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When The Invisible Becomes Visible

A Semiotic Study Of The Visualization
Strategies Used In The Popular Science
TV Program Schrödingers katt

Master Thesis in Film and Video Production

Trondheim, spring 2013

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Norges teknisk- naturvitenskapelige universitet
Faculty of Humanities
Department of Art and Media Studies



NTNU

Norwegian University of
Science and Technology

"By faith we understand that the universe was created by the word of God, so that what is seen was not made out of things that are visible"

Hebrews 11:3

"For He rescued us from the domain of darkness, and transferred us to the kingdom of His beloved Son, in whom we have redemption, the forgiveness of sins. He is the image of the invisible God, the firstborn of all creation. For by Him all things were created, both in the heavens and on earth, visible and invisible, whether thrones or dominions or rulers or authorities -all things have been created through Him and for Him. He is before all things, and in Him all things hold together."

Colossians 1:13-17

"For you formed my inward parts; you knitted me together in my mother's womb. I praise you, for I am fearfully and wonderfully made. Wonderful are your works; my soul knows it very well. My frame was not hidden for you, when I was being made in secret, intricately woven in the depths of the earth. Your eyes saw my unformed substance; in your book were written, every one of them, the days that were formed for me, when as yet there was none of them."

Psalms 129:13-16

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I would like to express my sincere gratitude to The Lord, the creator of heaven and earth, of the visible and invisible things, from the unseen atoms that form every living organism to the greatest star discovered by humans. National Geographic wrote in 2010 about the star R136a1 "The discovery could rewrite the laws of stellar physics, since it's long been thought that stars beyond a certain mass would be too unstable to survive"¹.

I want to thank the Lord for my parents; I thank the grace over our family to understand more about what real love is about. I want to thank the Lord for the beautiful country of Norway where I met Jesus Christ in 2002, and after that day, my life was never the same. I thank Norway that allowed me to study the Master degree at the Department of Art and Media studies at NTNU. I want to thank Marit Album Kvernmo whom I have had contact since 2007 and she answered all my questions regarding this Master. I thank my supervisor Sara Brinch for her patience, wisdom and knowledge she shared with me to write this Master Thesis. I thank the team of Schrödingers katt at NRK for their time and friendly attitude, and for the fascinating program they broadcast every week, that reaches a lot of people and gives them important knowledge about scientific issues. May the Lord continue to bless the team production at Schrödingers katt and give them wisdom to find interesting topics in accordance to ethics. I thank my semiotics professor Alfredo Cid Jurado for his knowledge, time and ideas to write this Master Thesis. I thank my Norwegian parents Reidun and Geir Medhaug, for their prayers and mentoring. I am grateful to Line Guldvog for her friendship and prayers that were important in this season of my life. Finally I want to thank Strinda Menighet and Berg Menighet in Trondheim for their warmth and friendship.

¹ Fazekas, A. Most Massive Star Discovered-Shatters Record. National Geographic. Published July 21, 2010. Reviewed 8th of May 2013 from <http://news.nationalgeographic.com/news/2010/07/100721-science-space-most-massive-star-ever-discovered-record/>

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By Karla Paz

Abstract

"When The Invisible Becomes Visible" is a Master Thesis that study the visualization process of three pieces on the topics of cell biology and genetics televised as parts of the popular science TV program *Schrödingers katt* at NRK. The sign theories of Charles Peirce and Umberto Eco were used to study the visualization processes.

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When The Invisible Becomes Visible

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1. Introduction

1.1 Topic for discussion

One of the challenges in scientific journalism is: How to bring the public the right information, with which they will understand and relate, without losing the scientific content. Journalists at popular science TV programs face yet other challenges because they must deal with the script text and images related to the TV media format. This master thesis focuses on one such program called *Schrödingers katt* at NRK and studies how the production team perform their tasks related to visualizing scientific knowledge and presenting scientific topics to a common audience of TV viewers.

Umberto Eco, a known semiotician and philosopher uses the "rhino" as an example of how a person faces something new and the process that person goes through in order to share knowledge of this new thing. In his book "Kant and the Platypus", Eco writes about Marco Polo's problem to describe the rhino in one of his trips to Java. He had never seen one before but he could distinguish its body, four legs and a horn². For him this new animal looked to what he thought could be a unicorn. He knew that a unicorn had a horn on the head and four legs, and then he described the "unicorn" as a very rare animal with buffalo hair, elephant feet³, a dark horn and a head that looked like a boar. Marco Polo took the decision to treat the content as if it was the "known legendary unicorn" but not as people thought it was, rather as a rare non-delicate beast. In this thesis, Eco's theory will be used to study the popular science journalist's process to understand and share the knowledge from scientists.

² U Eco, *Kant y el Ornitorninco*, trans. H. Lozano, Editorial Lumen, Barcelona, 1997, p. 69

³ Eco, *Kant y el Ornitorninco*, p.69.

Schrödingers katt has been on air since 1990 and it is the only TV popular science program by a European broadcaster televised during primetime⁴. It makes available science and research results to a broad public⁵. Most of the members at the editorial team in *Schrödingers katt* have journalist education⁶, and the program host Eldrid Borgan has a PhD in Molecular Biology⁷. The program has a magazine format and in 2012 it had 33 broadcasts with 5-6 issues per transmission often with different topics presented within a unifying framework. In 2012 they had three program hosts: Hanne Kari Fossum, Eldrid Borgan and Per Olav Alvestad. The program host performs interviews with professionals in a thematically related environment to the story and can also interact with the environment to connect the different elements of the program together⁸.

The topics that become pieces in *Schrödingers katt* depend on the research results that wake up interest in the editorial team, and also what the viewers at that time are engaged with⁹. Olav Høgetveit, one of the former members of *Schrödingers katt's* editorial team said that it is important that people get knowledge about research, because then they can give an opinion in questions based on research results¹⁰.

1.2 Research questions and methods

This master thesis "When The Invisible Becomes Visible" is about how cell biology issues are visualized in three *Schrödingers katt's* pieces. The reason why I chose cell biology issues, is because genes, cells and proteins involved in the pieces that I chose to study are impossible to see with the naked eye, therefore I thought it would be interesting to study how the journalist's at *Schrödingers katt* deal with those issues where they need to visualize the invisible. In other words, "When The Invisible Becomes Visible" studies the

⁴ Synnøve Ness (2013): Interview made 4th of April.

⁵ S Brinch & G Iversen, *Populær vitenskap: Fjernsynet i kunnskapssamfunnet*, Høyskoleforlaget, Oslo, 2010, p.56

⁶ Krüger, Frida (2013): Interview made 4th of April.

⁷ Vitenskap og Teknologi, *Eldrid Borgan*, NRK, 2012, retrieved 23 February 2013, <<http://www.nrk.no/vitenskap-og-teknologi/1.8283925>>.

⁸ Brinch, & Iversen, *Populær vitenskap*, p.61

⁹ N Røv, Interview made 22 December, 2009, cited in Brinch & G Iversen, *Populær vitenskap: Fjernsynet i kunnskapssamfunnet*, Høyskoleforlaget, Oslo, 2010, p.61

¹⁰ Brinch & Iversen, *Populær vitenskap*, p.59

process of the journalists that must make visible what is invisible to the naked eye. But I will not only focus on how they visualize genes, cells and proteins, but on how the scientists visualize the pieces about those issues as well. The research questions are the following: What kind of strategies and resources do *Schrödingers katt's* journalists use to visualize cell biology issues? What process do the journalists follow to obtain the right images that will be shown to the public? Is there a correspondence between the journalist's visualized representations and the visualized representations the scientists use to reach their public?

In my attempt to answer these questions, I will perform an analysis of three pieces taking in consideration how the piece is visualized in general. As mentioned before, I will not only focus into how *Schrödingers katt* deals with the unseen things such as genes, cells and proteins, but also how *Schrödingers katt* illustrate the whole piece about these topics. I will find out what types of images *Schrödingers katt* uses to visualize the pieces. Then I will interview the scientists at the pieces as well as the journalists to find out what the main challenges in the process of scientific knowledge communication are. The interviews with the journalist will tell me the process they go through in order to choose the images they think will express the right information to the public. The interviews with the scientists will give me information about their challenges in sharing scientific knowledge to journalists and the visual media they use with their patients or other scientists. I have chosen the pieces *Kondisgen* (Fitness gene), *Brystkreft* (Breast Cancer) and *Navlestrengsblod* (Umbilical Cord Blood), all televised during 2012, as cases for my work.

This thesis is based on the semiotic theory of Charles Peirce and Umberto Eco. I will use the theory of signs of Charles S. Pierce to categorize the images that are important to this master thesis. I will interview the researchers that were on the pieces and ask them about their experience to participate at *Schrödingers katt* and what were the main challenges to bring further their knowledge to the journalists. I will study the communication process between scientists-journalists through the semiotic theoretical framework that Umberto Eco presents in his book "*Kant And The Platypus*" when a person faces something new. I will

present a model I created that summarizes Umberto Eco's and Peirce's theoretical framework that will help me to study the communication process between journalists and scientists. The model I created was also helpful for the practical part of the Master Thesis of the Master degree program in Film and Video Production at the Department of Art and Media Studies at NTNU. The practical part was a film script called "*Pomposa*". How the model was applied in the creation of this film script is described shortly in the Preface of the script.

I will interview the journalists and ask them about the challenges they faced to visualize the pieces and their selection process of visual media. I will also ask the journalists about the challenges they face in their communication with researchers and how they make sure the information they obtain is the correct. I will do a narration typology of the pieces pointing out the way the production team in *Schrödingers katt* visualizes the different parts of the narration.

The reason why I chose this theory and this set of methods to answer the questions of research is because Eco describes how a person relates to new content that had never seen before (as Marco Polo and the rhino), in this case, the cell mechanisms are invisible and the journalist must trust the scientist in order to obtain information about a topic to present the public. Another reason is because Eco describes the process of how a person facing new content is able to edict a judgment about the new knowledge obtained about the object. The theory of signs of Pierce will allow me to categorize the images that were used in the pieces, and the interviews with the scientists and the journalists will give me the information I need to study the communication process between journalists and scientists.

As material for analysis I have chosen three pieces: *Kondisgen* because the piece is about the fitness gene, and since genes are invisible to the naked eye, I thought it would be interesting to study how *Schrödingers katt* visualize this topic in the piece. I chose *Brystkreft* and *Navlestrengsblod* because both pieces address the issue of cell biology, and it was interesting to study how *Schrödingers katt* makes this topic visible for the public. In the season 2012, *Schrödingers katt* had about seven cell-biology related pieces, as well as some

other pieces related to microbiology and nanotechnology. The reason why I only studied 3 pieces is because I choose to make a thorough analysis of the three pieces so I can find similarities in their visualization strategies among these three.

1.3 Overview

In the next chapter (chapter 2) I will describe the theoretical framework and give the definition of Popular Science, the sign theory of Charles Peirce and the semiotic theory of Umberto Eco used in this Master Thesis. At the end of chapter 2 I present a model I have created that summarizes my understanding of Eco's reading of Peirce's theories. In chapter 3, I will discuss the three pieces of *Schrödingers katt: Kondisgen, Brystkreft* and *Navlestrengsblod*. The last part of chapter 3 I will discuss the narrative typology of the pieces and their image categorization. Chapter 4 contains the interviews with the scientists and journalists. Chapter 5 contains the discussion of the process communication between scientists-journalists seen through the semiotic theory of Peirce and Eco. At the end of Chapter 5 I present a model I created of the communication process between the *Schrödingers katt* journalists and the scientists and discuss this process. Chapter 6 is the conclusion of this master thesis.

2. Theoretical Framework

2.1 Popular Science

Popular science's main task is to share scientific knowledge with people whose main area of awareness is not on that specific topic in scientific issues. Jusso Aarnio wrote in his doctoral thesis that scientific language follows its nature, and thus cannot function as a transparent window to show the world as it is¹¹. This means that in order to bring further scientific knowledge to a broad public, the information needs to be treated, and even translated into a language that broad public will understand.

According to Sara Brinch and Gunnar Iversen, "To popularize" means to make something comprehensible to a wider audience, to present something in an easily understandable form¹². When scientific research is being popularized, it is important that scientific language is presented in a way that makes the knowledge available for someone who stands outside the scientific community¹³. Gry Molvær, former broadcaster at NRK described the challenge¹⁴: "*Mykje av tida I redaksjonen går med på å lage nyord eller omsetje vitskapleg terminologi til ord som blir brukt i kvardagen eller visuelle uttrykk, slik at fenomen kan presenterast på ein rask og lett forståeleg måte*"¹⁵. Harald Hornmoen in his book *Vitenskapens vakthunder* says "Better roughly right than precisely wrong"¹⁶ which means that it is better to share some knowledge to the public, than nothing at all. According to Brinch & Iversen this does not mean that the journalist can be imprecise with scientific knowledge but rather have thoroughness and accuracy in the use of their sources as any other journalist¹⁷.

¹¹ Jusso, A. *Rhetoric and Representation: Exploring the cultural meaning of natural sciences in contemporary popular science*, Helda, 2008, retrieved 10 January 2013, <<https://helda.helsinki.fi/bitstream/handle/10138/19247/rhetoric.pdf?sequence=2>>.

¹² Brinch & Iversen, *Populær vitenskap*, p.64

¹³ Brinch & Iversen, *Populær vitenskap*, p.64

¹⁴ I Myking, 'Kattekvinn', *Forskerforum* vol.1, 2003, retrieved 8 December 2009, <<http://forskrforbundet.no/Nyheter/Arkiv-Forskerforum/2003/Forskerforum-12003/13308/>> cited in Brinch, S & G Iversen, *Populær vitenskap: Fjernsynet i kunnskapssamfunnet*, Høyskoleforlaget, Oslo, 2010, p.64.

¹⁵ A lot of time, the editorial board agrees to build new or convert scientific terminology to words that are used in everyday life or visual expression, so the phenomenon can be presented in a quick and easily understandable manner.

¹⁶ H Hornmoen, *Vitenskapens vakthunder. Innføring i forskingsjournalistikk*, Tano Aschehoug, Oslo, 1999, p.155. cited in S Brinch & Iversen, *Populær vitenskap*, p. 74.

¹⁷ Hornmoen, cited in S Brinch & G Iversen, *Populær vitenskap*, p. 74

In other words, Popular Science TV journalist's challenges include: the abstraction of scientific information and translation of this information to a language that the broad public will understand without losing accuracy of scientific knowledge. Journalists need to take decision during the production of a scientific piece to choose meticulously which information and images they will use to reach their public. Since they have to take into consideration the determined amount of time given to a piece within the media format, they must use their resources in such a way that the important points are shown.

2.2 When the invisible becomes visible

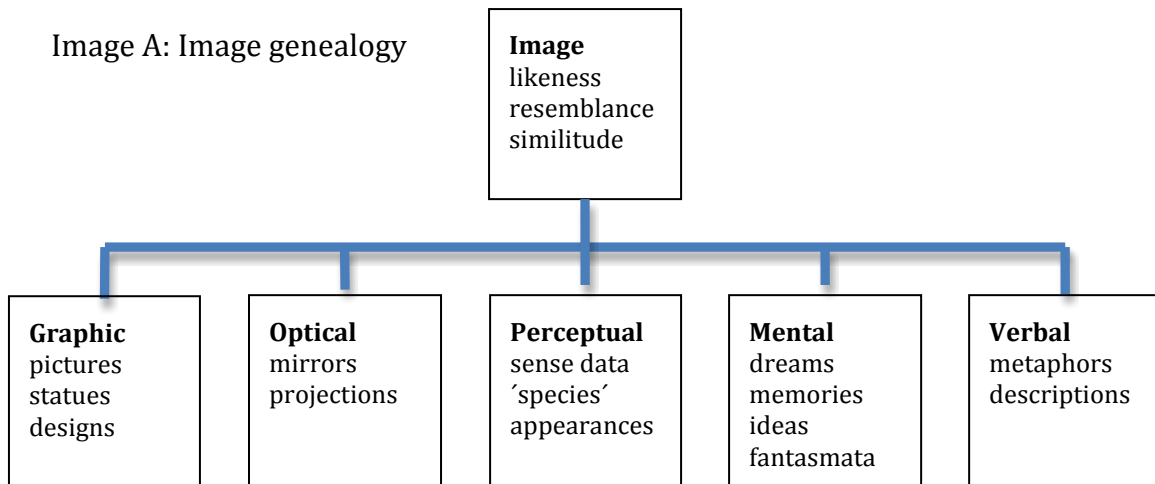
The television is a visual media where images and sound carry information to the audience. One of the challenges that popular science TV programs face is how they visualize the unseen, such as microscopically small objects. Cellular biology, genetics, chemistry, biotechnology are areas of scientific study difficult to visualize. The producers and journalists must select the images that will best describe the information given to the audience, for this, they would use image databases, microscope imaging, 3D model graphics and so on¹⁸. The journalist shows the audience images that they hopefully will understand and where scientific information will not be lost in the process between the researcher and the public. In other words, the journalist becomes a mediator between scientists and the public. According to W.J.T Mitchell the main problem with the use of images is that they must be understood as a kind of language, for him, images " instead of providing a transparent window on the world, images are not regarded as the sort of sign that presents a deceptive appearance of naturalness and transparency concealing an opaque, distorting, arbitrary mechanism of representation, a process of ideological mystification."¹⁹ In other words, images are not perceived in the same way by all viewers and involve multisensory apprehension and interpretation²⁰. According to Mitchell if images were a family, the genealogy would be as seen in image A²¹

¹⁸ Brinch & Iversen, *Populær vitenskap*, p.77

¹⁹ W Mitchell, 'The Family of Images' in S Manghani, A Piper & J Simons (ed.), *Images: A Reader*, Sage Publications, London, 2006, p.296.

²⁰ Mitchell, p.299.

²¹ Mitchell, p.297.



