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Future Design: Artistic Visions for Audiovisual Media

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Four years ago, I founded the Expanded 3 Digital Cinema Laboratory in Germany. At this time, most of the people at the center of the art and media technology sector were working with new technologies, digitalization and 3D, but no one was paying much attention to content development. New technology without new content makes no sense. Technology is driving story but, in my opinion, story should drive technology. You write a story and then try to find out what's the best technology to use. At this time, 3D was coming up mainly in animation. I thought this could become a major change because normally digitalization is just another way of grabbing information. From the image we go to data and produce the image out of that data.

I thought the use of 3D could be similar to when color came and sound were introduced to cinema. So we started this project, which nobody took seriously in Europe, but almost everyone took seriously in Asia and the Pacific region. We immediately had places like Shanghai, Tokyo, Singapore, Sydney, and Vancouver as partners, but almost no one in Europe. Everyone here said 3D is 'Disney' and we're film *auteurs*, not Disney. The first symposium included people from the gaming community. When we discussed the topic of three-dimensional storytelling, we concentrated on the elements of film, TV, gaming and sound. But we found that this technology might be a game-changer, especially in science. We created the 3D Alliance in Karlsruhe, where we united a technology university with climate research, architecture, and other disciplines. It was really amazing because it was the first alliance where those people were working within an art context. Art was the leading partner and the other disciplines were co-partners.

We started work on this alliance of science, art and technology and tried to find out what's possible. When you're working with these supercomputers, for instance, that calculate something like future climate research, you have billions of pieces of data and nobody could really handle it anymore. We started to visualize the data by entering a three-dimensional component, a funny yellow spot that you can move around as you research. Why do we have a yellow spot here? It was the beginning of a very good friendship like in *Casablanca*. The science sector had all those supercomputers, and we got €1.3 million to provide all the technology for Mistica and other stereoscopic displays. We also built a European winter school that is in development and our friends at Aalto University in Helsinki are partners along with the HFF Munich. Barcelona is another partner. They do a lot of experiments with 3D film and 360 degree filming environments, always starting with the idea of what kind of story would make sense, what kind of style would make sense if we shoot in 360 or stereoscopic.

We tried to take a really wide approach to the subject, so we made 3D art exhibitions. We did a 3D opera with Peter Weibel. Four years ago, we made the first live 3D transmission from a small art university. We did experiments with underwater 3D. When you have the glasses it already feels like diving. We made 3D projections onto public buildings, and in the past year we've also done 3D printing for fashion and architecture and produced an entire building with a 3D printer. At the University of Edinburgh, we worked on a 3D laser scanner, making such perfect scans that it's precise to the millimeter and you can move around inside these buildings. They use it mainly for architectural cultural heritage preservation. But if you have all this data, you can easily make an animated film because you can move around in all the buildings and the data is already there.

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We found out how nice and big this whole thing could become starting with a BEYOND Symposium every year. The first year's was called Future Cinema Future TV. And then we had Artistic Visions for Europe. For four years we've had the first international 3D festival, which is not only a film festival but includes art, opera and expos. Discovering what I consider really interesting – and what you all would find interesting – is the eye of the needle with this new technology. It's all about creating new content. At the moment, the industry is trying to produce 3D films to milk the 2D market. Only hybrids are being produced, where space has no meaning with very few exceptions, where only the subculture or the academy uses 3D in a radical way because it doesn't make sense, for instance, to look at Kieslowski's *Red* in black and white. If you make an original story for 3D, then it wouldn't make sense to watch it in 2D. And no producer at the moment wants that because they want to make money. We used the concept we call 'designed thinking' when we started to work with this kind of development of content for 3D.

Erwin Schmidt, the producer of Wim Wenders' *Pina,* together with my students, developed a 10-part TV series on architecture for ARTE called *Cathedrals of Culture.* At the Berlinale, Wim's section on the Berlin Philharmonic was part of the premiere with another section shot by Robert Redford. The whole concept was developed with ten of my students. First we had to understand what this technology means, and then we had to observe what was already there and find a critical view towards what's now possible what might be possible in the future. Because today, for instance, if I wanted to come up with a theory about thrillers, I would break down a hundred bestselling thrillers to determine what they have in common, and then I would have something like a "thriller theory." Now we have 2D films with 3D effects, so I have to seriously speculate about future probabilities. We want to define what we want to do with 3D. The next step is to ideate, sit together and discuss. But unlike the industry, we can immediately build a prototype whenever we have an idea that could be cool. We start shooting it, and then we test it and then we produce it and do research. In the beginning, we had only very vague ideas like using different rhythms when we cut in 3D. People from Finland made eye-tracking experiments in both 2D and 3D. The eyes move very differently when they see the same scene in 2D and when it's in 3D. This enables us to find scientific proof of why we need to change the rhythms.

