scale and force. The premise seemed to be: if one

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<sup>40</sup> Another version of the analysis was presented in Skjoldager-Nielsen 2015.

<sup>41</sup> Cf. Dehlholm 2014.



Figure 2: The cloudscape of Jupiter. In front: Tom7 (Frederic Linde-Fleron); left to right: Physicist 2 (Lisbet Sonne); Astronomer (Ellen Hillingsøe); Physicist 1 (Sofie Lebech); Philosopher 1 (Preben Harris); Philosopher 2 (Bende Harris). Photo: Roberto Fortuna. Courtesy: Hotel Pro Forma

cannot hope to comprehend the cosmos, then at least it is possible to experience it. Thus, on the artistic level, one might appreciate how the *mise-en-scène* worked against the physical limitations of the theatre stage to evoke a sense of the cosmos.

These impressive audiovisuals were accompanied by the spoken words of ten performers. They did not enact a conflict-based narrative as psychological characters, but delivered the text as types: (according to the programme) Tom7 (the boy), the Moon Girl (his sister), the Astronomer, Philosopher 1 and 2, the Mathematician, Physicist 1 and 2, and Operator 1 and 2. They barely interacted; only the delivery of the text bound them together. The text commented, more or less, on the cosmic visualisations, or it accompanied the performers' actions, e.g. dictating, reading, observing, measuring etc. The text constituted the dramaturgical structure of the performance and provided forward momentum through an encyclopaedic listing of topics, varying between astronomical phenomena and astrophysical theories, the concrete and the abstract: the moon, the sun, formula rain (video projection of mathematical formulas), gravity,



solar system, dark matter, dark energy, quantum physics, red giant, twin paradox, spacetime, galaxies, Big Bang. These lofty topics were often connected with short stories about something ordinary and mundane: like Tom7's decision to visit his sister, whereby he caused the universe to split in two, one in which he visited her, and one in which he did not.<sup>42</sup> Humour was also used to defuse incomprehensibility: "If we talk about nothing, then nothing becomes something. Then nothing is a thing. And if we don't understand any of that, then we are on the right path."<sup>43</sup> In general, the text served the function of providing the spectator with knowledge about cosmic phenomena as well as putting the cosmos into a lifeworld perspective.

PHYSICIST 1

The Sun is a star that produces 400 million million million million million joules of energy per second. Every second.

That is the equivalent to the amount of energy all of us use in a year to turn on the lights, cook dinner, play computer games and use the hair dryer, the toaster, a refrigerator, a coffee machine.<sup>44</sup>

Compared to *Svarta håls* playfulness, the text of *Kosmos+* did not use scientific concepts as metaphors but conveyed, without distortion, scientific information to non-professionals and reflected upon it philosophically and existentially. In this sense, *Kosmos+* was popular science delivered matter-of-factly as a lecture, but by several speakers and presented in a theatrical format. One is reminded of Rubin's astronomy lectures using magic lantern slide shows, although the technology was much more advanced.<sup>45</sup>

A little boy played Tom7, who knew unusually much about the universe. In the *mise-en-scène*, he was placed at the front of the stage and separated from the other adult performers, who stood or moved about mid-stage between the large translucent screens. Tom7 was the spectator's guide to the universe, as he initiated the performance's exploration. Thus, the child's perspective was subtly realized. Behind him, the universe unfolded. In one scene, the solar disc

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<sup>42</sup> Dehlholm et al. 2015, 23.

<sup>43</sup> Ibid., 21.

<sup>44</sup> Ibid., 14.

<sup>45</sup> For a discussion and illustrations of these lectures, see Vanhoutte and Wynants 2017, 159-62.

grew as the image moved from rear screen to front screen, enveloping the Astronomer and Physicist 1 in the sun's atmosphere, and, after reaching Tom7, it seemed as if it would engulf the audience next. A scene about gravity presented a black hole; a video effect induced once more the sensation of being sucked into the imagery: at the rear, blurry streaks of star material was pulled toward a black disc in the centre of the screen, at the same time resembling the iris muscle contracting on the pupil of a human eye. In the front, Physicist 2 disappeared behind an event horizon of a large inflatable, pillowed floor. The performance culminated in the explosive rupture of perspective and stage space itself, as powerful bands of light cut across the blackened screens, the light being caught and reflected in a multitude of soap bubbles that were dropped from the ceiling above the audience. The bubbles distributed the Big Bang 'explosion' throughout the space of the auditorium – an 'impossible' scenario made observable. As Tom7 put it: "I would like to be able to watch that Big Bang when it happens, but there would be no place for me to be. There is no space outside where it all happens. The Big Bang happens everywhere at the same time."<sup>46</sup>