The popular science journalists must create different types of images in their pieces. These images can be graphical, verbal, mental or perceptual and journalists choose the best way to visualize scientific information that they think will best describe knowledge. Scientists also use different types of visualization in their own scientific understanding. Rudolf Arnheim in his book *Visual Thinking* writes about how scientists from old ages such as Aristotle, Isaac Newton and Galileo used models to explain their theories. For instance, in 1953 with the help of X-ray diffraction the scientists understood the physical structure of the DNA molecule by "The "photograph 51" (Image B1) which revealed the helical structure of DNA.²² In April of the same year, James Watson and Francis Crick presented the structure of the DNA-helix (Image B2), the molecule responsible to carry genetic information from one generation to the other²³.

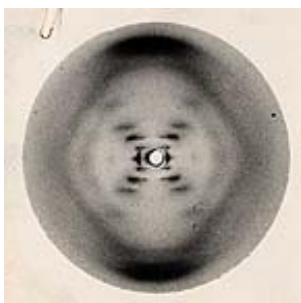


Image B1
"Photograph 51" X-ray diffraction photo of DNA molecule
Photo: Cold Spring Harbor

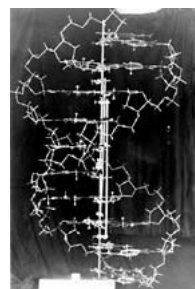


Image B2
The original DNA model by Watson and Crick
Photo: Cold Spring Harbor Laboratory Archives

²² Fredholm

²³ L Fredholm, *The Discovery of the Molecular Structure of DNA- The Double Helix*. Nobelprize.org, 2003, retrieved 9 January 2013, <http://www.nobelprize.org/educational/medicine/dna_double_helix/readmore.html>.

When science is presented to a general public, scientific models can be simplified into what Charles Peirce calls iconic images. Then through the media available, scientific models become an icon to a general audience. Some other times, scientists make 3D graphics of protein structures to visualize their data. For instance we can see the protein structure of Herceptin made by Andrew Ryzhkov a PhD in Physical Chemistry at McGill University²⁴ in image B3. When these kinds of structures are presented to the wide public, they simplify the characteristics in an iconic image, as the one seen later in the piece *Brystkreft of Schrödingers katt* (Image B4).

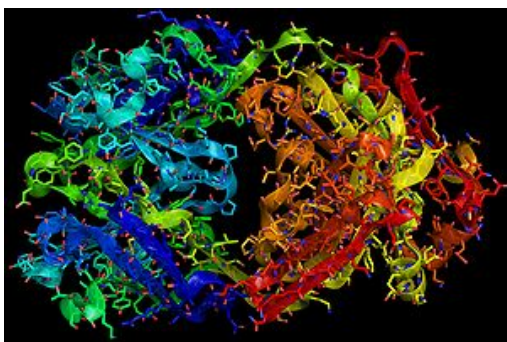


Image B3



Image B4

2.3 Charles Peirce And Umberto Eco

The reason why I chose the sign theory of Charles Peirce and the semiotic framework of Umberto Eco is because: 1) Umberto Eco gives a clear explanation of the approach of a person that faces something new; 2) Eco describes the process of that person to understand the new object using the categories of phenomenology of Peirce (*Firstness*, *Secondness* and *Thirdness*); 3) Eco explains how a person compares a new object to their past experiences and knowledge (through the *encyclopedia*); and 4) How the person gets an interpretation of the new object through feedback. At the end of chapter 2.3.1 I summarize the process through a model I created (Image C 1) that summarizes and explains the process when a person that faces something new. How this model is applied in the communication process between *Schrödingers katt* journalists with scientists is discussed in chapter 4.

²⁴ Ryzhkov, A, *HerceptinFab*. Wikipedia, 2007, retrieved 29 March 2013, <<http://commons.wikimedia.org/wiki/File:HerceptinFab.jpg>>.

2.3.1 *Encyclopedia and Ground*

According to Umberto Eco, a person that faces something new will react by approximating the content and compare it to what already exist in their *encyclopedia*²⁵. The *encyclopedia* is all the knowledge that a person has as a reference and uses it when he or she is confronted to something new. Umberto Eco states that the *encyclopedia* is a semiotic postulate that contains the set for all interpretations recorded in a person²⁶. This means that anyone that faces something new will approach the new content of that object and will compare it to their past experiences and their knowledge of the world. In the case of scientific journalists, they are confronted to a new object that is scientific information, which they can see or maybe they can't. In both cases, this new knowledge can be treated as an unknown object that needs to be compared to the knowledge they have from before (*encyclopedia*)

Charles Peirce states that there are three modes of being:²⁷ 1) *Firstness* is the mode of being of the object without any type of analysis, comparison or any other process²⁸ 2) *Secondness*, is related to how we perceive objects through our experience²⁹ (*encyclopedia*). It allows us to create a hypothesis that enables us to understand the object.³⁰ 3) *Thirdness* is related to the synthetic consciousness, sense of learning and cognition³¹. In other words, *Firstness* refers to the object's qualities, *Secondness* is when we compare the object's qualities to our *encyclopedia* and *Thirdness* is when we edict a judgment about the Object.

Peirce says that the semiosis is involved in the perceptive process as an inference, not by Cartesian intuition, but rather by the knowledge that comes out from hypothetical reasoning of external facts and previous knowledge³² (the *encyclopedia*). According to Eco, a person's perception is reached through an *idea*, and after have referred the idea to previous knowledge (*encyclopedia*),

²⁵ Eco, *Kant y el Ornitorrinco*, p.69

²⁶ Eco, U, *Semiótica y filosofía del lenguaje*, Editorial Lumen, Barcelona,1990, p.133)

²⁷ C Peirce, *Philosophical Writings of Peirce*, Dover Publications, New York,1940, p.75

²⁸ Peirce, p.81

²⁹ Peirce, p.88

³⁰ Peirce, p.89

³¹ Peirce, p.95

³² U Eco, *Kant y el Ornitorrinco*, p. 71

the person emits a judgment of the object admitting perhaps it was not as that person thought, causing the person to correct his hypothesis about the object³³.

Charles Peirce places the *Ground* as the initial point of the cognitive process, between the Dynamical Object through *representamen*, and the formation of an Immediate Object (that will be the starting point of the *interpretant* chain)³⁴. *Ground* refers to the object qualities³⁵; not the totality of them all, but rather one specific quality at the time³⁶. Perceptive judgment belongs to the *Thirdness* as a premise of a successive interpretation chain.³⁷ In other words, The Dynamical Object is the one that triggers the response sequences (We think “there is something in front of me, I don’t know what it is”). The Immediate Object doesn’t tell us everything about the object (because we compare one quality of the object at a time with our encyclopedia) but by it we get closer into the understanding of the *Ground* through feedback (we come back to the *Ground* to obtain another aspect of the object’s qualities), and then we can tell something about the object³⁸.

To recapitulate Eco and Peirce’s theoretical framework seen in chapter 2.3.1, I created a model, which summarizes my understanding of Eco’s reading of Peirce’s theories (Image C1), which embodies the process that undergoes a person that faces something new. From Image C1, we have a Dynamical Object, which is the new object that triggers a response in a person (a person thinks, “there is something in front of me, I don’t know what it is but has quality 1, quality 2, quality 3...”). The object will be approached through the *Ground* by its qualities (*Firstness*), one by one (first quality 1). Each quality will be compared to the person’s *encyclopedia*. After inspecting one first quality, and have compared it with his *encyclopedia*, the person will create one hypothesis (hypothesis 1) about the object. The person will come back to the *Ground* to get more information about the object focusing in a second quality (quality 2). This second quality will be compared to his encyclopedia and maybe will lead him to

³³ Umberto Eco’s example of Marco Polo and the rhino. In U Eco, *Kant y el Ornitorrinco*, p. 72

³⁴ Eco, *Kant y el Ornitorrinco*, p. 72

³⁵ Eco, *Kant y el Ornitorrinco*, p. 73

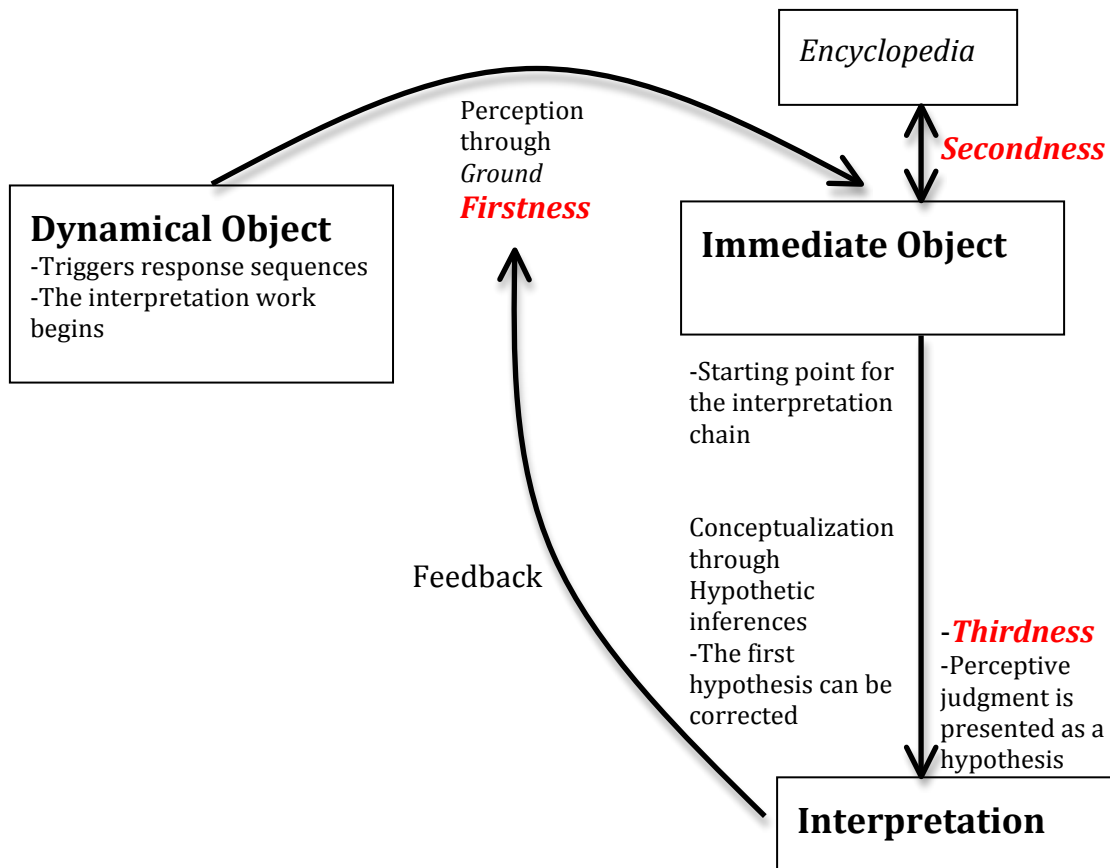
³⁶ Eco, *Kant y el Ornitorrinco*, p. 73

³⁷ Eco, *Kant y el Ornitorrinco*, p.75

³⁸ Eco, *Kant y el Ornitorrinco*, p.78

create a second hypothesis (hypothesis 2). The person will do the same until he has enough information about the object and the final hypothesis (hypothesis final) will allow him to edict a judgment that leads him to conceptualization. How this model is applied to the communication process between *Schrödingers katt*'s journalists and scientists is discussed in chapter 4 of the master thesis.

Image C 1 Interpretation Process



2.3.2 Symbol, Icon and Index

According to Brinch & Iversen a documentary film consists on several edited film clips, assembled together by the filmmaker to communicate an argument or bring forth knowledge of a matter from real life³⁹. Brinch & Iversen point out that a photograph or a film image are a representation and therefore can be considered as a sign where the represented object is visualized⁴⁰. According to Peirce, a sign or *representamen*, is “something, which stands to somebody for

³⁹ S Brinch & G Iversen, *Virkelighetsbilder: norsk dokumentarfilm gjennom hundre år*, Universitetsforlaget, Oslo, 2001, p. 22.

⁴⁰ Brinch & Iversen, *Virkelighetsbilder*, p.20

something in some respect or capacity”⁴¹ This means that a sign addresses someone, and creates in the mind of that person an equivalent sign or a more developed one (*interpretant*)⁴². The sign stands for something, which Peirce calls *object* that stands in reference to an idea called the *Ground* of the *representamen*⁴³. This means that every *representamen* is connected with three things: the *Ground*, the object and the *interpretant*⁴⁴. According to Peirce a sign can be presented as an *Icon*, an *Index* or a *Symbol*⁴⁵.

An *Icon* is a sign, which refers to the *Object* by virtue of the characteristics that object possess, whether that Object exists or not⁴⁶. An *Icon* represents its object mainly by its similarity⁴⁷. A sign is iconic when the likeness is aided by conventional rules. Photographs, models, diagrams, can be iconic because they resemble to their objects. A sign can be iconic when it represents their parts and their relations⁴⁸. An icon is easily found in the way a researcher shows his findings through tables, diagrams, metaphors or images. In other words, a sign is iconic when it is similar to its object, when it represents relations, by analogous relations⁴⁹ (diagrams) and by representing a parallelism (metaphors)⁵⁰. Some signs are icons, which has the likeness of its object by conventional rules⁵¹.

We see an example of how Andrew Ryzhkov created an iconic image of the protein structure of Herceptine in image B3 in chapter 2.2. The same protein was visualized iconically in a less complex image by a pharmaceutical firma to reach the public (image B4 in chapter 2.2). Both images are iconic, one more complex than the other and both are used for different purposes: One for scientific approach, the other for general public.

⁴¹ Peirce, p.99

⁴² Peirce, p.99

⁴³ Peirce, p.99

⁴⁴ Peirce, p.99

⁴⁵ Peirce, p.102

⁴⁶ Peirce, p.102

⁴⁷ Peirce, p.105

⁴⁸ Peirce, p.105

⁴⁹ Peirce, p.105

⁵⁰ Peirce, p.105

⁵¹ Peirce, p.105

An *Index* is a sign, which refers to the Object by virtue of being affected by that Object, this means that an *Index* is no longer a sign if its object is removed. The indexes have three characteristic marks: first they do not have an important likeness to their object; second they refer to individuals, simple unities, or simple unity collections; and third, they direct their attention to something that can be unknown to the spectator⁵². Photography or film can be an indexical sign because they point to their referent⁵³, because the photography refers to the object that is in the picture. Peirce says that there are no pure indexes⁵⁴, and Brinch & Iversen states that photography or film can be considered a hybrid sign because they have both indexical and iconic attributes. It is indexical because they are associated with its object, and iconic because of the likeness to its object⁵⁵.

According to Peirce *Symbol* is a sign which refers to the Object that it denotes by virtue of a law, sometimes an association of general ideas, may cause the Symbol to be interpreted as referring to that Object⁵⁶. A sign can also be seen as a Symbol through convention, where the meaning in the representation emerges through interpretation such as logos, signals, and signs that are culturally and conventionally determined⁵⁷. The Symbol is connected with its object by virtue of the idea of the symbol-using mind⁵⁸. A symbol cannot indicate any particular thing; it denotes a kind of thing.⁵⁹ If someone makes a new symbol, it is by thoughts involving concepts, and when is created it can spread among people⁶⁰. Pictures and film have a context they are presented in and the cultural conventions that are used in the picture can give them a symbolic character⁶¹. All words, sentences, books and other conventional signs are symbols⁶².

⁵² Peirce, p.108

⁵³ S Brinch & G Iversen, *Virkelighetsbilder*, p. 21.

⁵⁴ Peirce, p.108

⁵⁵ Brinch & Iversen, *Virkelighetsbilder*, p.20

⁵⁶ Peirce, p.102

⁵⁷ S Brinch & G Iversen, *Virkelighetsbilder* p.20

⁵⁸ Peirce, p.114

⁵⁹ Peirce, p.114

⁶⁰ Peirce, p.115

⁶¹ Brinch & Iversen, *Virkelighetsbilder*, p.21

⁶² Peirce, p.112

3. Peirce, Eco and a Cat (Analysis and Discussion)

3.1 The Cat: The Pieces Of Study

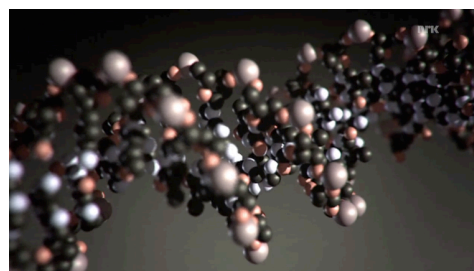
In this chapter I will discuss the three pieces *Kondisgen*, *Brystkreft* and *Navlestrengsblod*. I will present and discuss some of the pictures that *Schrödingers katt* uses to visualize their pieces in general, but I will also take special consideration those pictures that are important for the representation of the unseen, for example cells, genes and proteins that are mentioned in the core explanation of the pieces. By core explanation, (discussed further in chapter 3.2) I mean the scientific explanation *Schrödingers katt* gives in their pieces.

3.1.1 *Kondisgen* (The Fitness Gene)

This is an 8' 10" long television piece from *Schrödingers katt*. The journalist that was in charge of this piece was Frida Krüger. The piece was about the gene that may provide fitness development in people. This story was broadcasted on air on the 19th of April 2012. The title of the piece "*Jakten på Kondisgenet*" appears at the beginning and we hear music in the background. The story starts in a sport center where people are training and the TV host voiceover says "*Vi jakter på det alle sammen. God kondis er nøkkelen til et sunt og godt liv hører vi. Men er det bare trening som skal til?...⁶³*". This is the introduction and the question that will be solved during the piece. The program host introduces Anders Risan, the main character. The image changes from Anders to the training center and then to some people skiing. Then we see an image of an unborn baby (Picture 1.1).