Another thing not explored completely is the possible creative potential from 3D errors. You can see the frame with the left eye before you see it with the right eye, which completely changes the atmosphere because your brain doesn't recognize it. We had to demonstrate hundreds of errors with test groups. Salvador Dalí, who learned 3D with Disney, painted all of his major paintings with the "second eye." The right eye sees something darker than the left eye and sometimes he put skulls in the left eye that don't appear in the right one. We have the rights to do a digitalization where both eyelines need to be made parallel to see the effect. Most people can't do this. When we make a digital photo and then a DCP, we can watch what Dalí had originally intended in a 3D cinema. This enables us to conduct a lot of research without having to go to the effort to produce it.

We started a group of workshops to "re-learn" our craft. It was clear that when DoPs work with two stereo cameras, they have to re-learn their craft, as do editors. The paradigmatic change came when first working with people on a 3D set where there were mostly 2D people with only a couple of people having a 3D experience. One of the major things to get over was to stop thinking in frames. In the film business, we learn how to frame the world, to get a 2D frame out of a three-dimensional impression. 3D has nothing to do with normal life, but more to do with stages, where the corners become much more important than when we work with theatrical stages. We must stage our movie, not frame it. This is a major step in producing 3D. When we look out of the window, we have this frame with a space behind it. This is, more or less, the 3D impression.

Another thing we discover is that the spatial coordinates have emotional significance. When Michael Curtiz shot *Casablanca,* there was the technical idea that your eye would move quickly

over the screen, staying in this red spot, the sweet spot. The object of desire, Ingrid Bergman, was always set within this spot. But in the flashbacks to Paris, Rick has to drive the car so it would be impossible for her to drive and therefore be out of the sweet spot. What they did was to bring a British car to Paris so he could still drive but she could also be seated in the right spot. Most viewers never reflect upon this, but they feel where the object of desire is, where the tense moment is.

I learned to direct actors in space, how they are aligned and how they are in opposition to one another. There was a crisis in cinema in the 60s, and in the film schools they lost the idea of teaching directors how to move actors in this way instead of moving the camera. We then had to re-learn how to make meaningful movements of actors in space. It's the reason Wenders' *Pina* was so great because with Pina Bausch and her dance theatre, it was all about expressing feelings and relationships by moving through space. Wim had to transport this to a 3D cinema experience. We found out that when you really start to work within the space and place sub-stories in the background, you provide more time to look and find pleasure in searching for things in the picture. Like in an Asterix comic, first you see the picture, then the story, then you read the bubbles of text, and then you search for the dog because the coolest thing is always the little dog hidden in the picture. It's like returning to the same spot over and over again because you haven't seen everything. When you have a very complex picture, you have to give the audience more time to really cherish the image.

An important thing in directing 3D is depth budgeting for dramatic reasons, for contrast and changes in depth. It all creates eyestrain, if used in an excessive way with no moments of relaxation. The only film until recently that thought about using depth budgeting is *Coraline*. When Coraline was in her normal world, there was a flat picture with very little movement between the depths. When she entered the fantasy world, you sometimes had hyperspace in between a very huge space and a very flat space. There was quite a different pulsation in this fantasy world, so you had the feeling that it was much, much cooler. Titles change because when they pop up they appear behind the action. One of the first creative attempts at using titles in space was *The Life of Pi*. The titles flow into space. That was kind of a good idea.

In the beginning, this was one of the major things in 3D – the negative parallax, the pop out that seems to come into the cinema. This is the most terrible effect of 3D. It's the best know effect, but the most terrible effect because we don't want to have things sticking in our faces very closely. I know of only two negative parallaxes which I really love, and those are the light bubbles coming out by the tree by Avatar and the documentary by Mike Slee [*Bugs!*,2003] , where butterflies were floating around, and kids in the cinema were happy, not frightened.

