APPENDICES

APPENDIX 1

Transcripts of video-narratives used in case studies 2 & 3 (Chapters 6 & 7)

<table>
<thead>
<tr>
<th>Subtopic 1a: What is synthetic biology?</th>
<th>Christine</th>
<th>Karin</th>
<th>Walter</th>
<th>Marlous</th>
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<tbody>
<tr>
<td>For me it’s about being able to create your own world. I’m not a biologist so I’m not familiar with the real subject but this is how I see it. And I think with Synthetic Biology we will have a toolbox available, with all kinds of solutions for problems we have right now.</td>
<td>To be honest I didn’t know what it was until you told me a little bit about it. Of course I have read articles and stuff. In my opinion its a kind of... Artificial biology, human made biology, and I think we should be cautious. We should be careful with this.</td>
<td>I think it’s when you play with biology. So it’s like creating new life, by using technology. It’s something everybody can do. Like I make music with computers, so you can make new life with technology.</td>
<td>(In Dutch) Synthetic Biology as far as I can see, is actually a new development. I see it as a continuation of scientific developments in the field of genetic technology or Nano-technology. It will develop a sort of new order (of life).</td>
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| Subtopic 1b: What is the role of synthetic biology in our future society? | I think it will help us to be way more efficient in solving problems; big problems that we have right now. Like we have over-population of the earth hanging above our head. And this is going to help us to produce food more efficiently, I think. Another thing is that we live in a world were we want to create our own world. We want to be in charge of it. And I think this is going to help us. So we won’t have to accept that you die of cancer at a very young age. | Uhmm the influence of Synthetic Biology on society? I think it should be limited. If you look at for example at the story about braces with children. I think ten years ago one in ten children had a brace because it was really necessary. But at the moment every child has a brace. And we are going towards some kind of perfectionism. Everybody has to look perfect or as perfect as possible. And I think we don’t know what is perfect... | (I think) The influence of Synthetic Biology on the future society? I think there is a bright future with lots of possibilities. And lots of innovative solutions for things like... I just read an article about some scientist who does research on a plant... that creates its own resistance to bacteria. And that is great! I think it is really cool that these things are possible. |
| (I think) The influence of Synthetic Biology on the society is, I think, dependent on the context at that moment. It is not only a matter of how are we influence as society by the Synthetic Biology? But also how do we influence the Synthetic Biology field? It is a two-way street. And depending on the politics at that moment, the economy, war threats or not, tensions among citizens, how do we look at power of big companies - multinationals.... Depending on these things we will give Synthetic Biology a place I think in our society. | The influence of Synthetic Biology on the society is, I think, dependent on the context at that moment. It is not only a matter of how are we influence as society by the Synthetic Biology? But also how do we influence the Synthetic Biology field? It is a two-way street. And depending on the politics at that moment, the economy, war threats or not, tensions among citizens, how do we look at power of big companies - multinationals.... Depending on these things we will give Synthetic Biology a place I think in our society. |
**Subtopic 2:** What is the relationship between technology and human beings?