Picture1.1



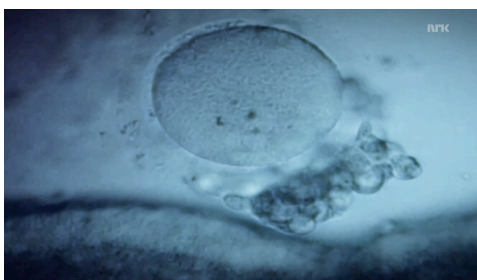
Picture 1.2

They introduce the researchers Claude Bouchard, and Anja Bye. The image of the unborn baby appears again (Picture 1.1) and it is used as a symbol for the

⁶³ We all look after it: Fitness is the key to a healthy and good life, as we have heard. But is it only training what we need?

unseen DNA that every person has from before they were born (The program host mentions this while we see the image). A 3D model of the DNA appears (Picture 1.2), by iconic convention we know it is the DNA molecule that resembles the DNA model of Watson and Crick. It is the first time this DNA model clip appears in the piece and it is used as an iconic sign to make reference to “genes”.

Bye explains that fitness is very important for the risk of cardiovascular diseases, and other types of diseases. Therefore, training becomes an indexical sign that points toward good health. Anja Bye talks about her research that consisted in finding out the background mechanism of why some people have high oxygen uptake and others have it low. The next part of the piece shows how the research is being made. The voiceover explains how a group of people was tested, and through the measurement of oxygen uptake they see how fit each participant is. The participants’ blood samples gave them access to the participant’s DNA. A shot of blood samples appears as a sign for the participant’s DNA. We see Anders taking the oxygen test while he runs on treadmills inside a lab with an oxygen mask. A shot of something looking like a cell seen through the microscope appears (Picture 1.3). By iconic representation we know it is a cell because of its round shape and colors it resembles as a cell seen through the microscope. The voiceover refers to Picture 1.3 as the “inheritance material”. So the cell (picture 1.3) functions as a symbol for DNA too.



Picture 1.3



Picture 1.4

What comes next is the core explanation illustrating Anja’s research. Hanne Kari Fossum, holds a blue thread ball in her hand (Picture 1.4) and says, “*Det er som at inne hvert eneste celle av kroppen vår så har vi ca 1m DNA tråd og det*

er overraskende mye”⁶⁴. Bye’s voiceover states “Men det er som er artig er at på den tråden er det faktisk ca 20.000 forskjellige gener...”⁶⁵ Bye then cuts a little piece of that thread (Picture 1.5) and explains that it could be a gene containing about 10 thousand of letters of the DNA.



Picture 1.5

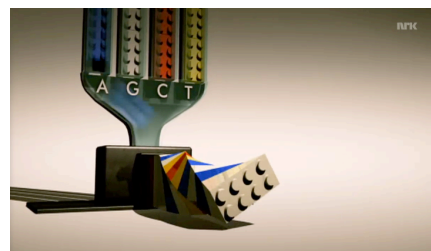


Picture 1.6

We see an extreme close up shot with the small piece of the thread (Picture 1.6). This little part of the thread becomes an iconic sign for a gene by analogous relation to the real gene in comparison to the whole DNA sequence and the blue thread. They visualized the unseen in this whole explanation sequence iconically by metaphor.



Picture 1.7



Picture 1.8

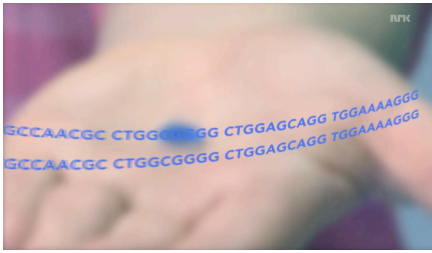
Picture 1.7 appears and it is a symbolic image because the letters ACGT stands for the Adenine, Cytosine, Guanine and Thymine. The picture changes to a Lego dispenser where blocks are being put together (Picture 1.8). In picture 1.8 we see how the helix is being shaped as the Lego blocks are formed, this image is iconic because we can see how the Lego blocks shape the DNA Helix. The picture 1.8 do not illustrate the base pairs but rather the gene variation.

The image that comes next (Picture 1.9) is a chain of letters with ATCG and in the background out of focus is the hand with the little part of blue thread

⁶⁴ It is like that in every cell of our body, we have about 1 meter of DNA thread and it is a surprising amount

⁶⁵ But what is funny is that this thread has actually about 20 000 different genes...

(Picture 1.9) while Bye explains that several of the letters can be replaced with other letters in some of us, and these variations make us different.



Picture 1.9



Picture 1.10

In mid shot we see Anja who has the blue thread's fuzz over her hand pointing at it with the scissors. Anja explains that her results so far indicate that a small region at the chromosome 6 looks it has many of the genes that determine our basic fitness. Picture 1.9 and 1.10 are both iconic and symbolic. Iconic because we see the small little fuzz of the blue thread, and this represents a gene by metaphor. They are also symbolic images because they contain the chain for letters ACGT that stands for the base pairs in the DNA.

We see Anders taking a blood test and Arnt Erik Tjønnå explains that Anders falls in the category of non-responders of oxygen uptake, so that he can train a lot without increasing his oxygen uptake. This is the climax point of the narration where the public finds out that the main character does not have the fitness gene. Fossum's voiceover explains that 10-20% of us are non-responders. We see a group of people in front of the camera and about 10% of them disappear one by one (an iconic image using analogous relation). Anja explains that further research is to be made since the fitness genes are not yet found.

The following is something I determined as *the falling action*. Falling action comes after the *climax* and before the *resolution* in a piece. In this piece, the falling action shows Anders running outside while Anja explains that there are many benefits of training even though you are a non-respondent. The resolution of the piece comes next: Anders explains that he would like to run a half marathon and have more focus on other things besides just the increasing of the level of oxygen. Anja finally concludes by saying that whether you are a non-respondent or not, people should get out off the sofa. The piece finishes

while Anders runs as a symbol of hope and as a symbol that exercise has other good benefits than just increasing fitness.

The journalist visualized *Kondisgen* through film clips the production team filmed, some other times they used pictures that they bought from companies that produced them. For example, the unborn baby is taken from National Geographic. As for the image categorization according to Peirce, we see that several images acquired meaning to become symbolic images through the piece and the context in which they were presented. For example, people training in different sports became a symbol for “fitness”. The main character Anders Risan, participates actively and we see him running, taking blood and oxygen tests, he participated actively in the piece, so when they introduced Anders Risan was more as asking “Has he the fitness gene?”.

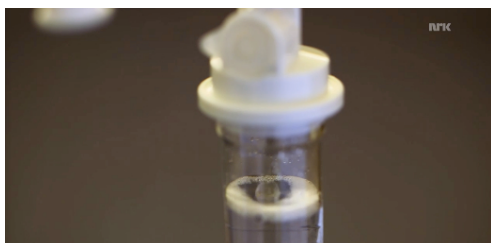
The piece uses the iconic images that become also symbolic in the piece of an unborn baby and a pregnant woman to refer that we all have DNA since before we were born. The journalist uses an iconic image by convention of the DNA (Picture 1.2) when she refers about the genes and DNA. The journalist also uses the iconic picture of a cell seen through a microscope (Picture 1.3) to refer to DNA. The core explanation of the piece is visualized by an iconic sequence by metaphor through the use of a blue ball thread that represents the DNA chain. Then the researcher explains that a gene will be so small as if we would cut just a millimeter of the blue thread from the ball. Later on, it is used an iconic image of a Lego block dispenser, to show how the blocks form the double helix. In the interview with Frida Krüger, she mentioned that the reason why they used this image is because it illustrated very well the gene variation. Peirce talked about this when he referred to the *Ground* where the object is seen through one certain aspect isolating a character⁶⁶. The piece had an iconic sequence by relation to illustrate that 10-20% of the population fall in the category of non-respondent to increase fitness. The piece finished with clip of Anders running as a symbol that he will continue training even though he falls in the category of non-respondent.

⁶⁶ Eco, *Kant y el Ornitorrinco*, p. 73

3.1.2 *Brystkreft* (Breast Cancer)

Brystkreft is a 4' 51" long *Schrödingers katt* piece from the program that was on air the 20th of September in 2012. The journalist that was in charge of this piece was Synnøve Ness and it was presented in the section *Fantastisk Medisin* (Fantastic Medicine). The piece is about how a woman prolonged her life due to the use of a medicine called Herceptin. The piece's intro starts when the TV host Eldrid Borgan introduces Karin, together with the doctor and researcher Inger Thune. Eldrid mentions that Karin had breast cancer spreading to the skeleton and the prognosis was bad. Then Eldrid states the possible solution for Karin's problem "*Men det fantes en ny og nesten uprøvd metode*"⁶⁷, getting the public's attention and allowing them to ask themselves "will this new and untested method help Karin?" We then see an image of an intravenous plastic tube and a wrist getting some fluid through the tube in Picture 2.1. This picture is a symbolic image for "treatment" that is being used along the piece several times. It is a symbolic image because it acquires its meaning by referring to "medical treatment" and also we know that those tubes are used to give medical treatment to the patients.

Inger Thune describes Karin's symptoms: strong pain between her shoulder blades and the right arm. *Schrödingers katt* introduces Karin by showing a shot of her. Then we see an indexical picture of Karin's x-rays pointing out the tumor with a red arrow (Picture 2.3). This last picture is iconic and indexical because it is an x-ray picture and we understand by likeness that it is the x-ray of a person. We can distinguish the silhouette of a person, and it is iconic because we know that what we see is the spinal bone. The red arrow indicates where the tumor is located.



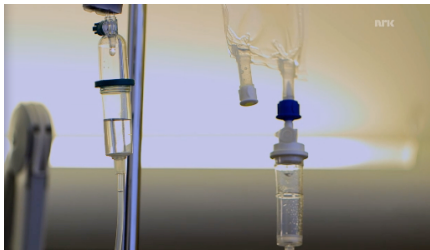
Picture 2.1



Picture 2.3

⁶⁷ But it existed a new and almost not tested method

What comes next is the Rising Action, where they show Thune walking from one room to another at the hospital while Eldrid's voiceover explains that they gathered a team of doctors to work on Karin's case. They show a picture of medicine tubes hanging from a metal rack (Picture 2.5). This last picture, as was mentioned earlier, becomes a symbol sign for medical treatment against cancer. They show an image of a 3D woman's breast (picture 2.6) close up indicating the place of the cancer. Picture 2.6 is an iconic picture because it represents the woman's breast by likeness, but it also is indexical because it points out where the tumor is. They come back to the shot where Inger Thune and Karin sit outside and say "*Kunne vi komme i gang med en helt ny medisin som hadde akkurat kommet til Norge?*"⁶⁸. Eldrid voiceover then presents the name of the medicine: Herceptin (Picture 2.7). They show an iconic image of the medicine Herceptin. It is iconic because it is similar to its molecular structure but in a much more simplified manner.



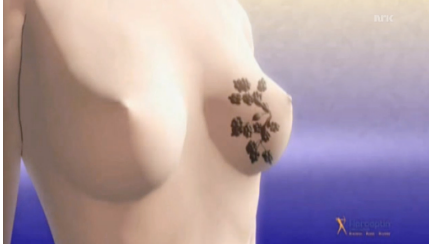
Picture 2.5



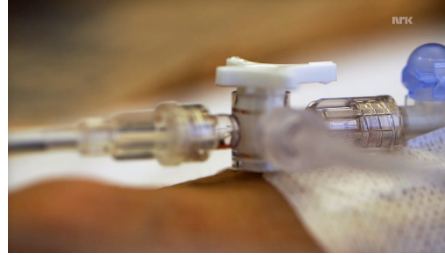
Picture 2.7

The Rising Action of the piece starts when Erik Wist, the leader at the Norwegian Breast cancer group, talks together with Inger Thune and Eldrid and explains that they started using Herceptin in 2005 to Karin's case, and they hoped for forgiveness instead of permission. The doctors are presented as heroes in the piece and take the risk to save Karin's life. Thune appears together with Eldrid explaining that they didn't really know for how long Karin had hope. A picture of the intravenous tube is shown again (Picture 2.9).

⁶⁸ Could we use a new medicine that had newly come to Norway

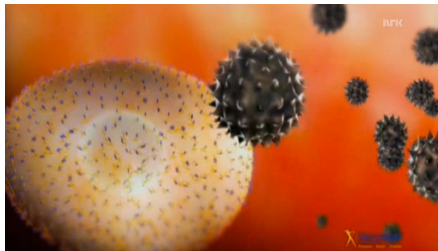


Picture 2.8

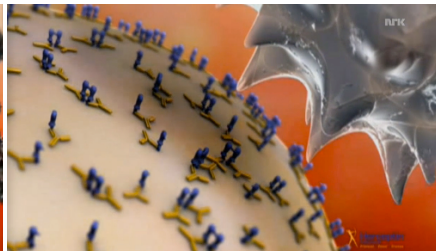


Picture 2.9

What comes next is the core explanation of the piece. The program host voiceover explains while an animation of some cells are being shown “*Denne nye medisinen er målrettet, det går rett på svulsten og bare på den*”⁶⁹. The animation shows some black balls and a big one with dark pricks on it (Picture 2.10) We see the surface of the big ball and something blue and yellow is sticking out of it (Picture 2.11). These two last pictures are both iconic and indexical because we can recognize that they are cells by likeness (we know that cells are round) and then we see how the dark spiked ball (the medical treatment) reaches the cell’s membrane. The dark color indicates the medical treatment needed, therefore it is an indexical picture. In picture 2.11 we can see indicated the HER2 proteins in purple color. Later we see a close up of the protein HER2 (Picture 2.12)



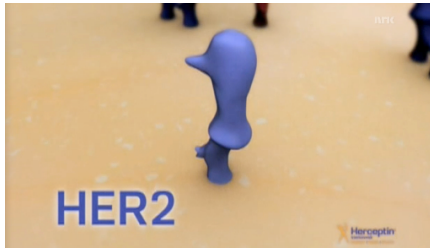
Picture 2.10



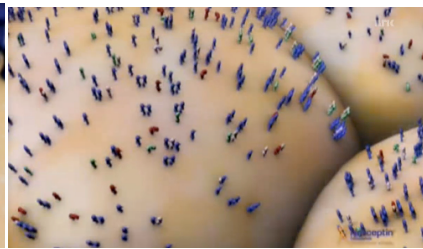
Picture 2.11

Eldrid voiceover explains that Karin’s cancer cells produce a lot of the HER-2 protein. Picture 2.13 is an iconic and indexical picture too because they show several cells together by likeness and we also can see indicated in purple the dots of the HER2 proteins. The sequence animation is an iconic and indexical visualization of how the medicine Herceptin works over the protein HER2 over the cell membranes, and all become the core explanation of the piece, showing how Herceptin works at a cellular level, making the unseen, visible. The colors used in the clip animation serves as a way to indicate the medical treatment and to point out the HER2 protein.

⁶⁹ The new medicine is specific and it goes right to the tumor and only to it...



Picture 2.12

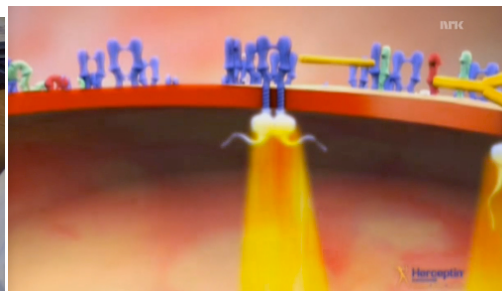


Picture 2.13

In Picture 2.14, we see the professor Lars Akselen drawing and explaining how the proteins over the cell membrane become hyper stimulated, so they grow and divide, rapidly, therefore the cancer tumor becomes more aggressive. Picture 2.14 is an iconic image because it resembles the cell membranes. The clip animation shows a yellow thing flying and landing over the cell membrane on the HER2 protein (Picture 2.15). This last picture is also an iconic and indexical image that shows how the medicine attaches to the HER2 protein. Lars Akselen explains that the treatment blocks the HER2 proteins on the cell membranes so the cancer tumor decelerates.



Picture 2.14



Picture 2.15

The climax is when Eldrid's voiceover says that Karin got the treatment and the tumor got stabilized so she could go home, and after eight years, she comes to the hospital every third week to get the medicine. We see Inger Thune sitting outside saying that they can't stop Karin's treatment. Then Karin appears sitting outside saying *"Det går veldig bra"*⁷⁰.

The resolution of the piece is by Erik Wist when he concludes while sitting at in his office *"Så hvis noen hadde sagt det til meg tidlig på 2000-tallet at det var mulig å behandle den typen kreftsykdommen i 8 år og at pasienten skulle ha*

⁷⁰ It goes very well

*det bra, så ville har sagt at dette var drømmerier*⁷¹. The piece ends with a shot of Karin walking outside in a beautiful spring day.

In general, the piece *Brystkreft* is visualized similarly to *Kondisgen*, by the use of video clips that the production team filmed and by clips that were bought. Both pieces introduce the main characters through an interview with them at the beginning and present the scientists also by interviewing them. Similarly to *Kondisgen*, some of the images become a symbol because of the context they are used and the repetition of them along the piece. An example of this is the image of the intravenous plastic tubes that becomes a symbol for “medical treatment”. Other images are used to explain where the tumor was situated, like Karin’s x-ray, which is an indexical image pointing out the tumor through an arrow. Another image that explains the location of the tumor is the 3D model of a woman’s breast, which is an iconic image. The core explanation is a clip animation about how Herceptin works at the cellular level where we can see how the medicine blocks the function of the protein at the cell membrane. This last image is an iconic image, and very pedagogic because of the use of bright colors and very simple shape forms. It is easy to understand what is happening. The handmade drawing from the doctor Lars Akslen is an iconic image that explains where the HER2 proteins are situated over the cell membrane. The conclusion of the piece is given by Erik Wist while Karin walks outside in a beautiful spring day, while they show the text *Dette gjelder 15% av alle brystkreftpasienter* (This is the 15% of all the breast cancer patients).