I'm sorry I told this story two years ago, but I have to tell it again. I was invited to the set where the first 3D porno was being made. There was a scene where there was a guy standing there with a nice ass and he turned around and had a huge erection. It came like a crane, like from here. [laughter] They were into what could stick out of the screen. And I said, "No, no! I don't want to be that close to that, not in my face, too close." You have to be really careful. Normally, what we love is to be able to look into eternity. When we stand at the sea or on the top of a mountain, we're completely relaxed and even have sacred feelings. This is because our eyes can fix in a parallel when we look into infinity. Our brain starts to relax. But whenever you take your finger and go like this, it's very uncomfortable.

What you're probably most interested in is how this impacts screenwriters. Four years ago, nobody thought it had anything to do with the screenwriter. It gives them too much power so they can only decide on things that are pure story. If there are not multi-dimensional characters in a multi-dimensional world, interesting subplots and edifices already in the script, then no director can put

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them into the scene. Going back to *Life of Pi,* if you saw it in 3D, I will talk about the last scene. We see the tiger going into the jungle, and then we see the jungle, which is completely flat and then black and white. But the sound goes on and opens into the space and into the cinema and it has an incredible effect. Your visuals flatten and lose color but the sound expands around you. It was written exactly like this in the screenplay. Normally producers and directors say this is not the job of the author, but he thought about how to use his ideas of what it means when life loses something on one end but opens on another. This is story and there is mise-en-scène. This is one of the few examples when even Anglo-American producers accepted a script that could think about space.

When we think about space, then we find out that the whole dramaturgic history of story, drama, and screenwriting is about how to organize time. There's not a single theory on how to organize space. In Hollywood, they say that film is like life without the boring parts. It's about how we place suspense in time. But when we think about 3D, why shouldn't we have a theory about meaningful space without the boring parts? We should have temporal tension, horizontal tension, vertical tension and parallax tension. It has to be in the screenplay from the beginning. What could horizontal tension mean?

When we see an object of desire, it causes erotic tensions – this doesn't only mean sexual. To the ancient Greeks, anything erotic was greed-driven, whether it's wanting a glass of water or wanting to connect to a person. When I want something, I normally move horizontally. More interesting is the vertical tension, and it's quite difficult to explain since Freud ruined our idea of what humans can desire. We lost something important which the Greeks called *thymos*, thymotic energies. It's not an "I want to have," but "I want to become" kind of tension. It's not greed but a very esoteric tension.

Achilles despised Menelaus. He was the best warrior, and when he was asked to come to Troy, he said, "I don't want to go kill people who haven't done anything to me." Achilles then went to his mother who was a seer, a visionary, and he told her that Menelaus wanted him to come to Troy, and he asked her what he should do. She told him if he stayed home, he would have lots of wives and children and that he would be a great king. Whatever he desired would be there for him and his people. This would be quite erotic in every sense of the word. She said if you go to Troy, you will die there. But even after a thousand years, people will remember your name and sing songs about you. Freud should explain what kind of Eros-driven motivation took place. This was a thymotic motivation to become immortal by name as Achilles would be if he went to Troy and died there in battle. There are some people who want to have such things. The vertical tension is in his character because of what he wanted to become.

What could the fourth dimension, the parallax tension of closeness and depth mean? We can reference this whole point-of-view debate. How close can we attach our audience to the story, to the protagonist and to the scene? In *Perfume*, the point of view changed constantly, and people just completely lost any emotional response to the film. With the 3D negative parallax, we can very precisely define how close the point of view is from the audience to the screen. When we make three-dimensional stories, we need multi-dimensional characters in a multi-dimensional world. I call it 'chrono-tempo', a space-time relation. And whenever you develop your idea and start to think about it as a 3D film, the first question should be: What would be the three-dimensional surplus? Sometimes it makes sense to make a film black and white or without sound, but what will be the three-dimensional surplus? What I like to do with my students is I ask them to imagine their favorite film. If you were able to re-shoot your favorite film in 3D, what would the surplus be? If you don't find any surplus, then it's not a 3D story.