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<td>Well human beings as I know them, are curious. Curious about things that can be explored. I think it is inevitable that human beings keep on searching and exploring the world. I am a scientist so I know that if you are a scientist you cannot always oversee the consequences of what you are researching simply because you don’t know what it is going to be sometimes. So you will always keep on searching. I think we humans will always keep on searching. And it is possible that devices will be used in immoral ways or to hurt other beings. I think as a person we people, we are in control over technology, and we do not always choose what we find out, but we can choose what we do with it.</td>
<td>The world of technology and the human world. I think, of course, it influences each other. But I think we should be careful with that. If you see children in my school for example. They call them the Head Down (HD) generation. Everybody has his own screen with him or her. We could not foresee five years ago that it was going to be like this. And so fast it went. So I think it should be two separate worlds, which influence each other. That is my opinion.</td>
<td>The relationship between human beings and technology? I think they are one. They are all together, it is like one world. Humans create technology, and technology develops. Did you see the movie HER? It is about a writer fall(ing) in love with an operating system. The operating system is self-learning. And they really start having are relationship together. So it is all one, technology and the real life. And their love, and…. But in the end I think humans dominate the technology. You can reprogram the technology so things are changing.</td>
<td>The relationship between human being and technology. It is actually more and more becoming one. It is becoming one world, more and more a part of being a human, for which we logically start to internalize technological applications. What you often see is that people with new technological developments first are very distant and afraid. For example if we jump back in the time to the moment at which the first trains and train tracks were being built. A lot of people - farmers for example - were really scared. When the trains would start driving, cows would get confused - like no more milk production. And humans thought it would be unhealthy to drive that much faster than humans naturally move themselves. At a certain moment people started trying it and discovered it delivered them benefits. Time and more efficiency. And then it became a part of their daily behavior. Then people do not even think consciously about it anymore. Then it (the technology) becomes part of you being a human.</td>
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<td>Subtopic 3a: What is the adequate ethical approach to synthetic biology?</td>
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<td>I can imagine that we will encounter ethical dilemmas in this field. I think you should always base your decisions on facts and not on fears. It is easy to be controlled by fears. But it is important to stick to the facts. So if it were me, I would choose someone who is capable and analyze if there is a real ethical problem and then make a decision. And not be guided by fear. I was thinking about nuclear energy. Because that is also, there is a lot of uproar about it and fear. And I know someone who is a nuclear physicist and knows a lot about it. And I always thought why can’t someone like him decide whether we are going to buy or going to place another nuclear reactor to produce energy? Why can’t it be someone like him and not politicians who do not know anything about it and are guided by fear?</td>
<td>Uhm ethics, I thought you would be coming to this. I think we have a lot of arrogance in science. There is a lot of research and we think we know a lot about the world. But if you look at it exactly, every answer we give to a question gives another ten questions. So what do we really know about the consequences of what we are doing now? If you look for example at the gender of a child that is conceived. Think about it if we could decide what gender it would be and you have a mother with four boys and she really wants a girl. And the girl is born. What kind of treatment is this girl getting from her parents? Because she is so much wanted. And how are they treating the other four boys? I don’t know. I can’t oversee, I can’t foresee what consequences there are. So well I think we have to be critical and look at the limits.</td>
<td>The ethical approach to Synthetic Biology? I think we need freedom. No rules. No structures, but just freedom. If you wanna be creative and think in new solutions, you don’t need so many rules and just. You just need freedom. More the ‘yes and’ attitude, instead of ‘yes but’. And I think we should believe in the integrity of people who work with that. And they will find good ways to do so.</td>
<td>The adequate ethical approach for Synthetic Biology is mostly that we as society are going to carry the responsibility all together. It is needed that we converse with one another about it. That we engage in a dialogue with one another, in which we search for what unifies us. What is our mutual interest? What do we want? And how can we achieve that in such a way that everybody can agree with that? It is really important that we listen to each other carefully and in a respectful manner. That we do not judge too quickly but also give it time to develop new ethics for it; a vision.</td>
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### Subtopic 3b:
What is the role of citizens in the further development of synthetic biology?

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<td>The role of the citizen in the field of Synthetic Biology? I think citizens should be well informed so that they won’t be afraid of it. I think the decision-making should be with the experts. So the citizens should not be part of the debate about that. And if I look at myself, I am a physicist so I am not a biologist. I don’t know all the ins and outs of this. And I trust that the experts will have a good opinion about this. But I don’t have to intervene. I can leave it safely with the experts.</td>
<td>I think it’s, I should stay critical. That is what I am asking from myself. And I think the public should do as well. In this kind of developments. Maybe send letters to newspapers. Maybe on public media. You can post critical articles. You can ask people to stay, keep on thinking about these things. Of course there have to be laws from the government, but I am a bit insecure if that is really going to help. So I think everybody has his own responsibility to stay critical.</td>
<td>The public involvement? I think everybody should be able to contribute and to discuss. And everybody should TAKE their own influence in that. If you want to have influence in the development you should be heard and take the influence. For example when I started making music, I used the technology that was available. And things were developing and I just go with that flow. I was thinking, I did, I studied biology long time ago. And I was thinking perhaps I should also create some things with or experiment with Synthetic Biology. So perhaps I am going to do, make a kind of lab in my studio as well. And create something over here?!</td>
<td>I think that the role of the citizen is incredibly important. And everyone should feel that, and take that responsibility. Actually in the way a democracy can only function when everyone participates and votes. In that way only can science and applications of it flourish; when people express themselves about it. And within that people should be willing to be critical, dive into it. Look at it from different perspectives, develop an opinion, exchange it, dare to change your initial assumptions and form new opinions. Stay in contact, keep moving, keep conversing. That is really important I think.</td>
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<td>What I will do, I will am planning to gather knowledge about it, develop a preliminary opinion based on that, and publish that. I have a blog and always invite people to respond. And I find it really interesting if people come back with well-elaborated arguments and opinions about it, which give me new ideas. Then I respond to it again, and I like open discussions, open conversations, and also the willingness to let go your initial thoughts. So what I would like to contribute in that is facilitating conversations; participating in forums. Or maybe even start new forums. That actually... Yes.</td>
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APPENDIX 2