The main difference in the visualization strategies between *Kondisgen* and *Brystkreft* is found in the core explanation where *Kondisgen* uses the visualization strategy iconic by metaphor, while in *Brystkreft* they used a clip animation to illustrate how Herceptin works at a cellular level. Both ways are pedagogical because of its simpleness and because the scientific explanation is being traduced to a more common language that is reinforced with the use of this types of visualization.

⁷¹ If someone would have told me at the beginning of the 2000 that it was possible to treat this kind of cancer for eight years and that the patient would have it right, so I would have said that this was just a dream

3.1.3 Navlestrengblod Redder Liv (Umbilical Cord Blood Saves Lives)

Navlestrengblod Redder Liv is a 6'40" long *Schrödingers katt* piece from the program that was on air the 25th of October in 2012 in the section *Fantastisk Medisin* (Fantastic Medicine). The journalist that was in charge of this piece was Frida Krüger. The piece is about how umbilical cord blood saved the life of Marianne, a patient with damaged bone marrow due to chemotherapy and radiation. The piece's exposition starts with the voiceover of the program host says "Et fly har landet på Gardemoen med en helt spesielt last...På Rikshospitalet skal pasienten med blodkreft med noen få dager få livs nødvendig behandling"⁷². The challenge is not yet presented, but the public knows now there is a connection between the load and the patient with few days left. We see an airplane landing and a car then drives to Radium hospital in Oslo. The load is transported to a hospital room. A woman with blue gloves opens the package while some gas comes out of it and gets a small frozen bag with blood. Eldrid asks the woman about what it is, and the woman answers that it is umbilical cord blood that traveled from a blood bank in Europe (Picture 3.1). Picture 3.2 is an iconic and indexical image animation clip of an unborn baby. Is iconic because it resembles to an unborn baby and the umbilical color turns in red color pointing out where is situated. Then we see a clip of a real umbilical blood (Picture 3.3), this picture is iconic because it is a real film clip of an umbilical cord.



Picture 3.1



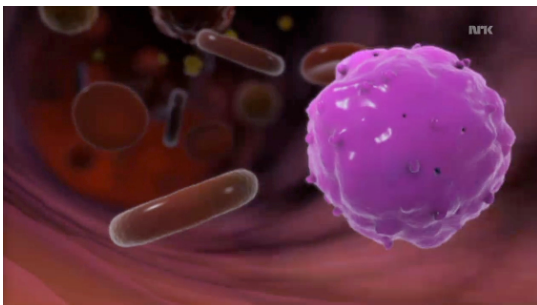
Picture 3.3

The piece's challenge is stated while we see an animation of several cells in the blood torrent and Eldrid's voiceover explains that stem cells have the task to produce new blood cells that can save a life. The animation is taken from the Cord Blood Registry.

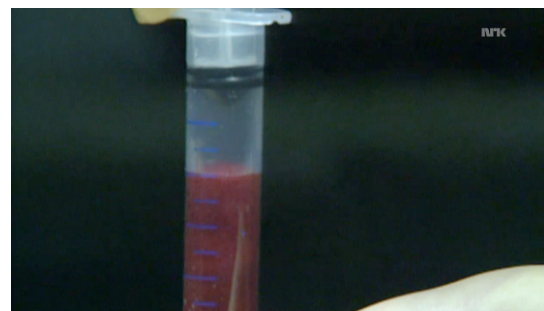
⁷² An airplane has arrived at Gardemoen with a very special load that will go to Radium hospital in Oslo. At Rikshospitalet a blood cancer patient with few days left will receive the needed treatment

Grete S. Andreassen, bioengineer at the department of cell therapy at Radiumhospitalet in Oslo talks with the program host Eldrid at the hospital. Andreassen examines the number at the blood package and then she stores it in a special refrigerator with fluid nitrogen. We can see again the animation of the blood cells in the bloodstream (Picture 3.4). The animation clip is an iconic image because we can see the different blood cells in the blood torrent in different shapes and colors.

The presentation of the recipient of the stem cells follows: we see a shot of a patient in bed and Eldrid's voiceover introduces the main character Marianne, whom has blood cancer. Marianne acts more as a recipient to the treatment but does not participate actively in the piece due to her situation. They introduce a second character: Hege Trondsen, whom had cancer in 2001 and has gone through the same treatment, as Marianne will. We can see the animation of blood cells at the bloodstream again (Picture 3.5). Then we can see a plastic tube that is filled with blood (Picture 3.6). Picture 3.5 is an iconic image because we see the blood cells iconically (alike), but also it is an indexical image because we can notice that a pink cell is highlighted among the other cells by a bright pink color, to point out that this is the stem cell that we need to notice during the piece.



Picture 3.5



Picture 3.6

Picture 3.6 is a symbolic image that represents the stem cell treatment, but also it is an iconic picture because it is a real clip from blood in a tube.

They introduce Lorentz Brinch, doctor at the department of blood sickness at Rikshospitalet in Oslo. He is interviewed by Eldrid and he points out that there are principally three different forms of donors they use: one through family (We see a clip of a doctor holding a plastic package with blood and hangs it on a

steel stand. Then we see how the blood starts dropping from the blood package to a thick plastic tube that has a thin plastic tube under); second are the non-relative donors from an international register; and third, which is a small percentage, where they don't find a donor, use the umbilical cord blood. (While he says this, we see Picture 3.5. We see the frozen blood package from the beginning (Picture 3.1). Lorentz explains further, that the use of umbilical cord blood is the last-chance possibility.

What follows next is the core explanation of the piece. They show the animation of the bloodstream with Eldrid's voiceover "*Stamcellene i navlestrengsblod er yngre og ikke så moden som stamcellene i beinmarg fra en voksen donor. Det tar derfor lengre tid å få å produsert nok blod*"⁷³. Hege Trondsen and Eldrid walk outside in the garden; afterwards we can see the clip of the small frozen package with blood (Picture 3.1). Hege says that it was very strange to think that the small bag could save her life and give her a worthy life again. The little bag with umbilical cord blood becomes a symbol for saving a life.

The rising action follows when we see a small clip of the hospital in Oslo and then a wide shot of the hospital room with Marianne laying in bed with Eldrid's voiceover explains that Marianne is going to receive the same treatment as Hege. We see a mid shot of Grete walking in the hospital and then talking on the phone control before she refreeze the cells. They open a round refrigerator, and the package is washed with water. Then one of the bioengineers sets the package in one crystal box. We see Grete going through a sterile room with the blood package in her hands. In mid shot we see how she turns the package upside down and hangs it on a stand (Picture 3.11). The blood goes through a thin plastic tube towards a plastic bag that also hangs on a stand (Picture 3.13). Then Grete stores the plastic bag it in a thermal box and Grete says that the product is ready to travel to Rikshospitalet with the cells. The picture 3.13 can be seen as a symbolic image because it represents the blood cells that will save Marianne's life.

⁷³ The stem cells in the umbilical blood are younger and not so mature as the stem cells in the bone marrow of a grown up donor. Therefore it takes longer time to produce enough blood



Picture 3.11



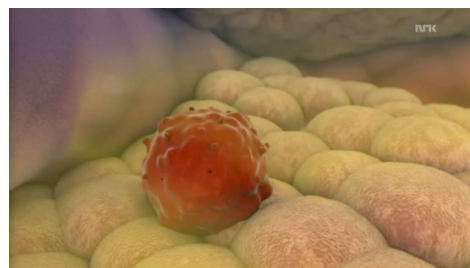
Picture 3.13

The climax is when we see Grete with the thermal box getting into the car ready to save Marianne's life. They travel to Rikshospitalet and the doctors receive them at the reception. Grete asks them *"Pasienten er klar?"*⁷⁴. Then we see them all sitting inside a room and Grete gives the package to one of the doctors *"Vær så godt . Ta godt være på det"*⁷⁵.

The falling action is when Marianne finally gets the treatment as follows: we see a shot of Marianne at the hospital bed, the doctor gets into the room and then Lorentz's mid shot explains that the bag is connected to the hose the patient has on the breast so the cells circulate arriving to the bone marrow and settle there, then they can produce blood. While he says this, we see a shot of the blood bag being hanged on the stand and the hose over the patient's chest, then we see the blood dropping from the bag into a thick plastic tube with a thin tube connected to it from the bottom (Picture 3.14). Picture 3.14 is a symbol of hope to Marianne. We see again the animation of the bloodstream traveling and one of the blood cells goes through the something like the vessel walls (Picture 3.15). This last picture is an iconic image because we see the cell (by likeness) go through the membrane, finding its way to the bone marrow. But it can also be an indexical image because the stem cell is pointed out through its bright red color.



Picture 3.14



Picture 3.15

⁷⁴ Is the patient ready?

⁷⁵ Please take good care of it

The resolution is given when Lorentz answer Eldrid's last question "*de finner veien selv til beinmargen?*"⁷⁶ and Lorentz finally answers, "*Ja, det er jo et mirakel!*"⁷⁷.

The piece *Navlestrengsblod* is visualized through the use of filmed clips from the biomedical procedure comprising the preparation of the blood that will be transplanted and the reception of the blood by the patient Marianne. The bioengineers are interviewed and also the doctor Lorentz Brinch. The main character is not interviewed because of her delicate health situation but instead is Hege Trondsen interviewed because she went through the same treatment that Marianne will go through. Other images that the production team at *Schrödingers katt* used are the video animations that were bought from a firm that produced them, in the same way as *Brystkreft*.

The piece starts with an image of an airplane landing. After some images a "little frozen plastic bag with blood" is introduced to be the very special load from the airplane that landed at the beginning. This little blood package becomes a symbol for the medical treatment required to save Marianne's life. And later on we understand that such a little bag meant also hope for Hege Trondsen, the second character that went through the same treatment that Marianne would have. The core explanation of the piece is the animation of how the stem cells travel through the blood torrent and find their way to the bone marrow. This clip is obtained from the Cord Blood Registry and is an iconic image because they represent cells by likeness. The shapes of the cells are easy to distinguish and we understand they are blood cells because of its shape and color, and it is easy to assume that it is the blood torrent. By iconic resemblance we can distinguish some of the cells that travel in the blood torrent such as red blood cells and plaquettes. Along the piece we can understand that the pink round cells are the stem cells, but this requires explanation from the host's voiceover and the scientist Lorentz Brinch. Therefore the stem cells are both iconic and symbolic. It is iconic because they resemble to stem cells by

⁷⁶ They find the way by their own to the bone marrow?

⁷⁷ Yes, it is a miracle!

likeness, and symbolic because it requires the information of the context to understand that they are the stem cells.

In comparison with the other two pieces, *Navlestrengsblod* uses a second character very wisely because ethically it was not possible to film Marianne so much due to her delicate health situation, so *Schrödingers katt* solved this is a good way by interviewing Hege Trondsen. The clip animation in the core explanation was a good way to visualize the stem cells and how they find their way to the bone marrow. In likeness to *Brystkreft* and *Kondisgen*, some images become symbolic through the piece, in this case "the little bag with blood" is the symbol used in the piece that means hope for life.

3.2 The Piece's Narrative Typology

The reason why I chose to do a narrative typology of the program is so I could find out what kind of pictures they use to visualize the different parts of the piece, also because I knew this would help me to understand the general structure of the piece and to find out if there is a similitude (if there are similarities) between the way they visualize the different narrative parts in the three pieces.

We can find a similar narrative typology in the three pieces, and in this part of the work I will write about it and discuss it. The pieces' narrative components are: 1) Introduction or exposition: where they introduce the title, the challenge, the main character and get public's attention. 2) The rising action: where they introduce the researchers and present the solution to the challenge. 3) The core explanation: here they gather the important information about the researcher's investigation, or the mechanism to solve the challenge. 4) The climax: is given when the main characters get everything in place to solve their challenge or problem. 5) The falling action is given when they explain what happens with the main character after their challenge is solved. 6) The resolution is the conclusion of the piece, which can be given by a phrase together with an image that concludes the piece.

1) Exposition

The title: The title of the piece is presented after the breaker of the section “*Fantastisk Medisin*” breaker in *Brystkreft* and *Navlestrengsblod*, but in *Kondisgen* it starts directly with the title of the piece.

Main Character: The three pieces have introduced one main character. In *Kondisgen* and *Brystkreft*, they use only one main character that participates actively both in interviews and taking part of the treatment (Karin went through the Herceptin treatment) or research (Anders takes oxygen uptake and blood tests). In the case of *Kondisgen*, they also add why this information is important to the public (fitness is important to us because is related to cardiovascular diseases and other sickness). Marianne is not interviewed due to her delicate health situation, but this problem is solved smartly by *Schrödingers katt*, by interviewing Hege Trondsen, whom has gone through the same treatment as Marianne will go through.

The problem or challenge: In *Kondisgen* the challenge is to find out if Anders has the fitness gene. In *Brystkreft*, for instance, the challenge is presented when they introduce that Karin had cancer and there was a new treatment that could save her life. In *Navlestrengsblod* the challenge is Marianne getting the treatment of umbilical cord stem cells.

2) The Rising Action

In this part of the piece, **the researchers** are introduced (we see a clip of them presenting their research or being interviewed by the program host). In *Brystkreft*, for instance, the doctors gather to help Karin. Erik Wist proposed the use of a new, not yet approved medicine called Herceptin. In *Navlestrengsblod* the bioengineers explain how the umbilical cord blood is prepared before it is ready to be used in Marianne. Later on, Lorentz Brinch explains the different ways for a patient to obtain stem cells. In comparison with the other two pieces (*Kondisgen* and *Brystkreft*), Lorentz, just provide information and is not involved actively with the main character. In *Kondisgen*, *Schrödingers katt* interview the researchers Anja Bye and Arnt Erik Tjønnå.

The solution to the problem: The researchers in *Brystkreft*, act as heroes because they get into the adventure of using a new not yet approved medicine in Norway, but they had success and preserved Karin’s life. In *Navlestrengsblod*, the rising action is when Eldrid mentions that Marianne will get the treatment

that day. Then we see how the bioengineers prepare the blood to be transfused to Marianne

3) The Core Explanation

In *Kondisgen* we see a pedagogic explanation sequence, by what Peirce would call iconic by metaphor image. This core explanation includes a blue thread, which Anja Bye compares with the DNA. Later on, she cuts a little part with the scissors and compares it with a gene, then she explains that an alteration in the letter sequence of that gene at the chromosome 8 is linked to fitness. In *Brystkreft*, for instance, the core explanation is an animation of how Herceptin works to block the HER-2 proteins on the cell membranes. In *Navlestrengsblod* the core explanation is made by an animation sequence that explains the stem cells transplantation and we see the blood torrent, the blood cells and stem cells traveling through the vessels. Eldrid and Lorentz Brinch's voiceover give the explanation.

4) The Climax

In *Kondisgen* the climax is when they find out that Anders is a non-respondent, and he is interviewed. In *Brystkreft*, Karin is treated with Herceptin and they show an image of an intravenous tube with medicine (Picture 2.17) while the program host voiceover explains that Karin got the medicine and her tumor was stabilized. In *Navlestrengsblod* the climax is when the umbilical cord blood is ready to be transplanted to Marianne. We see a shot of the blood in a plastic bag, then the program host and the bioengineers transport it to Rikshospitalet.

5) Falling Action

In *Kondisgen*, the falling action is when Anders changes his fitness goals and changes his focus of increasing oxygen uptake to increasing strength. We can see Anders interviewed and running. In *Brystkreft*, the falling action is when Karin says "*Det går veldig bra*" (It is fine) Karin feels well after the treatment. In *Navlestrengsblod* for instance, when Marianne finally gets the treatment

6) The resolution

In *Kondisgen* when Anja Bye says that no matter if a person is non-respondent or not, they should get off of the sofa and train. *Kondisgen* image conclusion is a clip of Anders running. In *Brystkreft*, Erik Wist, states that it was a dream at the beginning of the year 2000, that a patient with the same type of cancer as Karin could prolong her life for eight years. In *Navlestrengsblod*, the resolution

is when the animation illustrates the stem cells arriving at the bone marrow and Lorentz closes the piece by saying that it is a miracle that they find their way by themselves to the bone marrow.

3.3 The Pieces' Image Categorization

In general, the three pieces present the main characters by interviewing them or by showing a picture of them, while the host's voiceover introduces them. To broaden public's knowledge, they use clips of interviews with the scientists to explain their research or the medical procedures. In the three pieces, they use iconic images known to the public such as DNA molecule, cells and blood cells, along the pieces as a starting point to give further new information. To illustrate the core explanation of the piece they used an iconic metaphor to explain Bye's research (*Kondisgen*) and animation clips to explain the Herceptin mechanism (*Brystkreft*) and the stem cells way to the bone marrow (*Navlestrengsblod*). They use indexical signs to point at specific things such as an arrow in Karin's x-ray image and the umbilical cord (Picture 3.2) in *Navlestrengsblod* through color change; and the color change in the letter chain in *Kondisgen*. They use images that become symbols during the piece. For example, people training become a symbol for fitness, plastic intravenous tubes become a symbol for medical treatment (*Brystkreft* and *Navlestrengsblod*) and the small blood bag becomes a symbol for hope in *Navlestrengsblod*. In *Kondisgen*, the image of a pregnant woman and an unborn baby becomes a symbol for << DNA >>. In *Kondisgen*, they use iconic image of relations to illustrate the percentage of people that is non-respondent to the increase of oxygen uptake.

They used an iconic sequence by metaphor to visualize the research of Anja Bye by comparing a blue thread to the DNA and a small part of that thread to a gene. They end the pieces with a clip of the main character together with the researcher's conclusion.

4 The interviews with Scientists and Journalists

4.1 Imagine There Is A Cat Inside The Box...

In this chapter I will write about the interviews I had with the scientists of the pieces: Anja Bye (*Kondisgen*), Inger Thune, Erik Wist (*Brystkreft*) and Lorentz Brinch (*Navlestrengsblod*). I asked them about their experience in sharing knowledge to with the production team of *Schrödingers katt* and also about what strategies of visualization they normally use to share the same knowledge with their patients or their own audience (Anja Bye does not have patients but she has participated in conferences). The interview transcripts can be found under Attachments 4, 5 and 6.