Six years ago, I thought about the movie *The Fantastic Voyage.* Scientists get into a small submarine and get injected inside a human body. Using technology in 3D, this submarine could be

among these red balloons, which are the veins. We could write an adventure story where by the end, you have learned a lot about the interior of the human body. That was one idea. The next idea, which people hated me for, was Ingmar Bergman, because I think a lot of his films in 3D could be amazing – the abyss of psychological turmoil. Up until now, the best 3D films use space as a metaphor for physical space, which is obvious. Buildings, dance theatre have been done. But nobody goes further. We can go much further.

Going back to *Coraline*: in terms of development, let's say there is research for a documentary in 3D or even for screenwriting. The task would be to identify the two worlds for dramatic reasons, but also to apply different uses of space towards the story. This is the only film that has used this concept of creating two worlds by using depth differently, making it far ahead of almost any other 3D film that came before.

So if we want to identify the tools, then we have to understand orientational differences. Any kind of society or group has these differences: perfect versus imperfect in sacred or religious communities, bravery versus cowardice in military societies. We can identify the orientation in the story and use these attributes in relation to space.

Another thing that is most important for my concept is identifying the different levels of conflict. I'm not so much into this kind of psychotherapeutic screenwriting shit. I believe more in character, and think of character in terms of immune systems. They avoid different things but might have common desires as well. What we might normally call the antagonist's network is a stressor on this immune system. You can define whole cultures as collective immune systems, which can be stressed by an outside influence. The three levels of conflict are three levels of stress. When you call yourselves Finns or Germans, if you feel normal and there are no problems, there's no reason to feel 'German'.

When the Twin Towers fell, we became the Western world again. It's interesting. The moment outer stress comes in, a collective can start to define itself as an immune system. At one moment, everyone was talking very badly about the European idea. Now that there's a crisis, we've all started to become European again. Stress creates identities, immune systems, characters – a nice approach to writing characters that are not completely psychologically-driven. When someone is having a problem in a screenplay, there is now always this background of abuse, sexual abuse as a child. I can't hear it anymore. We need to find motivation to discuss why people are the way they are. Using this idea of the immune system, we can re-think writing characters and we can think about the three levels of conflict.

What I find most important when thinking about the possibilities of what we could do with this new technology is how everyone is currently using space simply as space. *The Journey to the Center of the Earth*, *Pina* in 3D, architecture in 3D – all of this is quite obvious.

In *Life of Pi* and a little bit in *Gravity*, directors used the possibilities of using this relationship network. This is so astonishing because whenever we talk about relationships in language, we always use spatial metaphors. I come closer to you. Now we move apart again. There's an abyss growing between us. Whenever we talk about relationships, we talk about space, so it should be quite easy to translate words of relation into a visual space. We're moving quickly with all this, but in talking about all these tools, we really need to have new story models. There's normal plot structure building and normal ideology of cause and effect, and we need to shift into how we can change, how society can change, how the world can change, the ideological idea of what we call the Western world. The most adequate use of story in these three levels of stress, an inner character conflict, a relationship conflict and an outer plot conflict would fit into a four-act structure.

In the first act, we develop mainly the outer plot in the foreground, a relationship conflict in the background and the inner conflict in the subtext or underground. We develop this story until we have a major threshold to cross, a point of no return in an outer plot conflict that moves into a second act. Now we not only shift the story forward but we go deeper. We now know more about space and time in the story, and can shift deeper into the relationships and their conflicts. It becomes more complex and therefore, we have to build in at least one reminder of the outer plot conflict where we re-shift the different storylines in space in the second act. We then have a very developed mid-point sequence.

Do you read books on dramaturgy? There's a lot of talk about mid-point. I've never really found a good definition. Another stupid thing is turning points. You should know by now that in every time-based art, there are no points. We have sequences. So what could a mid-point sequence help develop? One possibility is to reuse the first half, where we put story and events that foreshadow some resolution if we want to have the biggest contrast towards the resolution. We can use it as a point of no return or a catalyst for the inner character conflict, which dominates the third act. We need reminders of the emotional network and the outer-plot story. In the application of the different uses of the different levels of stress and different storylines, all the time it becomes more interventionist, more complex. It leads to something like a ripple catastrophe, a ripple in between the different levels of storyline. If the relationship cannot change in the outer world, the inner character plot cannot change, or the other way around.