In accordance with Husserl, *Kosmos+* acknowledged the need to establish a first person's view of science. Contrasted by its scientific information, it staged the spectator's perception in an embodied attempt to relate to the Husserlian lifeworld as well as challenging that anthropocentrism, or human everyday self-centredness. Yet, since one cannot escape one's consciousness as the centre from which a perception of the world begins, compare the mirroring of a single point of view in the basic central perspective orientation of the stage,<sup>47</sup> one can only hope to realize that this centre does not equal that of the cosmos; in fact, due to the Big Bang, which happened everywhere at once, any point in the cosmos is moving away from every other point, and it has no centre; or, it has

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<sup>46</sup> Dehlholm et al 2015, 31.

<sup>47</sup> In terms of phenomenology, the spectator is always included in the stage world observed. Hotel Pro Forma's performances are all about world construction through observation. For a discussion of this, see Theil 2003, 13 pass. and Lars Qvortrup 2003, 174 pass.



as many 'centres' as there are observers. Mankind can only find its true place in the cosmos if each and everyone starts with themselves but tries to shift the perspective and transcend their self – to realise that any sense of being at the centre is a mere optical illusion of observing the sky. Such a realisation may be seen as the performance's potential for critical reflection on human existence and civilisation: the universe does not revolve around Mankind. In fact, it is impervious to our existence; and yet, as Philosopher 1 & 2 suggest in the performance, "Life is the way the universe understands itself."<sup>48</sup>

We have now seen how *Kosmos+* served the function of communicating scientific information that was factually accurate. Philosophical reflections and everyday situations related cosmology and astrophysics to the lifeworld and made scientific knowledge accessible and experiential through the audiovisuals, even if not everyone necessarily understood what all of it meant – an approach comparable to Priestley's pedagogical principle of spectacular lecturing: "It is enough, at the first, if striking facts make an impression on the mind, and be remembered." The explicit intention and framing of the theatrical event made it science theatre, i.e. communication of scientific information supported by dramaturgical tools, but without compromising the artistry of the performance. A painterly style prevailed in the views of planets comparable to Chesley Bonestell's Saturn landscapes from the 1940s<sup>49</sup>, along with an imaginative visual reimaging, e.g. an electron star turning and morphing as a vibrating crystal, or the before-mentioned organic black hole sucking everything into its pupil of an eye, possibly a reference to the 'Star Gate' sequence in Stanley Kubrick's epic movie *2001: A Space Odyssey* (1968). Stylistically, the performance rivalled the Hollywood CGI-effects characteristic of the National Geographic TV documentary series *Cosmos: A Spacetime Odyssey* (2014). By emphasising its theatricality, *Kosmos+*, however, presented visual compositions of live performers and projections with the impossible as a result: human beings on the sun, or Jupiter, or heading into a black hole. In this very concrete sense,

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<sup>48</sup> Dehlholm et al 2015, 25.

<sup>49</sup> See for Saturn as seen from Mimas, 1944.

Man was woven into the cosmic vistas in fantastical images reminiscent of the surreal space art of painters such as Jon Lomberg<sup>50</sup> and Rick Guidice<sup>51</sup>, vistas that invited symbolic interpretation: life and the cosmos may at once be in conflict with each other and inextricably linked as both life-threatening and life-harboring. The performance suggested that the spectator should embrace the cosmos. In the words of the Russian space pioneer, Konstantin Tsiolkovskij: "The Earth is the cradle of humanity, but mankind cannot stay in the cradle forever."<sup>52</sup>

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<sup>50</sup> See e.g. *Milky Way Woman*, s.a.

<sup>51</sup> See e.g. *View to the Future (II)*, s.a.

<sup>52</sup> Cited in Hamish 2001, 5.

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