In general, all of the researchers mentioned that they had a good experience being interviewed by *Schrödingers katt* and that the journalists were well informed about the topics they would cover in advance before they met the researchers. All of them said that they could share all the information they needed, except for Lorentz, who said that he would have liked to share even more information. All the researchers said that *Schrödingers katt* illustrated the information given well. Anja Bye and Lorentz Brinch mentioned that they were constantly updated during the piece's production and that they could see through the images *Schrödingers katt* used and approved them before the piece was on air. They also gave their opinions all the way. Anja said that she liked the idea of the thread ball to illustrate the piece.

Anja Bye used a Power Point presentation to visualize her research to other scientists during a conference (image 4.1). From image 4.1, we can appreciate an indexical and symbolic image of the DNA molecule showing the letters that form the DNA sequence. This image is not iconic because it does not resemble the double helix DNA, and it requires the context to be understood. The context is the text "DNA molecule" and the letters CTAAGTA. Bye uses this image indexically to point out the gene variation by the highlighted letters in red and purple. In image 4.2 from *Kondisgen*, *Schrödingers katt* uses almost the same visualization strategy to Bye in addition to the background with the hand with the blue fuzz. *Schrödingers katt* uses the letters that symbolizes the DNA

molecule highlighting the "A" in red that points out gene variation, therefore image 4.3 is both indexical and symbolic. Both images resemble but *Schrödingers katt* strengthen the symbolic meaning with the blue thread fuzz background, which reminds the viewer the gene. We need to remember that the blue thread fuzz already is part of the of the viewer's *encyclopedia* (if the viewer had seen all the piece from the beginning), therefore the viewer has the knowledge that the fuzz symbolizes a gene.

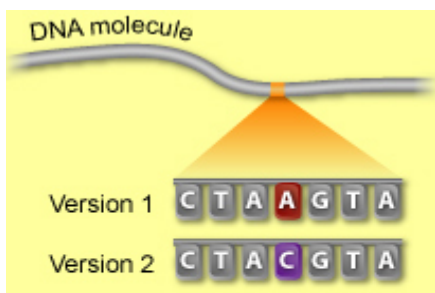


Image 4.1



Image 4.2

Inger Thune and Erik Wist, two of the scientists at *Brystkreft* made remarks about the importance of the journalist's knowledge of the scientific topic in advance before they writing scientific papers for a general audience. Erik Wist had one observation from the piece, and it was about how they presented Herceptin in such a way that could have sounded like all the patients with cancer could be treated the same way as Karin. At the end of the piece there is a text that says "*Dette gjelder 15% av alle brystkreftpasienter*" (This is 15% of all cancer breast patients). So that the public will not believe that all the breast cancer patients can be treated with Herceptin. Wist mentioned that it could be dangerous when journalists give wrong information to the general public, therefore any journalist that covers scientific researchers, must choose meticulously the information they use. In Wist's opinion journalists have a great ethical responsibility to bring the precise information to the public.

Erik Wist visualizes the same information to his patients with a self-made drawing while he explains it. A drawing very similar to the one *Schrödingers katt* captured by professor Lars Akselen (Image 4.5). Inger Thune explains the treatment to her patients through a drawing. In the first drawing (Image 4.3) we see the response statistics in cancer treated patients. In 1970's the response rate to the treatment was 50%, while in 2010 the response rate was 85% and

by 2020, the response rate will be 95%. This image was not part of the piece in *Brystkreft*, but it is used by Inger Thune to explain the percentage of recovery from cancer through medication to her patients.

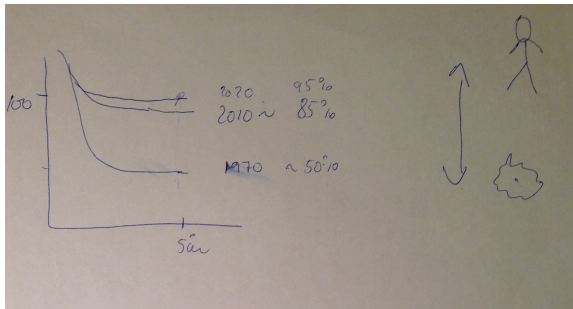


Image 4.3 Response rate to cancer treatment

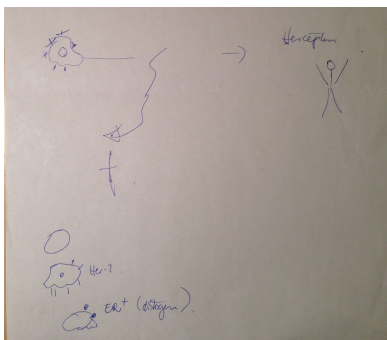


Image 4.4

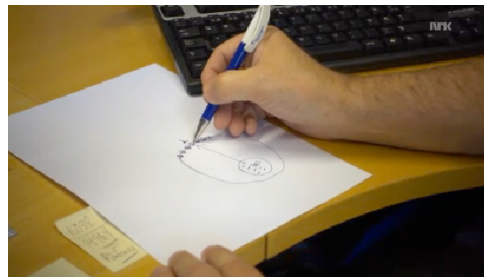


Image 4.5

Inger Thune also made the Image 4.4, and we see how the medicine Herceptin attaches to the HER-2 proteins on the cell membrane. These receptors on the membrane are in charge of the cells reproduction. A great amount of protein Her-2 leads to rapidly reproduction to cells into a tumor, but Herceptin blocks the function and the cells break down their reproduction. Image 4.4 is an iconic image because it resembles the cells and the receptors at the membrane. Image 4.5 is an iconic image from *Brystkreft*, here we can see the similarity to image 4.4, explaining how the receptor is situated in the cell's membrane.

Lorentz Brinch at Rikshospitalet in Oslo was interviewed for the piece *Navlestrengsblod*; he mentioned that dealing with scientific knowledge is like learning a new language. He also mentioned that *Schrödingers katt* journalists were well prepared in advance before they interviewed him, but not always all journalists covering scientific issues are well prepared. But not always are all journalists covering scientific issues well prepared. I asked him about the way he shares information about stem cells treatment to his patients and he said that he gives them a brochure with all the necessary information, but mainly he

explains them verbally what they will go through and tells them that they need to read the brochure. His patients must know the risk about the treatment before they are exposed to it. I asked him about how he got in contact with *Schrödingers katt*, and he mentioned that they didn't contact him directly, but rather they contacted first the Norwegian Blood Registry, who then contacted him and then he asked the patient Marianne if she wanted to participate in the piece. He also asked the patient Hege Trondsen who had gone through the same treatment.

Lorentz said that the animation they used in the piece was good and showed the point of how the stem cells find their way to the bone marrow. He talked with the *Schrödingers katt* team for a long time and had time to explain to them what he thought was important. He would of course have liked to have more information in the piece, but he said that he was being asked about his opinion while they made the piece. He thinks that they grabbed the important points out and used them, and were smart to obtain the essential information. His suggestion to all journalists covering scientific issues is that they are well prepared in advance before they do the interviews about the topic they will cover. And it is very important not to create unnecessary media turmoil in general public, so journalists should be more objective.

4.2 Those Who Are Curious About The Idea Of A Cat In The Box

In this chapter section I will write about the journalist's experience in dialogue with scientists and the piece's visualization process. I interviewed Frida Krüger and Synnøve Ness from *Schrödingers katt* whom made the pieces *Kondisgen*, *Brystkreft* and *Navlestrengblod* (Attachments 7, 8). *Brystkreft* and *Navlestrengsblod* are part of a series called "*Fantastisk Medisin*" launched in the Fall 2012, about the fantastic medical research that happens in Norway, they have focus on the technology, method and scientist⁷⁸.

Frida Krüger mentioned that some of the images she used in *Kondisgen* are from National Geographic Norway. They have a policy that if *Schrödingers katt*

⁷⁸ Krüger, Frida (2013): Interview made 4th of April.

needs a picture, they can use them by crediting them because of the copyright. Some other pictures are taken from a Swedish program at SVT through Norvisjon that works with the channels in the Nordic countries such as Norway, Sweden and Denmark. They have agreements so that they can use their pictures and exchange pieces and documentaries. I asked her about the visualization strategy with the blue thread and the fuzz, she said that they like this kind of visualization (Iconic by metaphor) because they can get tired of just using clip animations. In the 2012 season, *Schrödingers katt* used this kind of visualization strategy in other pieces, where they used balloons and snowballs. She mentioned that the Lego dispenser (Picture 1.8) explains gene variation, and that image explained that specific aspect that she wanted to point out. According to Peirce, a person that faces something new will take one characteristic of the object and isolate it; Krüger uses this specific image to point out that specific aspect she wants to communicate to the public: gene variation.

Krüger mentioned that the main challenges of covering scientific issues and interviewing scientists are that many times the journalists start from scratch about a certain topic, and science has a broad spectrum of nuances about an issue, therefore, it is important that the scientists understand that the journalist cannot know everything about a topic. So in order to communicate things right, they need to understand it first. This last exemplifies clearly what Eco wrote about *Firstness*, that a person before something new will take one first aspect of the object and understand it before the person takes into consideration another aspect. According to Frida, it is important that journalists are allowed to think out loud and use good time with the people they are going to interview and film in order to get to know them. If scientists want the issues to come right, they also need to use time with them. According to Krüger, the information needs to be “chewed” and then they can ask the scientists “can I say it this way?”, “Can I say it so easy?”, and the scientists can give their opinion. Frida mentioned that many times the scientists get surprised that it is possible to say things right in an easier way. Journalists need to do abstraction of a lot of information in order to use it further.

Krüger was also the journalist of *Navlestrengsblod*, she said that it was a challenge to film that piece because it was a linear process, so it was very important for them to be there and follow the process. She mentioned that the blood came the same day that Marianne would get it; therefore they planned in advance how they would film it because they would do it in a very controlled and sterile laboratory. It was very important to have good communication with the bioengineers. The other images were taken from You Tube from a firm in USA that works commercially with them. They bought the permit and credited the image. She mentioned that they showed Lorentz Brinch the clip animation that they had plan to use before the piece was on air and approved it. She said that it is important for them that the scientists see the pieces in advance before they are on air.

Synnøve Ness was the journalist at *Brystkreft*, and she mentioned that the picture and animation of Herceptin and how it works at the cellular level is from a medical firm. In regards to working with scientists and scientific issues, she mentioned that there is a challenge to popularize, and make the information available for a lot of people and to make the scientists be a part of this. They sometimes challenge them to “play” with them, because in order to produce TV, they need to do a lot to communicate knowledge. Some scientists think it is fun and interesting, but it was not like that 10 years ago. Ness mentioned that they need to explain new scientific words to the public in a way they will understand, but they are not able to explain everything about all new concepts and words. Again, this last part exemplifies what Eco described about the approach of a person through the *Ground*, by focusing on one quality of the object and isolating this quality before they take into consideration a new quality. They need to simplify a lot of facts and information, but not all the nuances of a topic, so they need to choose what they will use in the piece. The scientists should be willing to let go of some of the nuances, so that the public will be allowed to get an issue, a story, and Ness said that it is better to get something, than nothing at all. Both Synnøve Ness and Frida Krüger mentioned that science has a wide spectrum of nuances in one specific topic; therefore they need to do a great work of abstraction of scientific information.

5. Discovering the Cat Through Eco and Peirce

As shown in this thesis, it is possible to apply Peirce's theory to the way *Schrödingers katt* chooses their images to transfer scientific knowledge to the public from the researchers. The purpose of this thesis has been to focus on the communication process between scientists and journalists. The process of knowledge communication from *Schrödingers katt* to the public would be part of further analysis, which implies the possible use of a focus group and interviews with the target group.

From Umberto Eco's and Peirce's semiotic theory in Chapter 2.3, we can assume the following as a possible communication process between journalists and scientists: When before new knowledge journalists constitute a rule; then based on their *encyclopedia* they can reformulate "the rule". When something is unclear for them, they would create hypothesis 1, and turn back to their Dynamical Object (which in this case is the scientist). Journalist's perception is reached through an idea or an image. They refer again to their own *encyclopedia*, and when they admit that the idea or image they had was wrong; this makes them correct their "rule" or create hypothesis 2 that will go through feedback one more time. If hypothesis 2 is right, the journalist will use it further, if not, the journalist will create hypothesis 3 that will go through feedback again, and so on until the journalist finds an acceptable hypothesis he can use in his or her piece.

According to the interviews with the scientists and journalists from *Schrödingers katt*, the model would be as follows:

The process starts when the journalist approaches the scientist with a specific question (for example, "what is *gene variation*?"). The scientist's answer becomes knowledge that the journalists need to compare to their *encyclopedia* (The scientist might answer "*gene variation* is when the gene has other base pairs than are normal"). Through his *encyclopedia* (the journalist knows that DNA is formed by base pairs A, C, G, T), he might reformulate the "rule" about this topic after the feedback and edict a judgment, or will create a hypothesis (hypothesis 1) that will go back to the *Ground* through feedback. If hypothesis 1 is correct (The journalist might ask "is *gene variation* when the base pairs

AACAA are changed for AAGAA where the “C” is replaced for “G”?), through feedback (The scientist might say “yes, that is an example of *gene variation*”), the journalist will use the information in the piece.

From the interviews with the researchers and journalists, we see that the communication process occurs while the journalist works with the issue. Anja Bye and Lorentz Brinch mentioned that they were asked several times their opinion about the visual media that the journalist Frida Krüger planned to use (the iconic metaphor of the blue thread in *Kondisgen* and the stem cell animation clip from *Navlestrengsblod*). If the hypothesis 1 is right, the journalist will use it further either as an idea or an image. If the idea or image is wrong, the journalist will change the hypothesis 1 for hypothesis 2 and it will proceed to further feedback. If hypothesis 2 is wrong the process will be repeated with hypothesis 3 and as many hypothesis are needed until the scientists approve the hypothesis. We need to take into consideration that journalists will use an image that they think the public will understand according to their *encyclopedia*. But this last step is not part of this Master Thesis.

If we come back to the example of the rhino from Marco Polo, we see that he had no human feedback to correct his first hypothesis because no one else had seen a unicorn before. In contrast with Marco Polo, the journalists have a subject (the researcher) that is in contact with the unknown (The research) and whose *encyclopedia* has a broad specter to emit a judgment that will become an idea or an image more suitable for the public’s understanding the more scientists and journalists interact with each other. During the piece production, the journalists are in contact with the scientists, asking them their opinion about the images they choose. So in this way, the hypothesis from the journalists get constant feedback about which images to choose in order to use the correct ones that the journalists think will communicate more accurate scientific knowledge from the researchers to the public.

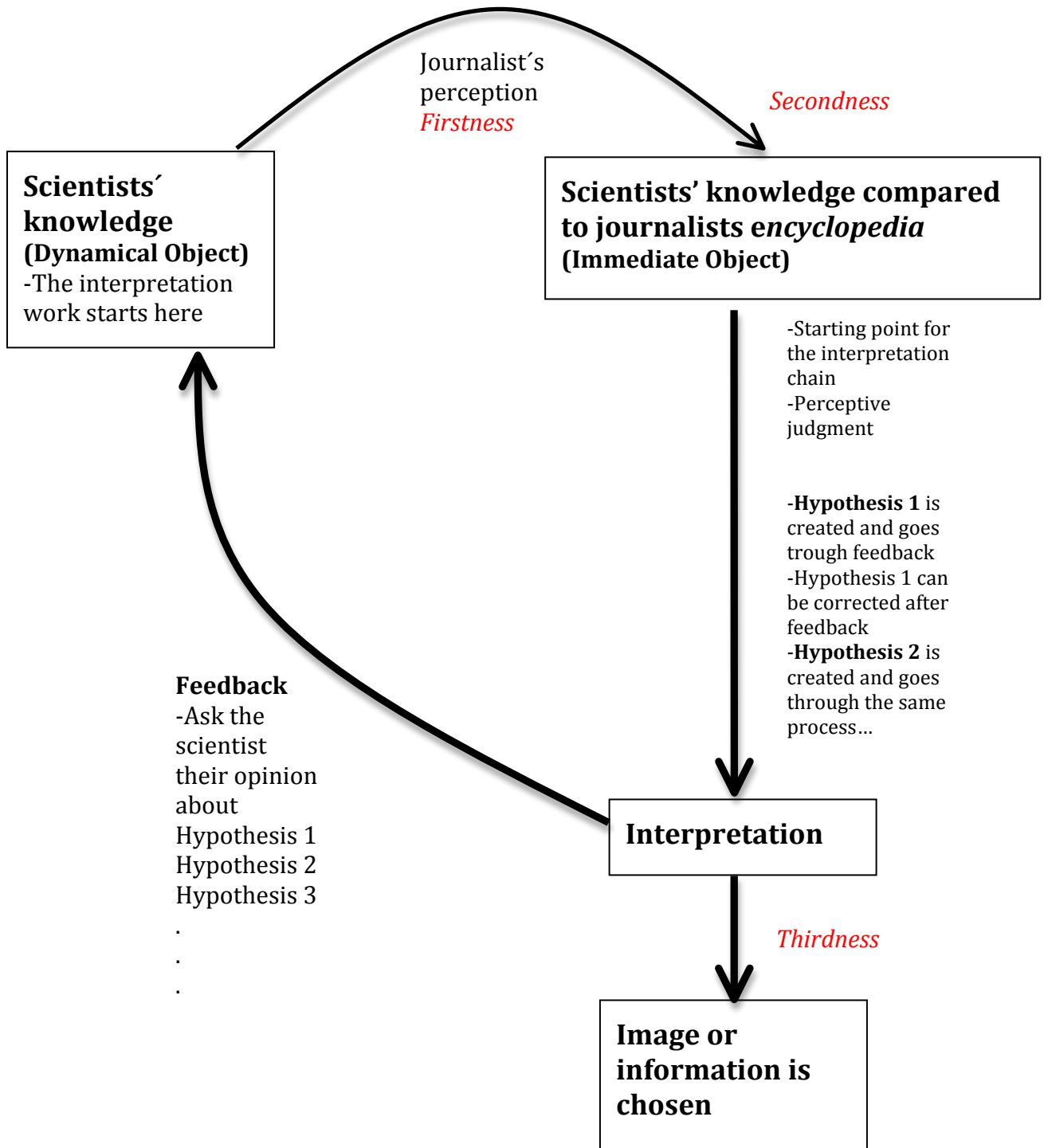
As Synnøve Ness pointed out (Attachment 8), they need to simplify a lot of facts and information; therefore they can’t use all the nuances of one topic in the production of a piece. So it is important that scientists are also willing to let go of

some nuances, in order that the public can understand certain aspects of the knowledge they are abstracting. Peirce mentioned that the *Ground* is the first way to considerate one object in one specific aspect⁷⁹. So the *Ground* is not the totality of the characteristics that compose the term but rather the attention is focused in one element at the time neglecting others. The journalists take one specific aspect in the broad specter of a topic and make the first hypothesis, which will be exposed to the scientist through feedback. If the hypothesis 1 is right, it will be used further.