This leads to a crossing in the vertical tension. The inner character conflict in the first act can become a ripple climax, a term I really like. In the ripple climax, we have developed all the levels of story, all applied to a certain level of stress, all to different kinds of spatial metaphors. This is a normal linear arc plot. Be careful to note that a model is a model for those who write stories. A model of a molecule is not a molecule. A model of views on a story is a model that has its own needs. When there are problems or we want to identify something, the simplification of a model can really help. We have models for game-over-restart movies like *Run Lola Run,* mind-fuck movies like *The Sixth Sense* or *A Beautiful Mind.* The author of Iñárritu's films, Guillermo Arriaga, does what I like to call a quantum theory of drama. This writer believes in quantum theory and chaos theory. If you have a linear, Western approach of cause and effect, of linearity of time, where the universe makes some kind of sense, this kind of model can be applied. If you want to go to more complex structures, then you have to re-think the use of space.

Here's a story where we tried to apply different kinds of information towards the use of space and create a space-time narration. So, this is a very, very quick overview of our research over the last four years. I changed from Future Cinema Future TV to what I now call 'Future Design', where I invite all the research centers in Tokyo and Singapore, Disney Research to think about what will come out of the next three years of our research. I'm quite sure that by the end of this decade, new technology will not only completely change our lives, but also our perception of life. For me, it might be an interesting time. At 55, I have a 13-year-old daughter, my youngest, who will live in a very different world. I try to combine all I know about stem-cell research, creating protein for hamburgers, 3D printing, new energy forms, vertical gardening and things like that into a bigger narrative, a serious speculation about the future. It's also the reason I teach. I tell my students what I know now. They leave the university in five years and have to re-learn almost everything. We have to open their minds for what is coming, although we don't know exactly when it will come. 3D was the driving force of the digitization of cinemas.

Eight years ago, I was invited here to Potsdam-Babelsberg for the first Inside Out congress. A question then was: Will the digital revolution come? There were many experts that said it will never come. Television will not change and the cinemas will not change because they have invested in technologies that have worked for over one hundred years and every investment would only be

pure risk. Eight years later, Fuji is bankrupt and the last cinemas with analog projection are closing. If you have an analog TV, there are no more programs for you to watch. You must head to the museums to see analog cinema projections. There's a new market.

I know some artists who now use film stock to shoot a film, make no copies of it, and sell the original to a museum, where you have to go to see it. It's become a niche market to shoot with film stock because it's complicated to reproduce. What will happen when 3D moves from the cinema to the living room? Greed is the biggest problem in modern evolution when 3D televisions started being thrown into the marketplace with glasses or other accessories. Nothing was really good and so the first impression was that of complete failure. Even if you really want something good, you must wait two to three years, and then you will have 8K stereoscopic – higher frame rates and higher resolution. Last year at NBA, there was 2K technology. This year it's 4K. I saw the first 8K, and also saw an experimental prototype with 16K. Why do we need such high resolution?

The Hobbit was shown in a double-frame rate, which makes sense for 3D, and this rate will probably be doubled again for the next *Avatar*. I have colleagues who made a calculation with this double or doubled double frame rate, which increases exponentially the points of view experienced, and that's a lot of data. For a really good multi-stereoscopic view, you need 8K TV where every single viewpoint is full HD. There are a lot of people researching what we will want to do in the future and we all gather and discuss. It's one of the few places where architects and philosophers, cultural historians and technicians can meet and exchange ideas. I'm a documentary filmmaker at heart, but when I go to documentary film conferences, I know all the faces and know exactly what everyone is talking about. It's so boring.

When I meet with people from completely different worlds than my own, it's immediately inspiring. We agree that even by the end of this decade, our iPods, iPhones, our computer monitors with be autoscopic and multi-view. With Wim Wenders we were working on an autostereo monitor with eight points of view making the first test. We have one major lens with two side lenses, one picking up the image and the smaller two only picking up spatial data. With this algorithm, we can construct this whole scenario. It's just the beginning, but when we shoot 3D on multi-stereoscopic equipment, there will be one normal camera with two small cameras on the side to pick up data. With auto-stereoscopic multi-view, when I'm in front of my television, I could be here, then move there, and move again. When we move, space moves. In cinema, where we sit in one spot, we don't mind these shifts so much. But at home, I'm ironing. It's still the same space, the same picture. After a while, this feels very uncomfortable because my brain doesn't understand it. We want to have multi-view, and this will change the way we tell and watch stories. Imagine an old Hitchcock film where the murderer is hidden behind your shoulder. The whole cinema would have to move to see this.