Transcript of introduction video used in case study 2 (Chapter 6)

This is a short introduction into Synthetic Biology.

Synthetic Biology is a rather new technological and scientific field that focuses on redesigning living cells, or parts of cells. Since this development is rather unknown, we will tell here about it. Our body and actually all living organisms are built from tissue, which contains cells. The human body contains 50 to 70 trillion cells. Cells can alter in build-up and functionality. Cells in your skin for example, are different from cells in your liver. But in every cell, the inheritable information is the same. That is the DNA, which is located in the core of the cell. In there all properties are stored of the organism that the cell is part of. For example the color of your eyes. Living cells can produce substances, change, divide and die.

Science is more and more able to unravel DNA of humans, plants and animals. Hereby we can improve our understanding about cells as they are. Scientists can also alter cell properties, for example cut a part of the DNA and paste that somewhere else. In that way one can alter the functionality of a cell. Synthetic Biology goes one step further. Synthetic Biologists are focused on the complete autonomous, synthetic composition of DNA. First the existing DNA is analyzed, then scientists produce by hand or with machines - like a small factory - reproductions or combinations of DNA. Therefore the word ‘Synthetic’. With these technologies one can make new forms of living. Therefore we also call it biology.

In short, synthetic biology offers the opportunity to design new forms of life. This example is a bacterium that is altered in a way it can emit light. People are currently exploring opportunities with Synthetic Biology in fields like healthcare, agriculture, environment, and industry. Next to opportunities, Synthetic Biology also knows some practical and societal barriers. To summarize, there is a lot still unknown. Synthetic Biology is fully developing.
### APPENDIX 3

Audio-narrative transcripts of Opinion Lab, Case study 4 (Chapter 8)

1. Bacteriophage (translated from Dutch)

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<thead>
<tr>
<th>Character</th>
<th>Audio-narrative script for the first round: What do you think about this bacteriophage?</th>
<th>Audio-narrative script for the second round: What is ‘being ill’, actually?</th>
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</thead>
<tbody>
<tr>
<td>Jack</td>
<td>Think of the diseases that these phages could detect and treat. Perhaps the time has come in which we do no longer have to accept that we die young.</td>
<td>You’re sick if you have something due to which you cannot live or work normally. You have pain, are sad, fatigued et cetera, by a specific abnormality in your body. Fortunately, we can often solve things with medical interventions.</td>
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<tr>
<td>Liv</td>
<td>Ok… a new type of cell in your body? How do you ensure that the cell doesn’t damage you? And do I want to know everything about my body? Pretty scary, I think.</td>
<td>It is of course very much to be really sick. But the medical world can also make you sick. You are nowadays called rather sick, cold, allergy ADHD. Everywhere is a remedy for. Hear disease is not simply to? It seems that we need to be more perfect.</td>
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<td>Zoë</td>
<td>How cool, with this you do not only stay healthy, you can become super healthy! Who knows what more we may invent. I want to try such a phage…</td>
<td>Health is something you are in control of yourself. What you eat and drink can make you healthy or sick. You just have to put keep working on your body to keep yourself fit. If you can take your health to a higher level through technology, then surely that’s fantastic, right? Just don’t forget yourself, that’s all.</td>
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<td>Dax</td>
<td>This is actually a kind of living computer in our body, so that we have almost nothing to do ourselves anymore. A chance for a healthier life. But what if we cannot live without?</td>
<td>Through scientific advances we still know more about health and disease. Old ideas were rejected. But we must pay close attention. Current ideas perhaps will be obsolete again in the future. So we need to keep thinking about what illness is.</td>
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2. Plastic eating E. coli (translated from Dutch)