Frida Krüger mentioned the importance of good communication with the people they are going to film and of using time with the people involved to get to know them. It is very important for both of them to receive feedback from the scientists and ask them about how they can explain the information further. Frida for instance, said that they ask scientists “Can I say it this way?” “Can I say it so easy?” then scientists will give their opinion. Sometimes the scientists become surprised that they can say things right in an easier way. The challenge is to simplify information; they must do a great work of abstraction about a topic that has several nuances. So the process of choosing the right information to use further in the piece depends greatly on the feedback the journalist get from the scientists. And as they get more the feedback from the scientists, the closer the gap between the *encyclopedia* from scientists and public and the reach public’s understanding will be. So in this way journalists are the mediator between scientists and general public. The summary of the communication process of knowledge between scientists and journalists is illustrated in the image 5.1. I made this model after the study and discussion of the pieces and the interviews with the scientists and journalists. Image 5.1 is very similar to Image C1 from chapter 2, but Image 5.1 is applied directly to the communication process between journalists-scientists seen through the theories of Umberto Eco and Charles Peirce.

⁷⁹ Eco, *Kant y el Ornitorrinco*, p. 73

Image 5.1 Communication process journalists-scientists



6. Conclusion: When The Cat Becomes Visible

The *Schrödingers katt's* team that produced the pieces *Kondisgen*, *Brystkreft* and *Navlestrengsblod*, made a great effort to visualize the right information. According to the scientists, the images on the pieces were used properly and through feedback the scientists approved them before the pieces were on air. The production process included research, interviews with the scientists and patients (or the main character), filming and edition. The visualization strategies that the journalists used depended greatly upon the feedback they got from the scientists. Umberto Eco's theory describes the process that occurs in a person before something new, and the way the person understands it and emits a judgment after feedback (coming back to the *Ground*). The feedback will be necessary until the journalist can emit a judgment about the new scientific knowledge. In this study we clearly observe how the *Schrödingers katt's* journalists get feedback from the scientists until they form a judgment about the new knowledge that can be used in the piece. Some images on the pieces became a symbol because of the context in which they were presented, other times the journalist used well known iconic images (such as the DNA double helix molecule), in another case the journalist changed the type of visualization strategy through an iconic metaphor sequence (the blue thread fuzz in *Kondisgen*), other times the journalist visualized the pieces with the use film materials from other sources such as National Geographic or other scientific TV programs.

There is a great responsibility from both journalists and scientists to bring the right information to the public. The scientists can contribute greatly to the public's scientific knowledge through serious TV popular science programs, but it requires time and effort to share this knowledge. The responsibility to all journalists that cover scientific issues is to be serious and prepare in advance before they interview scientists. The journalists must have in mind that the information they choose need to be correct, even though they can't cover all the nuances from a topic, those nuances should be correct. The problem is when non-serious journalists cover a scientific issue without the proper preparation in

advance before the interview with the scientists, with their goal being only to write something that will “sell”. This could create unnecessary turmoil.

From my point of view, one of the main strengths from the *Schrödingers katt's* journalists is the way they build a “relationship” with those who will be part of the pieces, because they take the time to get to know the scientists and patients, so they the needed feedback. The communication process through feedback makes the gap between journalist's *encyclopedia* and the scientist's *encyclopedia* become smaller. After this process the scientist and the journalist could talk the same *language*, but it requires time and will from both sides.

In general the theory of Umberto Eco and Charles Peirce is clearly applied between journalists and scientists, where the journalist must trust the scientist about new unseen knowledge, but this is the ideal situation when both parts are willing to accept the communication process. The problem could rise if one of the parts is unwilling to accept the feedback, then the information given to the public will depend merely on what the journalist chooses to say about the topic. An unsuccessful piece will probably use the images that the journalist thinks will explain the scientific knowledge, the problem is that the journalist (without scientific background on that specific topic) doesn't know if he got the right information in first place. Another unsuccessful piece could be created when the journalist's main goal is to find a story that will “sell”, when the journalist inflates the information, resulting in the creation of a turmoil-filled piece. This last situation is not ethical and shows that the journalist is not very serious about the great responsibility are in his hands to work with mass media. As a main conclusion I could say that the process of turning invisible scientific knowledge into something visible, is a process that requires a lot of creativity, understanding, preparation, time and will from both scientists and journalists. This work brings knowledge further which enlightens the public's eyes

It would be interesting to do further reception research and study how the target group receives the information. Further study could include the research on focus groups and interviews with the target group. As the former redaction member Olav Høgetveit said, it is important that people get knowledge about

research because then the people can give an opinion in questions of values based on research results⁸⁰. *Schrödingers katt* has a great responsibility to give the public the right information so that the viewers can take the right decisions into subjects that concern them directly in every day life and give a opinion based on knowledge rather than speculation.

⁸⁰ S Brinch, & G Iversen, *Populær vitenskap*, p.59

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Attachment 1

Schrödingers Katt piece on air the 19th of April 2012. "Jakten på kondisgenet" (Audio in Norwegian)

Script, Picture, Sign Category and Plot Typology

HK= Hanne Kari Fossum Program host

HKO= Hanne Kari Fossum Voiceover

AB= Anja Bye, Biotechnology researcher at K.G. Jebsen Center in Hjertetrening, NTNU


ABO= Anja Bye Voiceover

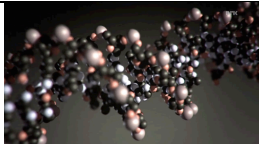
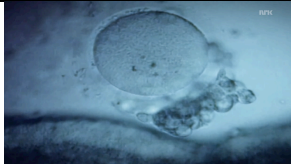
A= Anders Risan, Physiotherapist





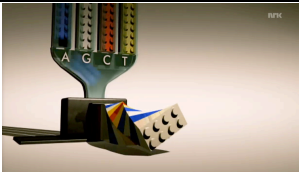
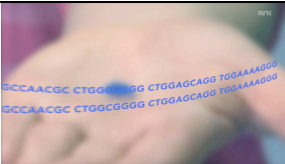


CB= Claude Bouchard, Professor, Louisiana State University

AE= Arnt Erik Tjønnå, Researcher at K.G. Jebsen Center in Hjertetrening, NTNU

Table 1.1

Time	Audio	Picture	Sign Category	Typology
7:59		Text: "JAKTEN PÅ KONDISGENET"		Title
08:02 - 08:09	HKO: <i>Vi jakter på det alle sammen. God kondis er nøkkelen til et sunt og godt liv hører vi.</i>	People at training center	Index and Symbol.	Introduction
08:09 - 8:22	HKO: <i>Men er det bare trening som skal til? Anders hadde et helt normalt forhold til trening til han inngikk et veddemål på jobben.</i>	Anders running	Index	presentation of the main character
8:23- 8:25	HKO: <i>Hvorfor er noen av oss lett-trente,</i>	people training		
8:25- 8:31	HKO: <i>mens for andre er det umulig å bli bedre?</i>	people training		
8:32- 8:37	HKO: <i>Svaret ligger i arvestoffet vårt. Det var allerede gitt fra før vi ble født.</i>	 Picture 1.1	Symbol	
8:37- 8:44	CB: <i>It took a very short time to realize that it was probably the black box, the genes.</i>	Claude Bouchard speaks		The first researcher speaks
8:44- 8:55	AB: <i>For ei side, kan det være vi er født med forskjellige utgangspunkter når det gjeld kondis og på ei annen sida så vises seg at det finnes forskjellen på hvordan folk responderer på treninga</i>	Anja Bye speaks A pregnant woman		Second researcher speaks
8:56- 8:58	HKO: <i>Nå jakter forskene verden over på kondisgenene</i>	Picture 1.1		
8:58- 9:04	HKO: <i>To av dem er Anja Bye i Trondheim og Claude Bouchard fra Louisiana i USA</i>	Anja Bye and Claude Bouchard talk to each other		Presentation of the first researcher
9:04- 09:08	HKO: <i>50% av kondisjonen vår er arvet fra mor og far mener Bouchard</i>	En kvinne som står på ski Bouchard og Bye står inne på universitetet og prater		

9:11-9:14	HKO: <i>Begge ønsker å finne ut hvilke gener som styrer om vi har god eller dårlig kondis</i>	 Picture 1.2 Picture taken from a Swedish program	Icon	
9:14-9:24	HKO: <i>Det kan vise seg å være et viktig prosjekt</i>	The face of a man training		
9:19-9:23	HKO: <i>For stadig flere studier viser at kondisjon vår er viktig for helsa, enn vi har trodd tidligere</i>	Anja running	Index	
9:24-9:36	AB: <i>Det er mye som tyder på at kondisjon er veldig viktig for fremtid risiko for hjerte-karsykdom og andre sykdommer som kreft, muskel- og skjelettsykdommer, psykiske sykdommer</i>	Anja speaking		
9:37-9:48	HKO: <i>Anja Bye er bioteknolog og forsker på K.G. Jepsen senter ved NTNU. Det er spesielt sammenheng mellom hjerte-karsykdommer og kondisjon hun er opptatt av</i>	Anja running		Presentation of the second researcher
9:51-10:04	AB: <i>For det første er jeg interessert å finne bakgrunnsmekanismen hvorfor noen har høyt oksygen opptak og noen har lavt og ved å finne ut mer om kondisjon så tror jeg også vi kan finne ut mer av hvorfor folk har hjerte-karsykdom</i>	Anja goes inside her lab Anja speaks		
10:07-10:18	HKO: <i>I jakten har gjennom hels undersøkelsen i Nord-Trøndelag fått hjelp av 4500 menn og kvinner på tredjemølle. Gjennom målingen av oksygen opptaket ser de hvor god kondisjon deltakere hadde og</i>	A truck of North-Trøndelag health research. Anders running and taking oxygen test People at training studio	Index	
10:19	HKO: <i>blodprøver gav dem tilgang til alle deltakers...</i>	blodprøver	Index	
10:20-10:24	HKO: <i>...DNA arvematerialet</i>	 Picture 1.3	Icon by convention	
10:24-10:31	HKO: <i>Gjennom avansert metoder har de studert disse mikroskopiske delene av oss som faktisk gjør oss mennesker forskjellige.</i>	Picture 1.2 Picture 1.3		
10:32-10:49	HK: <i>Det er som at inne hvert eneste celle av kroppen vår så har vi ca</i>		The whole sequence is iconic by metaphor to the real	This is the core explanation of

	<p>1m DNA tråd og det er overraskende mye. A: Men det er som er artig er at på den tråden er det faktisk ca 20.000 forskjellige gener.</p>	 <p>Picture 1.4</p>	DNA (p.105)	the report
10:50 - 10:53	<p>AB: Hvis du skal klippe et gen</p>	 <p>Picture 1.5</p>		
10:54 - 11:02	<p>AB: Her vi kan tenke at det er et gen. Det her genet, det inneholder faktisk 10 tusenvis av bokstaver eller koder for DNA</p>	 <p>Picture 1.6</p>	Iconically by analogous relation	
11:03 - 11:11	<p>AB: En slik kodet består av tusenvis av bokstaver ATCG og er liksom oppskriften på den proteinet genet skal produsere ...</p>	 <p>Picture 1.7</p>	Symbol	
11:12 - 11:21	<p>...og som igjen gir oss en egenskap. Hadde alle gener fullt oppskriften så ville vi være helt like</p>	 <p>Picture 1.8</p>	Icon	
11:22 - 11:24	<p>men flere av bokstavene kan være byttet ut hos noen av oss</p>	 <p>Picture 1.9</p>	Icon and symbolic	
11:25 - 11:30	<p>Det er slik variasjoner som gjør oss mennesker forskjellige</p>	 <p>Picture 1.10</p>		
11:30 - 11:44	<p>AB: Og dette prøver vi å undersøke, om det er sånn at den som har høykondis har en bestemt bokstav her, mens dem som har lavt kondis har en annet bokstavet. Så det er sånn vi leite oss fram til hvordan genene skal være viktig for kondisjon</p>	 <p>Picture 1.11</p>	Index	
11:45 - 11:50	<p>EO: Anja har studert 200 tusen genvariasjoner i hvert deltaker og har sett klare mønstre</p>	<p>Picture 1.2</p>		
11:51 - 11:59	<p>AB: og resultatet så langt tyde på at det er et lite område på kromosom 6</p>	<p>Anja speaks</p>		

	<i>som ser ut som har mange av de gener som faktisk bestemmer grunnkondisjon våres</i>			
11:59 - 12:08	<i>AB: Flere av de gener som vi faktisk finn, dem har tidligere blitt assosiert til blant annet hjerterytme forstyrrelsen og infarkt</i>	People training at the sports center		
12:09 - 12:44	<i>KH: flere av genene Anja fant er også tidligere koblet til hvordan vi responderer på kondisjonstrening også om evnen vårt til å forbrede kondisen vår, for her er vi nemlig forkjellige. Dette er Anders Risan. Anders: Jeg har trent og koset meg med trening F: Men han skulle få seg en overraskelse under et vedemål på jobben Anders: på jobben fant vi at vi måtte gjøre noe får å komme oss litt i gran. Så det ble en premie til den som forholdsvis økt mest i O2 opptakk.</i>	Anders Risan running Anders speaks Hanne Kari introduces Anders Risan		
12:44 - 12:53	<i>HKO: Gjengen tok kontakt med forskergruppa på NTNU og fikk testet oksygen opptaket som er den viktigste målet på kondisjonen vår. Først en test på våren.</i>	Anders taking oxygen tests		
12:53 - 13:00	<i>A: Det var enkelt og greit, så jeg begynte å trene fordi da skulle jeg vinne konkurranse.</i>	Anders speaks		
13:01 - 13:14 13:15 - 13:21	<i>HKO: Etter 3 måneders trening var han igjen tilbake på laboratoriet for ny test. A: Da følte jeg at dette hadde jeg kontroll på HKO: Men test resultatet viste ingen forbedring i kondisjonen! Han sto på stedet hvil</i>	Anders running Anders takes tests		Rising action: Anders takes active part to the research
13:22 - 13:29	<i>A: De sa at det var akkurat identisk som sist.</i>	Anders speaks		
13:29 - 13:48	<i>AE: Det vi så på Anders det var at han ikke hadde noen fremgang i oksygen opptakk selv om en 3 måneder intensiv treningsperiode. Det betyr at han antagelig faller inn under kategorier non-responder på oksygen opptakk og dvs. at han kan egentlig trene så mye uten at oksygen opptaket øker.</i>	Arnt Erik speaks at his office		Climax They find out that Anders is a non-responder.
13:48 - 13:51	<i>HKO: Det å ikke respondere på kondisjonstrening, er ikke</i>	Woman training at sports center People running marathon		

	<i>han alene om, de siste årene,</i>			
13:51 - 14:02	HKO: <i>har stadiet flere studier vist at mellom 10-20% av oss ikke forbrede oksygen opptak til tross for hardtrening.</i>	People training A group of persons in front of the camera and disappear one by one until about 10% is gone	Icon: Using analogous relations.	
14:02 - 14:20	HKO: En som står i spissen på jakten av kondistreningen er Claude Bouchard. Gjennom 35 år med blant annet tvilling studier og gjennom forskningsprosjektet <i>The family heritage study</i> . Han viser at vi responderer ulikt på kondisjonstrening og at responsen kan gjenspeiles i familieleinjer	Anja and Claude Bouchard		
14:20 - 14:31	CB: Based on our heritage, we know that about 10% of the population will not increase their fitness as measured by maximum oxygen uptake.	Claude Bouchard speaks People training		
14:32 - 14:47	CGO: And some that do not improve their cardio respiratory fitness at all. And there are those whom almost double their fitness after exposure to the same exercise regimen	People training at sports center Claude Bouchard speaks		
14:47 - 14:51	F: <i>Forskere har nå funnet konkrete gener på hvert sin kant men data må sammenordnes</i>	Anja enters her lab Claude Bouchard's face		
14:51 - 14:55	HKO: <i>Mer forskning må til på at sikre kan si at kondisgenen er funnet.</i>	Anja and Claude Bouchard Picture 1.2 People at the training center		
14:58 - 15:03	HKO: <i>Når vi kommer dit da, at vi vet hvilken gener som bestemmer hvilken kondis vi har og kan få</i>	People cycling at the training center		
15:03 - 15:07	HKO: <i>Bør hvert enkelt av oss få vite hvordan vi ligger an?</i>	Anders running		What should be public's attitude?
15:08 - 15:22	AB: <i>Det er så utrolig mange andre fordeler med å trene enn akkurat det om du øker kondisen din. Sånn at hvis man har en test på om man er non-responder eller ikke, så kan man kanskje foreta at noen slutter å trene og det vil vi ikke. Fordi det er utrolig mange andre fordeler med trening</i>	Anja speaks		
15:22 - 15:31	HK: <i>Men tenkte du da at alt trening du har gjort er forgjeves?</i> A: <i>Ja, den første reaksjon var sånn også.</i>	Hanne Kari and Anders speak outside Anders taking tests		
15:31 -	HKO: <i>Men så enkelt og trist er det ikke, Anders har</i>	Anders taking tests		