Everybody is now announcing the breakthrough from tension to technical in terms of more interest in content. I consult with companies that have billions to invest in new technologies in the next five years. You can throw all this technical stuff at people, but if they can still see the same shit they can see on a normal television they won't buy it. The focus really needs to be on what we can do with the technology and how we can develop content. This is where you all have this kind of pioneering chance.

Like I said, the biggest problem is greed. 3D got a very bad reputation because films shot in 2D were cheaply rototyped and turned into 3D films that give you a very bad headache because of the cheap conversion. If people pay five bucks more and get a headache, no one tells them it's because it's fake 3D. It's the same with building and selling these 3D television sets. They want to milk it so you're sold pretender technology, which is not developed technology. At the moment, Dolby has announced that in two years' time, they will have the best auto-stereoscopic televisions

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for the same price of a normal full HD TV. I don't believe them, not in two years. The technology is there and it works. It's just not affordable at the moment. What's needed is new programming and different lenses in the television window.

The next thing that will come up by the end of the decade is a virtual window to the world. I'm working on some concepts to capitalize on this idea. When you're in your living room and you don't have such a beautiful view as we have here, you'll have a screen on the wall just as big as you want to have it in auto-stereoscopic 3D. You'll buy it as a roll so you can cut it and put it wherever you want for watching films, for doing teleconferences, for shopping. What I'm working on are live transmissions from landscapes or underwater so that you can change your living room into your favorite beach in the Caribbean, live and in 3D. If it rains there, it rains where you are. You'll have a very emotional relationship, much more than you would experience from watching a tape of the same. There could be a transmission from the Great Barrier Reef so the kids could look for fish. There are some companies that plan on building something really huge for the home market, and I don't feel at home if it will be really so huge. I hate 180-degree projections. It feels dangerous. It reminds me of being in a war zone. I also hate 360-degree projections for the same reason – it's terrible. I would like to have a window onto the world in this size. I have control. I can watch it but it will not be dominant. If there is to be such a huge screen, how will it be transported, for instance, into a living room in Hong Kong? You'd need a crane. Everything is too narrow and small to just bring it in if it's not rollable.

What I don't understand yet but find quite interesting is that when you have such an artificial system in your home and you're using Google and Facebook, they'll find anything that is wearable robotronic items. I had a student who made a T-shirt that can make live translations into different languages like subtitles. If you speak to someone in Chinese and ask if they want to have a drink, they can see the subtitle on your T-shirt. Like I said, we have the ability to prototype it, use it and test it. The problem with that was that Chinese people hated it. They don't want to look at women's breasts. So the subtitles need to be placed elsewhere. The best thing would be here because it's what we know from cinema. I look at your face, and here's the subtitle. I think other cultures will have this problem with where they are placed now.

Some friends in Bremen make projection designs using public buildings. So you'll have screens in your room, for normal computing, and for public screenings. Or you can make ambient art by building projection sculptures as my friends and I do in the Canary Islands, which had to be run self-sufficiently by volcano or water or sun or by wind to make projections into landscapes.

There is increasing connectivity, what we call cloud computing, and what the Chinese companies especially go for, which is 5 billion more users. What they want to really target, more or less, are the 5 billion people that are not yet connected. They consider this a very huge market. Let's think about how nice and how scary the Internet is now. There are around 2.5 billion users at the moment, something like that. Five billion more will join this network. I made a provocative 3D installation with African and Middle Eastern women and called it Asynchronous Equation. We live on very different timelines. We're connected, but we'll be networked with people who live in different times and cultures.

While this is a political discussion we can have later over a beer, I think the socialist, communist and feminist ideologues had an idea to have a synchronous equation where we are all equal, but we are not synchronous. I worked for two and a half years for Native Resistance, and they were fighting for the right to be different. The asynchronous equation is something we have to think about. Can we be the same and different at the same time? This combined with big data enabled experimenting with the quantified self. Are you guys crazy enough to do things like that, to measure the different data from your body and store it in your cell phone? No? It's amazing. There is now a

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shirt that gives your heartbeat, your sugar levels, everything when you sweat. It analyses all this and feeds the information to your phone. It's nice when you're really sick but the people most interested in this are extreme sports enthusiasts. They're interested in enhancement, and the more data they have, the better they can perform. This movement will come from the handicapped side or from people who are very ill. Maybe you have a daughter whose blood sugar levels you want to read regularly for when something goes wrong. The others are the self-enhancers who seek perfection. By the end of the decade on either side, we'll become more like androids where we'll have our sleep tracked and other things.