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<tr>
<th>Character</th>
<th>Audio-narrative script for the first round: What do you think about this bacterium?</th>
<th>Audio-narrative script for the second round: Are humans more important than nature?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jack</td>
<td>I’m glad we have this technique and the problem of plastic soup is dissolved. What humans waste must be cleaned up by humans too.</td>
<td>Nature is for mankind to use. But as we also desperately need nature, we must do so this carefully. Plastic soup, or other threats? Fortunately mankind always invents new solutions for that.</td>
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<tr>
<td>Liv</td>
<td>Can’t we just use less plastic? If we do this, all sorts of scary organisms might end up in the sea that do not belong there. And perhaps this gets into our drinking water eventually!</td>
<td>We cannot live without nature. Think of all the ways we depend on nature: food, health, environment, but also for our leisure. All these techniques, such plastic and cells that can possibly eat plastic, they involve great risks. If we violate nature, we get that back for sure. So we must be very careful.</td>
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<td>Zoë</td>
<td>What an ingenious invention. Maybe we can even make other cells for the sea. Who knows what we can improve on the sea!</td>
<td>Human beings are part of nature. Mankind does not stand so much above it, but has more power, for which mankind can decide over nature. However, we must also have respect for the wisdom of nature, for nature can inspire us too. Nevertheless, it would be very cool if we can make something by which we can improve nature.</td>
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<tr>
<td>Dax</td>
<td>We have to adapt ourselves to new technologies that are invented. If humans make those cells, can’t we just make them so that the sea remains undamaged?</td>
<td>Nature is infinitely large. Man is part of the same system, but it takes only a modest place in it. Nature is continuously changing so we must adapt along with it. An important task lies there for us as people to keep developing ourselves.</td>
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3. All-growing fruit plant (translated from Dutch)

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<tr>
<th>Character</th>
<th>Audio-narrative script for the first round: What do you think about this plant?</th>
<th>Audio-narrative script for the second round: What exactly is nature?</th>
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<tr>
<td>Jack</td>
<td>With this, we can solve a major global problem: food shortage! With this plant we may finally have a solution for people with hunger. We’d have to do it carefully, of course.</td>
<td>If a plant grows and gives harvest, it’s a plant. For centuries we have selected the best plants for our food, so if we adapt a plant it’s not unnatural, suddenly. Unnatural plants do not exist.</td>
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<td>Liv</td>
<td>Wait a minute. Fruit is something you eat, right? Then it enters your body... and what happens next? And isn’t it terribly expensive? Soon, there might be only food for the rich!</td>
<td>If human beings adjust anything to a plant, it isn’t a natural plant anymore. We go further and further with this, it seems. Where does it end? There is a reason that the word ‘unnatural’ exists. I would not eat it.</td>
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<td>Zoë</td>
<td>Just imagine! We might be able to grow an entire garden in our houses, with lots of great new plants. Strawberries that taste like banana and stuff. Cool dude!</td>
<td>Human beings are part of nature, so we are just as natural as plants. We try everything to improve ourselves continually, but actually everything is naturally changing too, due to a variety of reasons. So whatever we change to plants, they are and will remain part of nature.</td>
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<td>Dax</td>
<td>If we do this, plants will become really very different. And agriculture too. How will these fruit trees reproduce? And what will the farmer do? Can we as humans, change too if we change our food?</td>
<td>What we see as ‘nature’ is based on an agreement between people. Over time, it changes too. Due to technology we live in a new sort of nature, and soon enough there will be something new again. So we must continuously adapt ourselves to that.</td>
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REFERENCES
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References


DeAngelis, M. (2014). *Reading the Bromance; Homosocial Relationships in Film and Television*. Contemporary approaches to film and media series. Wayne State University Press, Detroit, Michigan, USA.


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