15:40	<i>fremdeles ambisjoner om å forbrede seg men må fokusere på andre ting enn økt oksigenopptakk.</i>			
15:41 - 15:59	<i>A: Det jeg har lyst til nå er å ha persen på halvmaraton og ha mer fokus kanskje på beinstyrke, trene litt tungt beinstyrke og kan springe fortere til tross for at jeg kan ikke komme høyere i O2 nivå.</i>	Anders speaks Anders running	Symbol: Anders running as a symbol for hope and fitness even though he is a non-respondent	The falling action Anders changes his focus about training than only increasing oxygen uptake
16:00 - 16:07	<i>A: Uansett om du er non-responder eller ikke så bør man uansett komme seg opp av sofaen</i>	Anja speaks		Resolution People should come out off their sofa and train
16:07 - 16:10		Anders running		

Attachment 2

Schrödingers katt piece on air the 20th September 2012 "Brystkreft" (Audio in Norwegian)

Script, Picture, Sign Category and Plot Typology

E= Eldrid Borgan, Program host

EO= Eldrid Voiceover


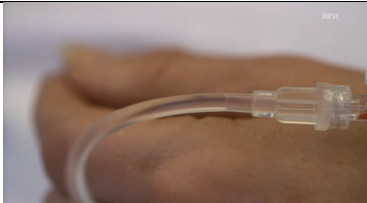

K= Karin, Patient

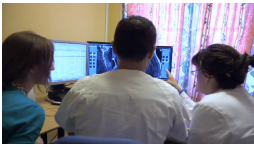

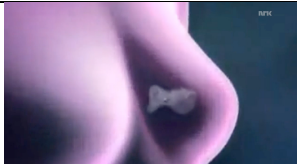


I= Inger Thune. Professor, Oslo Universitetssykehus



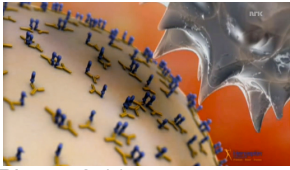

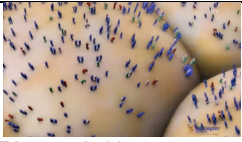

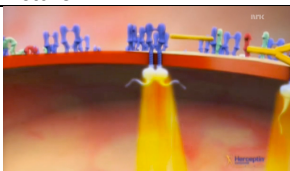

E= Erik Wist. Leader in Norsk Brystcancer-Gruppe

L= Lars Akselen. Professor, Haukeland Universitetssykehus

Table 2.1

Time	Audio	Picture	Sign Category	Typology
14:33		Different shots, nails, woman's throat, plastic tube with medicine.		Introduction
14:45 - 14:54	E: <i>Da legene fikk Karin på kontoret for noen år siden, visste ikke hva de skulle gjøre. Karin hadde fått brystkreft med spredning til skjelettet og prognosen var dårlig.</i>	Eldrid, Inger Thune and patient Karin are outside in a spring day		Introduction Exposition
14:54 - 14:59	E: <i>Men det fantes en ny og nesten uprøvd metode</i>	 Picture 2.1	Symbol	Exposition.
14:59 - 15:19	I: <i>Jeg ser faktisk på mitt notat fra 12. januar i 2004 i motakk på sykehuset.</i> EO: <i>Inger Thune er kreftlege og forsker. Hun husker godt den dagen for flere år siden. Det skulle vise seg å være starten på et medisinsk eventyr.</i>	 Picture 2.2	Symbol	
15:20 - 15:27	I: <i>Her har jeg skrevet at jeg har en slank kvinne som er 46 år gammel og som klager over sterke smerter mellom skulderbladene og i høyre arm.</i>	Inger and Karin		
15:28 - 15:35	PO: <i>Det var Karin, smertene skyldtes kreften som hadde spredd seg fra brystet til ryggraden</i>	Karin is outside		
15:36 - 15:40	PO: <i>Etter de første undersøkelsen så det ikke bra ut.</i>	 Picture 2.3 X-ray picture of Karin	Index	
15:41 - 15:56	K: <i>Jeg var ganske langt nede da.</i> I: <i>Da kom svaret om at da var det kreftceller rundt et område i ryggen din i ferd med å klemme helt av ryggmargen.</i> <i>Dramatisk</i>	Karin and Inger sit outside		

15:57 - 16:09	PO: <i>Det var ingen tid å miste. I løpet av bare noen timer kunne Karin miste følsomheten i hele kroppen. Rask fikk sykehuset et stort tverrfaglig team på beina</i>	Inger walks from one room to another at the hospital 		Rising action
16:10 - 16:19	P: <i>Hva tenkte du om fremtiden til pasienten den dagen?</i> I: <i>Jeg tenkte at dette håper jeg vi kan operere</i>	Eldrid and Inger Thune sit inside the hospital		
16:20 - 16:41	I: <i>Da fikk du beskjed om at du ikke kunne få kirurgi og vi kunne ikke operere.</i> K: <i>Det var ganske tøft men det var små marginer var det best ikke å ta sjansen</i>	Karin og Inger talk outside the hospital		
16:42 - 16:45	EO: <i>Dermed måtte de sette i gang med både stråling og cellegift i full fart</i>	 Picture 2.5	Symbol	
16:46 - 16:48	I: <i>Vi hadde ingen tid å miste</i> PO: <i>og de hadde en mulighet til...</i>	 Picture 2.6	Iconic and Index	
16:49 - 16:53	I= <i>Kunne vi komme i gang med en helt ny medisin som hadde akkurat kommet til Norge</i>	Inger og Karin prater		The introduce the solution of Karin's problem: Herceptin.
16:54 - 17:00	EO= <i>Herceptin heter det. Det var ikke en gang godkjent i Norge da de begynte å bruke den</i>	 Picture 2.7	Icon	
17:00 - 17:10	E: <i>Da begynte vi i 2005</i> EO: <i>Erik Wist var en av pådrivende for å få lov til å bruke medisinen</i> E: <i>og håpet på tilgivelse istedenfor tillatelse, kan du si.</i>	Erik talks with Inger and Eldrid		Rising Action
17:11 - 17:17	EO: <i>fordi den virket så lovende. Men likevel da Karin fikk den var det bare håpet de for det beste</i>	 Picture 2.8	Icon also indexical	
17:18 - 17:36	I: <i>Da hadde vi mulighet til å gi hvert fall måneder og kanskje år til hennes liv, vi sa kanskje, vi visste jo ikke nytten av det da. og jeg husker at jeg sa "Du kan være glad for at du har fått dette nå"</i>	Eldrid and Inger talk inside the hospital.		

17:37 - 17:43	PO: <i>For tidligere, ville hun bare fått cellegift, som kanskje ikke ville virket på en så aggressivt kreft. Dessuten...</i>			
		Picture 2.9		
17:44 - 17:51	E: <i>Vi har skutt med kanoner. Cellegift rammer alle celler som deler seg i kroppen</i>	Erik talks		
17:52 - 17:59	EO: <i>Denne nye medisinen er målrettet, det går rett på svulsten og bare på den.</i>	 Picture 2.10  Picture 2.11	Iconic image and also indexical	the core explanation
18:00 - 18:06	I: <i>Og vi går inn og gir målrettet behandling, bare mot denne så kan vi altså få kontroll over kreftsvulsten</i>	Inger talks		
18:07	EO: <i>Det viser seg at Karins kreftceller produserer altfor mye proteinet som heter HER2</i>	 Picture 2.12	Iconic image	
18:13 - 18:17	EO: <i>Det sitter på utsiden av celler på cellemembranen</i>	 Picture 2.13	Iconic image Index image	
18:18 - 18:26	L: <i>Det sitter svart mye proteiner i membranen og de blir hyperstimulert, slik at de begynner å vokse og deler seg. Kreftsvulsten blir mye mer aggressiv.</i>	 Picture 2.14	iconic image	Another researcher is introduced: Lars Akslen
18:27 - 18:35	EO: <i>Den nye medisinen er beregnet på å stoppe de hyperaktive HER2-proteinet</i>	 Picture 2.15	Iconic and indexical image	
18:36 - 18:46	L: <i>og da gir man behandlingen som da oppsøker HER2-proteinet på cellemembran og så blokkeres funksjon til dette proteinet og dermed så kan kreftsvulsten bremses opp</i>	 Picture 2.16		
18:47 - 19:07	EO: <i>Det var full klaff. Karins svulst stabiliserte seg, og hun kunne dra hjem. Nå 8 år etter må hun fortsatt på sykehuset og få medisinen rett i blodet</i>			Climax

	<i>hvert 3. uke I: Ut av den kunnskapen vi i dag har, så kan vi ikke stoppe behandlingen til Karin</i>	Picture 2.17 Inger Thune then talks outside while she is sitted.		
19:08 - 19:11	<i>PO: Men hun føler seg helt frisk K: Det går veldig bra</i>	Karin talks		Falling Action
19:12 - 19:24	<i>EW: Så hvis noen hadde sagt det til meg tidlig på 2000-tallet at det var mulig å behandle den typen kreftsykdommen i 8 år og at pasienten skulle ha det bra, så ville har sagt at dette var drømmerier.</i>	Erik Wist There is a super text that says "Dette gjelder 15% av alle brystkreftpasienter" (This is 15% of all cancer breast patients) Karin walks outside in a beautiful spring day		Resolution

Attachment 3

Navlestrengsblod Redder Liv. From the program on air the 25th October 2012.

E= Eldrid Borgan, program host




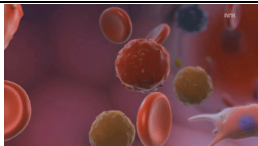
EO= Eldrid Borgan's voiceover

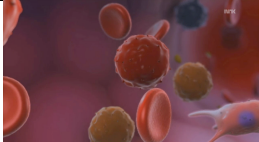
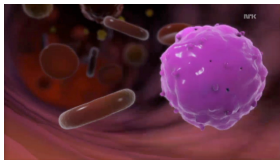

G= Grete S. Andreassen. Bioengineer Department of Cell therapy at Radiumhospitalet



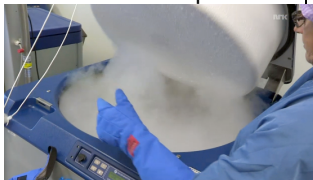
H= Hege K. Trondsen, patient

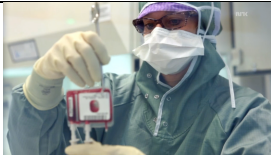



L= Lorentz Brinch. Doctor, Apartment for blodsykdommer, OUS Rikshospitalet.

Table 3.1

Time	Audio	Picture. Source of the image.	Sign Category	Typology
03:47-4:10	EO: <i>Et fly har landet på Gardemoen med en helt spesielt last. Den skal til Radium hospitalet i Oslo. På Rikshospitalet skal pasienten med blodkreft med noen få dager få livs nødvendig behandling.</i>	An airplane lands at the airport. Then we see a car, and then a shot of Rikshospitalet		Exposition.
4:11-4:27	G: <i>Her ligger produktet på flytende nitrogen i gassfasen</i> E: <i>Og hva er det innen den pakken?</i> L: <i>Det er navlestrengsblod som har reist fra en blodbank, en navlestrengsbank i Europa</i>	 Picture 3.1	A tiny blood bag as a Symbol for hope.	Intro
4:28-4:37	EO: <i>Blodet er hentet fra navlestreng som ble donert etter en normal fødsel. Dette blodet inneholder noen helt spesielle celler.</i>	 Picture 3.2  Picture 3.3 From a report in Newton about birth	Picture 3.2 is iconic and indexical Picture 3.3 is iconic	
4:38-4:43	EO: <i>Dette er stamceller som har som oppgave å produsere nye blodceller som kan redde et liv</i>	 Picture 3.4	Iconic image	The challenge
4:44-4:47	G: <i>De skal i utgangspunktet redde livet til den pasienten som får det.</i>	Grete talks with program host at the hospital		
4:48-5:04	GO: <i>Må vi først sjekke identitetet...</i> PO: <i>nummer og navn kontroll sjekkes mange ganger, er det gjort en feil kan det bli fatalt. Det holdes nedfryst til dagen er kommet.</i>	We see the number at the blood bag and how the package is controlled and stored in a special freezer with liquid nitrogen.		
5:05-5:20	EO: <i>Blodceller i kroppen vår har kort levetid og vi er helt avhengig av at stamceller i beinmargen hele tiden</i>			

	produserer nye blodceller . Når det er noe galt med beinmargen går ikke blod produksjonen som skal, det kan bli alvorlig.			
		Picture 3.4		
5:21-5:28	EO: <i>Marianne har blodkreft, det er hun som skal ta imot det stamcellene</i>	Marianne is laying at the hospital's bed		The main character: Marianne
5:29-5:48	PO: <i>En som vet godt hva Marianne går gjennom er Hege Trondsen</i> H: <i>Jeg fikk kreft i 2001 og da fikk jeg en veldig tøft cellegift og stråling</i> EO: <i>Den tøffe behandlingen, kurerer kreften men ga Hege en ny type kreft: blodkreft</i>	Hege Trondsen speaks		Introduction of the second character
5:49-5:53	EO: <i>Hun var helt avhengig av ny beinmarg for å overleve</i>		Iconic and indexical	
		Picture 3.5		
5:54-6:00	EO= <i>Den vanlig løsningen er å tilføre nye stamceller fra beinmargen eller blodet til en donor. Men Hege hadde uflaks ...</i>		Symbol for stem cell treatment	
		Picture 3.6		
6:01-6:07	H: <i>Det var veldig tøft. Det jeg fikk vite var at det var så sjelden at vi har ikke funnet ut noe til deg ...</i>	A very wide shot of Eldrid and Hege crossing a bridge. Hege talks in medium close up.		
6:08-6:45	L: <i>I prinsippet det er 3 forskjellige former for givere som vi bruker: den ene er familie giver, som dessverre et mindre tall har, så er der ubeslektet giver hvor da man har et internasjonal register, hvor det er registrert ca 18 millioner givere i verden nå og da vil man finne givere til alle fleste og så er det den lille andelen hvor man ikke finner en sånn giver hvor det kan bli aktuelt til å bruke navlestrengsblod</i> E: <i>Blir da en slags siste mulighet?</i> L: <i>Ja</i>	Lorentz Brinch speaks with the program host Picture 3.7 	Umbilical cord blood as a symbol for last chance hope	Presentation of Lorentz Brinch
		Picture 3.8		
6:45-6:52	EO: <i>Selv om navlestrengsblod er lett tilgjengelig og kan lettere matches til mange pasienter er det bare få som behandles slik</i>	Inside the hospital corridor		
6:53-7:12	L: <i>Samtidig som er en aktuelt behandling, må pasienten og</i>	Lorentz Brinch speaks		.

	<i>de pårørende også få vite at det faktisk er ganske farlig. Det ene er at navlestrengsblod er det mye færre celler enn det når man bruker beinmarg og å få nok celler er vanskelig</i>			
7:13-7:22	EO: Stamcellene i navlestrengsblod er yngre og ikke så moden som stamcellene i beinmarg fra en voksen donor. Det tar derfor lengre tid å få å produsert nok blod	 Picture 3.9	Iconic image	Here it starts the core explanation of stem cells transplantation
7:23-7:46	L: <i>Det er ikke bare stamceller som lager de vanlige blodceller men det er også et nytt innmunnsystem. Det er i utgangspunkt en mye mer umoden hos et nyfødt barn navlestrengsblod fra en ufødt menneske så den infeksjonsrisikoen på lengre sikt som alle som transplanteres har, den varer lengre enn et vanlig navleblods transplantasjon</i>	Lorentz Brinch speaks		
7:47-7:57	H: <i>Jeg skjønnte hvor dårlig jeg egentlig var, det var ingen alternativ og jeg bare synes at dette må jeg prøve</i>	Hege Trondsen speaks		
7:58-8:10	EO: <i>Men det er en bitte liten pose med blod fra bare en navlestreng</i> H: <i>Ja det var veldig spesielt at den lille posen kunne på en måte redde meg og gi meg et fullverdig liv igjen.</i>	Hege Trondsen speaks  Picture 3.1b	Symbol image: the little bag with blood cell saved Hege Trondsen's life and gave her back a worthy life.	
8:11-8:30	EO: <i>Navlestrengsblodet gjorde Hege Trondsen frisk. I dag er det Marianne som er klart til å ta imot de nye stamcellene, en forbehandling med stråling og cellegift har drept hennes egne beinmarg, nå er håpet at det nye cellene skal fungere og gi henne et nytt frisk blod</i>	Marianne lays in bed		Rising Action
8:31-8:52	EO: <i>På Radiumhospitalet tar Grete en siste kontroll telefon før de tyner cellene. Når cellene er først tynt er det ingen vei tilbake. For at cellene skal tåle nedfrysning er blodet tilsatt en væske som kan skade cellene i romtemperatur</i>	Grete talks on the phone  Picture 3.10		Procedure of how the treatment i
8:53-9:04	G: <i>Frost væsken er toksisk, den er giftig i romtemperatur eller i kroppstemperatur men den er nødvendig for -200C grader.</i> EO: <i>Så denne må vaskes bort raskt</i>	The package is washed on the outside while Grete speaks		
9:05-9:31	E: <i>Den lille posen der skal erstatte alt blodet til pasienten</i>	Pakken blir vasket videre	Picture 3.13 Symbol of the	

	<p>EO: Nå må blodet gå gjennom sluset og da får vi ikke lov å være med</p> <p>E: For da det er super sterilt</p> <p>EO: Alt gjøres for å ikke forurenses og skade cellene. I den ultra rene delen av laboratoriet vasker Grete fryse væska ut av cellene</p>	 <p>Picture 3.11</p>  <p>Picture 3.13</p>	<p>cells that will save Marianne's life</p>	
9:32-9:47	<p>E: Da er det klart</p> <p>G: Da er produktet klart og vi reiser til Rikshospitalet med cellene.</p> <p>EO: Når cellene er tynt må det overføres innen få timer</p> <p>E: Da er vi på rikshospitalet</p>	<p>The program host and Grete drives to Rikshospitalet</p>		<p>Climax The treatment is ready for Marianne</p>
9:48-9:49	<p>G: Pasienten er klar?</p> <p>Legene: Ja</p>	<p>Grete og Programleder ankommer Rikshospitalet</p>		
9:50-9:52	<p>G: Vær så godt . Ta godt være på det</p>	<p>Grete gives the umbilical cord blood to the doctors at Rikshospitalet while they sit in a room.</p>		
9:53-10:27	<p>P: Marianne er klar til å ta imot de nye stamcellene.</p> <p>L: Da blir posen brakt inn til pasienten og så blir den koblet til den slangen som pasienten har på brystet og da kommer det raskt inn i blodet og så blir det pumpet ut i sirkulasjonen og så kommer de cellene til beinmargen og slå seg ned der og så finner de seg da og de aller fleste tilfellene til etter hvert så godt til rette at det begynner å produsere blod.</p> <p>P: de finner veien selv til beinmargen?</p> <p>L: Ja, det er jo et mirakel!</p>	<p>The umbilical cord blood is connected to the intravenous tube of the patient</p>  <p>Picture 3.14</p>  <p>Picture 3.15</p> <p>Lorentz explains that the stem cells finds miraculously its way to the bone marrow</p>	<p>Symbol image</p> <p>Iconic image</p>	<p>Falling Action Marianne gets the treatment</p> <p>Resolution: Eldrid asks if they find their way by themselves and Lorentz answers "Yes, it is a miracle!".</p>

Attachment 4

Interview with Anja Bye through e-mail februar 11th 2013.