We did some artistic thing for self-enhancement design by getting beautiful six packs with this technology. We staged performances where everyone was wearing this computing stuff. One person was meditating, another was masturbating, people were hitting one another, making algorithms that transported our breath, our heartbeat, our sugar levels to computers that, in turn, transformed those into music and visuals. We found it really cool that you could make a performance with your body signals. We found a problem: I smoke and tonight I will have some beer. If I had these wearables on, not only could my wife or my doctor call me to say, "Please stop, you've already had three beers," but tomorrow my social security expenses would go up because I'm displaying 'unreasonable' behavior. This is combined with artificial intelligence – which is absolutely everywhere, still with the intelligence of a cockroach but increasing. When we talk about virtual reality – and filmmaking is virtual reality – we talk about going into story worlds that will become as normal as dreaming. It has completely different laws than our day-to-day experience. No one wonders why in dreams, the laws of physics are so different.

We worked on another idea recently with Arriaga on this concept that our daily lives are more akin to Newtonian physics and our dream world to quantum physics. It has its own rules, probabilities, improbabilities, things that are synchronous, parallel worlds, but our dreams are not completely lacking in physical laws. They're close to the laws of quantum physics. We don't even really ever wonder about that. Every night we dream four or five times, and I think that virtual story worlds and virtual networks will become very normal for future generations, like dreaming is for us now. With all this connectivity, I call this the third industrial revolution – a new technology of communication meets a new source of energy. There was coal, steam, the telephone, then television and oil, and now we face the Internet and new sustainable sources of energy. We went from atoms to bits, to transform whatever is real into digital information that can move around. We're now at a turning point where we go from bits back to atoms. I have a lot of trouble at my university because I wanted to buy every one of my students a 3D printer. They now have to think about what it could mean to have a 3D laser scanner in your phone so you can capture spatial data, take it home and feed it into your 3D printer and print. At the moment, it's plastic.

I was invited to Tokyo to see a printing of kidneys from stem cells. In the future when you have a heart problem, I can scan your heart and print out all the data from it. What I print is a replacement part using your own stem cells. They think in twenty years, we'll more or less be there. When you have a baby, don't throw away the afterbirth because it will be the fundamental piece for creating that new human's stem cell culture. This is where it could go.

Here's a guy who has a solar office. He has a panel and travels the deserts of the world. With the solar panel, he melts down sand and prints three-dimensional objects from it using nothing but sun and sand to create them. Imagine what this kind of development could mean for the third world. There's a new business idea of Disney's where you pick your favorite Disney princess from your favorite Disney film. You get your face scanned and print yourself as the Disney princess. Soon maybe you can also put your own scanned face into your favorite movie. You can take the place of Indiana Jones or any cinema characters or figures. Having daughters, having printable clothes and

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shoes, they can have something new every day because it would be completely un-cool to go to school with the same clothes.

We work with a guy in Hamburg who uses a 3D decomposition machine. You can have a 3D shirt but if you don't like it anymore, you throw it in where it gets taken apart and remade with a new substance to create a new T-shirt.

All of this is to say that I think we are in a great time for creative people because there are completely new opportunities. But also there are a lot of new risks. People say that information wants to be free. Why do we anthropomorphize information? It's just information. We're the ones who want to be free. But we should all aim for abundance and try to overcome the antagonism between technology and nature. It's improbable, like in quantum physics, but it's very possible that we'll end up in a data dictatorship. This is data that is used by the NSA. The data itself would control what we do. Our wearables could be programmed to say to us, "If you don't stop drinking now, you will receive an electric shock." This is nice to discuss in a screenplay, what kind of opportunities there are, where should society position itself in relation to all this? It will come. If you guys in Helsinki decide that this technology will never enter your island and then your kid has a problem, you'll have to go to Singapore where they have the technology to help. It will be there and as a society we should discuss what we want to do with it all. This is the whole idea of where Future Design comes from. When we work together with the simulation of climate data, the mathematician asked me if we could help them simulate complex data. I told them yes, but it's boring. When we take data from today and calculate for the future, there are only two possibilities: We'll destroy our planet by 2050 or 2060. We cannot change the data. When we calculate something from the past into the future, it's a dead-end.

I told them I will help them visualize their data, but they can help me calculate probabilities. At the next Beyond Festival, we'll meet with people and discuss what kind of planet we want to have in 2050, and then we'll visualize it. We'll tell the supercomputer where the data wants to go so we know where we are with carbon dioxide, water, population growth. Then we'll tell the computer to calm down, and the computer will find a way from this data set to that data set so that we at least,have an idea of what kinds of parameters we need to change and when. It would help to create a new debate.

Our politicians want to win the next election; they don't think more than three months ahead. The stock market is the same way. So this could be the moment when we artists come in because we have nothing to lose. We can use our imagination to start a new debate about where we want to go with this, and what the so-called industry tells me they're looking for, and it's a nice idea to think about doing subversive things like participatory storytelling. These ideas of non-linear and interactive storytelling are now boring for me. I really love a good author. This method of a thousand people contributing to bullshit is just creating noise. I want to focus on someone who will tell the best story. Participatory storytelling can be interesting, whether using wearables or windows on the world or other technologies. We can create story worlds where an author or a group of authors creates the center of the story. The community that builds around the story would have the rights to use characters and story elements to create their own story worlds around the main story world and participate.

We did an experiment with interactive storytelling by giving the same beginning to very different groups, a group of older women and a group of punks. The punks had more or less murdered the complete cast of characters after only five episodes and the other group had no conflicts whatsoever. So nothing really made sense. We had major stories, major characters in the participatory experiment, where there was an open source to use, possibilities to include their own ideas. Did you ever try to produce a non-linear screenplay or film? If you have five hundred choices

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in the beginning, it will explode. If there are only three or so jumping-off points, then it can be quite boring.

This is the jury of my festival. At my university, they tried to tell me there are no women in this area. I tried to find a good stereoscoper, and there was the head of an international research university, artists, theorists, there are women all over the place. Digital technology doesn't favor male bodies anymore. So I can have a complete jury with members from distribution, research, technology and find an all-female group.

I will go back to the story worlds because we are close to the end, I think. In the story worlds we must create the dramatic situation. By randomness or a plan, the 'must' moments must be created. We need exposition and all that special information on a character before we can move on. You throw a lot of this 'must' information into various story moments, and throw around what I call fruits and vegetables, which are nice story parts but which are not obligatory. Everyone has the feeling of creating the same story world and runs through this bottleneck, getting into his own part of the story world and having the obligatory moments together so you maintain control of your character. You need bottlenecks and obligatory moments and you need those fruits and vegetables.

We have new possibilities. I'm now 55. I was really young when color came in to the movies and missed the black and white world. I now have this moment when I can invent something nobody has done before, making a small mark on the history of art. Students have a chance in future markets. Not everyone will have a marvelous career, but now I have a female student who made her diploma two months ago and got an offer of a professorship at a university in Singapore. But she got a better offer from a university in Hong Kong – a luxury problem. I told her she could negotiate with both and then decide where she wants to go. Two major research universities are competing to have her because she has this kind of knowledge that no one else has at the moment because she's not coming out of a normal educational program. It's something that's not even recognized yet. I call it teaching for emerging futures. The future doesn't look like it used to. There are possibilities for young talents. We need to help them create tools to navigate insecure waters. I have a book on that coming out next week.

But here we probably cannot go much deeper into things. I hope I have been some source of inspiration for those of you interested in story worlds and these types of models.

One last thing: I recently was at the 3D summit in London. Whenever you enter a tube station in London, you hear a constant recording that tells you to Mind the Gap, Mind the Gap. This is the most important thing we have to say to young artists: Mind the Gap. Because what Disney and all those groups are trying to do with this immersive media making is to have a completely immersive environment. If I want to be completely immersed, I'll take LSD or read *Helter Skelter.* Art is confronting people with an artistic idea and maintaining a gap where people can insinuate themselves with their own psychology, their own social understanding and relate to the artwork in their own way. This can only happen through the gap. Whenever we think about art, I would say mind the gap. And I welcome you to come to Karlsruhe from 9 – 12 October when the next symposium will take place. Thank you very much.

Q&A session begins and Pfanz requests recorder be switched off for confidentiality of proprietary information.

END

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