1) According to the interview from Schrodingers Katt, how much information from the one you shared with them came in the report of "kondisgen"?

Ca 80 %

2) Was it important information that you think should have been in the report?

Det ble plass til veldig mye informasjon i programmet, så jeg savnet ikke noe særlig.

3) How do you explain the persons that are curious about their "fitness gene" with your own words? Do you use any picture to explain them?

Jeg sier til dem at foreløpig er det ikke nok informasjon tilgjengelig til at dette kan brukes direkte på vanlige personer. Det må en god del forskning til enda, før dette kan bli inkludert i kommersielle tester. Jeg henviser dem ofte til nettsidene www.23andme. Hvor man kan få testet sitt eget DNA på de kjente genene man har i dag. Denne siden er også veldig pedagogisk og fint lagt opp, så her kan de lese mye om gentesting og finne figurer og referanser som de aller fleste kan skjønne.

4) Have you been in any congress to show your research? Do you have any Powerpoint presentation I could look at? I am interested in the pictures you use.

Jeg har presentert noe av de første funnene på denne studien...legger ved en Power-point. Se litt ut i presentasjonen (under studie 3)

5) What do you think about the pictures and analogy that Schrödingers katt uses to explain the information you gave them? Did they ask your opinion about what pictures they would use? What do you think about the way they explain the gene using the blue wool thread and cutting a little bit with the scissors?

Jeg syntes NRK illustrerte dette veldig fint. De spurte meg om synspunkter hele veien, og jeg fikk se igjennom og godkjenne alt. Ideen til illustrasjonen med garnnøste var hentet fra et europeisk program av litt samme typen, og den likte jeg godt.

6) The Power Point presentation. What images Anja Bye uses?

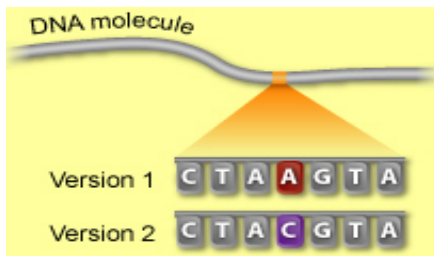


Image A4.1 The variations in the DNA sequence

One type of variation is something called Single Nucleotide Polymorphism (SPN)

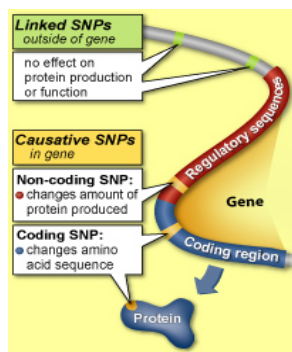


Image A4.2 The SNP outside the genes and in the genes.

Attachment 5

Interview with Inger Thune, Professor at Oslo Universitetetssykehus and Erik Wist, leader at Norsk Brystkreft-Gruppe. January 23rd 2013, Ullevål Sykehus, Oslo. About the piece “Brystkreft”, on air the 20th of September 2012

I met Erik Wist first at his office. He received me very friendly and I explained the purpose of my master thesis. We sat and I asked about his experience with the Schrödingers katt team. He said that he liked to participate at their report. And they did a good work, but he did have some observations he would maybe have done different. He mentioned that there was one thing that Schrödingers katt made it sound different to what he meant. He took a break, and said that Karin's treatment controlled the tumor, but he thinks that the way Schrödingers katt presented it, sounded as if any type of breast cancer could be treated the same way as hers. For me (Karla Paz), it was clear that Karin had a certain type of cancer and that they treated her that specific way. But I have cell biology background, so I understood it clearly.

Erik Wist mentioned that it could be very dangerous if a journalist gives the wrong information to the general public; therefore any scientific journalist must choose meticulously the information they use. At his point of view, it is very important that scientific journalists understand that they have a great ethical responsibility to bring the precise information to the public.

Another thing Wist mentioned was that maybe Schrödingers katt showed Herceptin almost as a commercial for that medical treatment, due to the animation they used with the name on it.

I asked Wist to tell me how they explain their patients about the treatment they are going to go through, if they used a film, or some images. He took a piece of paper and started drawing and explained me as if I was one of his patients. It was actually the same drawing that Schrödingers Katt used in the report by the professor Lars Akselen, in Haukeland Universitetetssykehus.

I met Inger Thune, afterwards. She was also very friendly and open, we walked together to her office and mentioned that Erik Wist likes very much to talk with journalist and that they have received and been interviewed several times by journalists. We arrived at her office and sat on a desk and I explained her the purpose of my master thesis.

I asked Inger Thune about her experience with the Schrödingers katt team and she mentioned that she chose the patient Karin, and asked her to be part of the program. The reason why she chose her is because she is a common Norwegian woman from Oslo in her forties. She does not like to drag too much attention to herself, so she thought she would be the perfect main character of the story. Inger Thune told me the story how she met Karin and that they used a treatment that was not yet approved in Norway at that time, but they took the challenge to treat Karin with that specific medicine.

The experience she has had with other journalists is that they are not well prepared in advance before the interview, so they give the wrong information about something.

I asked them how they usually explain their patients about the treatment. She took a blank sheet and made a drawing while she explained it. In the first drawing (Image A4.1) we can see the response statistics in cancer treated patients. In 1970's the response rate to the treatment was 50% , while in 2010 the response rate was 85%. They expect that by 2020, the response rate will be 95%.

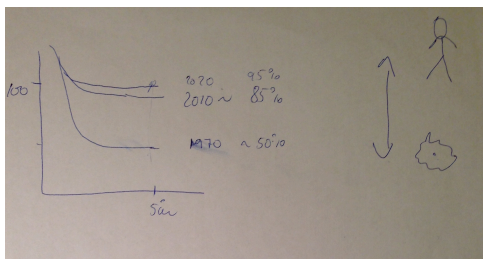


Image A5.1 Response rate to treatment

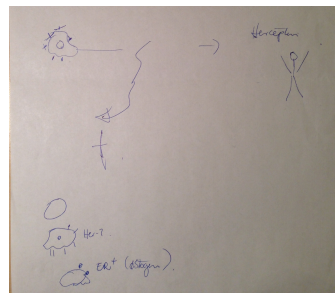


Image A5.2

Inger Thune explained that Karin had got a treatment that was not yet approved in Norway, so it was very good that she got the disease at that specific time and not before. Inger Thune and Erik Wist did not know how Karin would react to the treatment and now after 8 years, it is unbelievable that she is stable and the tumor is controlled and has a normal life.

Thune started drawing something new on the paper. This time she explained that a cell has receptors on their membrane. These receptors are in charge of their reproduction. A great amount of protein HER-2 lead to rapidly reproduction of cells into a tumor. But Herceptin will block the function of the HER-2 protein on the cells and break them down. When she had finished explained, looked at waiting for any possible question I could have, but I thought she explained it very well so I fully understood. She smiled at me and then we had a small chat about scientific media and their importance. I thanked her for her time and said I will happily show her my research when I am finished at the beginning of June 2013.

Attachment 6

Interview with Medical Doctor Lorentz Brinch at Rikshospitalet, Oslo. Monday 4th March 2013.

About the piece *Navlestrengsblod* on air 25th of October 2012.

I met Lorentz Brinch at Rikshospitalet in Oslo. We sat at his office and after I introduced myself and my project he asked me right away, if I knew what stem cells were and made me explain him what I thought they were. I answered that they were cells able to produce other cells for example blood cells. He mentioned that some journalists do not know much about stem cells.

His second question to me was if I knew the difference between "*beinmarg*" (bone marrow) and "*ryggmarg*" (spinal cord). This time he corrected my answer and explained that bone marrow is where stem cells are, while spinal cord is the bundle of nervous tissue that extends from the brain. We then laughed together to realize that dealing with scientific issues is not that simple but rather is like learning a new language.

I asked him about the way he usually shares the information about the stem cell treatment with his patients. He answered that he gives them a brochure both in Oslo and Bergen. This brochure is very detailed and very useful for the patients. The stem cells treatment is dangerous; therefore it is important that the patients are well informed and know the risk before they start the treatment. Is not possible to give technical details, because they would probably not understand. He started explaining me something with his terminology and then I smiled and asked him to explain. He smiled back and said that therefore is very important that a scientist uses normal language with their patients. We both smiled. I can't even recall what he said, but it was a difficult terminology. He mentioned that is very important that the scientific journalists have knowledge of the scientific or academic terms and transform these terms in a more friendly language.

He explained that for instance, the patient Marianne was informed about the risk to get few blood cells from the treatment and she approved it.

I asked him about his experience with Schrödingers katt's team. He said that they didn't contact him at first but rather they took contact with the Norwegian Blood Registry, whom contacted him. Lorentz then asked the patient Marianne if she wanted to participate in the report and she accepted. He also talked with the other patient Hege Trondsen that had gone through the same treatment; both participated free willingly.

I asked Lorentz Brinch about the animation they used in the report and he thinks the animation was good and showed the point of how the stem cells find their way to the bone marrow. He thinks that it was just good enough the way they showed the cells in different colors. He talked with the production team of Schrödingers katt for a long time; he gave them a lecture. Then he smiled at me, and said, -"just as I just did with you"- . We both laughed.

He thinks they were clever to explain the core of the case and show it. They asked him his opinion about the animation, and they talked about it together. Schrödingers katt grabbed the important points out and used them. They were smart to obtain the essential information from it, but of course he would have liked to have much more detailed information. But he thinks it was good the way they explained things in the report. Sometimes journalists that write about science not know the difference between *beinmarg* or *ryggmarg* for instance, but Schrödingers katt showed this information correctly in the report.

He suggests that journalists that write about science should contact and prepare with information before they interview the researchers, so they know what they are talking about. At his point of view, it is very important to learn something about the topic, before they meet the scientist. And should not create unnecessary media turmoil.

My last question to him was about the resolution of the report, why did he say it was a miracle the way the stem cells find their way to the bone marrow. He smiled and said, that it is a miracle, because they do find their own way there, even though they don't understand the mechanism of how it works, they arrive to the right place and start producing new blood cells.

Attachment 7

Interview with Frida Krüger. NRK.
Trondheim, Thursday 4th of April 2013

Navlestrengsblod redder liv

I came to NRK at Tyholt, and Frida Krüger received me friendly. As we walked through the corridors, I saw the people working in their offices. Per Olav Alvestad, one of the program hosts at Schrödingers katt was on the left side working at his desk, and as we arrived at Frida's office, I thought about how amazing and important job they have: to communicate scientific knowledge to the people of Norway. Some of the Norwegian scientific research results are being processed by Schrödingers katt editorial to be broadcasted to the country. The challenge is to abstract knowledge into a language that public will relate to and understand. We arrived at Frida's office and I explained about my project.

I asked her what was the greatest challenge to film *Navlestrengsblod*. She said that it was a linear process, so it was very important for them to be there and follow the process. The blood came the same day they were going to film, and everything was controlled, so they filmed and edited it later and decided which pictures they would use. They filmed in different angles. She mentioned that it was very important to have good communication with the people they were filming, in this case, the bioengineers. They had been there one week before to plan how they were going to film since it was a very strict and sterile laboratory. It was very important for them to use time to get to know the persons involved in the film.

I asked about how they got the different pictures they used to visualize the report (this information is found in attachment 3). She mentioned that some images are from YouTube with HD quality. They found some of the clips there and contacted the firma that worked commercially with them. They e-mailed them, and found out they were from USA. They bought the permit and credited the image.

I asked her about the communication process between them and the scientist during the report production. She mentioned that they showed Lorentz Brinch the clip they wanted to use at *Navlestrengsblod* and he said that it was fine. Lorentz Brinch saw the report before it was on air, and they told him to tell them if something was wrong so that they would know. They used Dropbox to share the report with him before it was sound mixed so that he could approve it. Frida said that it is important for them that the scientists see the reports in advance before they are on air.

I asked her how she prepares herself before the research conversation. She said that in this case, she talked with a man from the Bone Marrow Registry called Torbjørn, that contacted Lorentz Brinch and asked him if he wanted to participate in the report. They also talked a lot with the bioengineers and had a meeting with their leaders. She mentioned again the importance to use time with the people involved and get to know them. The research in advance is important, so they know how to visualize the process, because sometimes they don't know how things are, so they need to do research on the topic, read from the net, find videos on YouTube and use good time with the persons they are going to interview and film.

I asked about the target group to Schrödingers katt and she said is from 20 up over. Generally in NRK they are trying to get the young people.

Kondisgen

I asked Frida Krüger about the production process in *Kondisgen*. She mentioned that it took time before they made the report because they were waiting for Anja's DNA analysis results. I asked how they got some of the images and clips they used on the report (in Attachment 1). She mentioned that the clip of the unborn baby was from National Geographic. NatGeo Norway has a policy that if Schrödingers katt needs a picture, they can use it by crediting it because of the copyright. Some other pictures were taken from a Swedish program at SVT through Norvisjon that works with the channels in the north such as Norway, Sweden and Denmark. They have agreements so that they can use their pictures, and they exchange reports and documentaries. Sometimes they make things on their own, but it takes time to work them out.

They look for HD quality things that they can use. Frida mentions that she worked for Newton before, so the idea of the blue thread was taken from a Danish program. They look for this kind of ways of visualization because they can get tired of just using clip animations.

I asked her about the Lego dispenser (Picture 1.8 Attachment 1), and she said that it explained the gene variation, and that image visualized that specific aspect. They need to present things in an easy way, so that image did that about gene variation.

I asked Frida about the patient Marianne, she said that actually they filmed more of her than planned. For instance, Frida asked several times to Brinch if it was great for Marianne to be filmed. They had not made an agreement with her on first place because they knew her health situation was delicate and she would receive the blood that specific day, so it was a matter of ethics. They had planned for instance to interview Hege Trondsen instead.

I asked about the challenges they have covering scientific issues and interviewing scientists. She said that many times the journalist start from scratch about a certain issue, and science has broad specters of nuances about a topic. So the journalist do not know everything, therefore is important that scientists understand that it is difficult for journalists to know everything about all topics, and in order to communicate things right, they need to understand them first.

She also mentioned “we should be allowed to think out loud. It is good to use good time, very important indeed. And scientists need to accept that a journalist want to understand”. If scientists want that the issues come right, they also need to use time with us. It needs to be “chewed” and they ask scientists “can I say it this way?” “Can I say it so easy? and the scientist will give his opinion. Sometimes the scientists become surprised that we can say the right things in an easier way. We need to simplify information; we need to do abstraction of the information in order to use it further”.

Attachment 8

Interview with Synnøve Ness
NRK, Trondheim. Thursday 4th of April 2013

Brystkreft

I interviewed Synnøve Ness after Frida Krüger. I explained the purpose of my interview and what was my project about. The first question for her was about the way she obtained the pictures and clips that she used in the report *Brystkreft*. She said that she got the picture from Herceptin and some other clips, from a medical firma (this information can be found in Attachment 2).

I asked her about the challenge of working with scientists and scientific issues, and she said that it is challenging to popularize, make this information available for a lot of people, and it is a challenge to make that the scientists will be a part of this. It is a challenge that they will want to “play” with us, she said that they need to make a lot of things to produce TV and more and more scientists think this is fun and interesting, but it was not like this for 10 years ago, when scientists were almost only talking on TV.

She mentioned that she gave a media course to the PhD students where she shared with them what she would challenge them with. The new generation those under 50 years are a little bit different. She mentioned about Schrödingers katt “we are the only scientific program in Europe that goes in Prime Time, we have succeeded into making the program more popular than others. Before we were not so popularized, and the public knew that. Now it is our task to talk in such a way that people understand. We need to explain the new scientific words, and we ask scientists to help us with this and explain. We can challenge sometimes scientists to play with us”.

In the case of *Brystkreft*, there are some pictures we took where the scientists are spontaneous, we just let the camera film and we used the pictures maybe in another context, but we could use them to illustrate the point.

She said that they need to simplify a lot of facts and information, and they don't have all the nuances of a topic. The scientists should be willing to let go some of the nuances. That is why some people take doctor degrees about certain topics, and they need to accept that. It is much better that the people is allowed to get an issue, a story, than nothing at all.