TU/e EINDHOVEN UNIVERSITY OF TECHNOLOGY

Pyramid of technology : how technology becomes nature in seven steps

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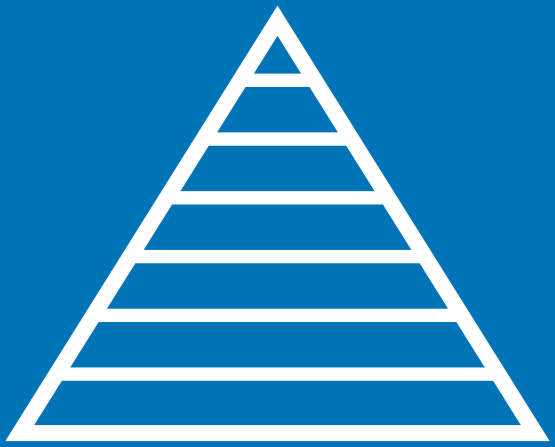

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How Technology Becomes Nature in Seven Steps

Eindhoven University Lectures 2013

TU/e Technische Universiteit Eindhoven University of Technology

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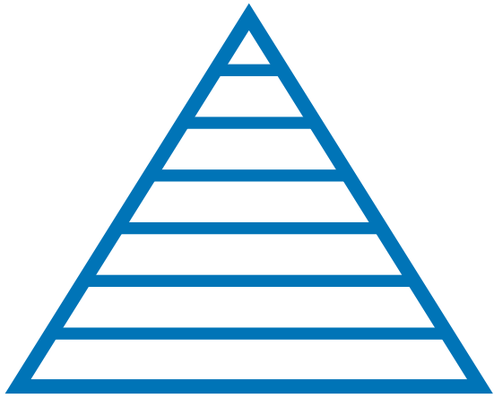

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Eindhoven University Lectures

In 2009 Eindhoven University of Technology (TU/e) launched the Eindhoven University Lectures. Each academic year a prominent scientist is invited to hold a series of lectures, aimed at a public of third year bachelor students from all disciplines.

The guest lecturer should present a topic which is not covered by the regular curricula at TU/e. The series aims at broadening the horizon of academic education for TU/e students. TU/e offers its students an education with a sound scientific basis and an educational climate that stimulates the development of intellectual and social skills.

As a tradition, the last lecture in the series is a public lecture and is part of the program offered by Studium Generale. The Eindhoven University Lectures are initiated by the Platform for Academic Education, with the support of the Executive Board of TU/e, and organized in close cooperation with Studium Generale.

I would like to thank Tijn Borghuis, Joep Huiskamp and Lucas Asselbergs for their support of the Eindhoven University Lectures 2012-2013.

Anthonie Meijers
Chairman, Platform for Academic Education

Eindhoven University Lectures 2012-2013

Koert van Mensvoort (1974) is an artist, philosopher and scientist whose work revolves around the changing relations between people, nature and technology. He started his career in the late eighties with the creation of videogames, belonging to the first generation of whizkids who are now no longer kids. In the nineties he moved on and studied computer science, philosophy and art. He received a M.Sc (1997) and a Ph.D (2009) in computer sciences from Eindhoven University of Technology (TU/e), a MFA from the Sandberg Institute/Rietveld Academy, Amsterdam (2000). Currently Van Mensvoort is director of the Next Nature Network, a foundation that aims at visualizing, researching and understanding the nature caused by people. Furthermore he is a part-time assistant professor at the Eindhoven University of Technology (Faculty of Industrial Design) where he directs the Next Nature theme. Earlier Van Mensvoort worked as an associate researcher at the Center for User-System Interaction (1998-2003), as a teacher at the Sandberg Institute (2002-2006) and as a Visionary in Residence at Art Center College of Design in Pasadena (2008).

Among his works are the Datafountain (an internet enabled water fountain connected to money currency rates), the TV documentary 'Daddy! The Woods smell of Shampoo', the NANO Supermarket (a mobile expo showing nanotechnology products that might be on the shelves one day), the fictional Shoe Company Rayfish.com (offering bio-customized sneakers from genetically modified stingray leather to catalyze a discussion on

bio-technology), the Fake for Real memory game (on the interplay between reality and simulation) and the 'Biggest Visual Power Show', an intellectual spectacle blending a scientific conference and a pop concert. Van Mensvoort is (co)author of numerous books and publications; among them Next Nature, Visual Power, Natuur 2.0, Entry Paradise – New Worlds of Design, Artvertising, and Style First. Van Mensvoort does not work in one specific medium or style, but rather uses all media to visualize his ideas. His most profound experience in life, so far, has been the discovery of next nature, which revolves around the idea that our technological world is so complex, that it has become a nature of its own. All his current activities relate to the exploration of this nature caused by people.

Websites: www.koert.com, www.nextnature.net

In his Eindhoven University Lectures series, Koert van Mensvoort, explores the development of Technology becoming Nature in seven steps. He presents a model, called the Pyramid of Technology, which describes how technologies that are initially seen as artificial, may in due time become accepted, familiarized and ultimately even naturalized. This publication is an elaborate version of the public lecture in the series, which was delivered on 27 February 2013 in Eindhoven.

Koert van Mensvoort

Pyramid of Technology

How Technology Becomes Nature in Seven Steps

From stone-axes to mobile phones, throughout history people have given birth to a wide range of technologies that extend our given physical and mental capabilities. Today, it is almost impossible to imagine a world without technology. Every human being on the planet employs technology of some sort, and every human has to cope with technological change at various points during his or her lifetime. Yet, despite our deep-rooted relationship with technology, and the fact that we are wholly surrounded by it, most of us are still relatively unaware of how new technologies are introduced, accepted or discarded within our society.

If you walk onto the street and ask the people you meet to describe 'technology', they will likely mention things that were recently introduced to their lives: mobile phones, tablets, Internet, computers. Most of us have an unspoken definition of technology as "anything that was invented after you were born" or "anything that doesn't quite work yet" (Alan Kay and Danny Hills in Kelly, 2011). Such definitions may make us laugh because they are funny and because they are true, yet they also confront us with our limited perspective on technology. Only when we start to reflect upon technology do we realize that, besides the latest electronic gadgets, technology also entails housing, roads, cars, wheels, clothing, money, writing, agriculture and clocks.

Like the fish that doesn't know it is wet, we are submerged by technology, yet we are relatively oblivious to its omnipresence. When it comes to technological change, we are sleepwalkers at best, moving from gadget to gadget, sensing our environment one step at a time, but lacking a clear vision or framework on how to cope with emerging technologies and where they will bring us. Especially in a time of astounding technological developments this seems like a missed opportunity, to say the least. If we are to set out a course towards a desirable technological future, it is important to develop a more profound understanding of how technology develops and what role it plays in our existence.

With the Pyramid of Technology I propose a model to describe the various levels at which technology may function in our lives. The pyramid is inspired by Maslow's Hierarchy of Needs (Maslow, 1943), which describes human requirements like nutrition, shelter, security and love in subsequent stages. Similar to Maslow's model, technologies can move up and down through various levels of the pyramid, while lower stages need to be fulfilled before the next stage can be attained. Although the Pyramid of Technology will certainly not answer all our technology related questions, it can serve as a tool for scientists, inventors, engineers, designers and entrepreneurs to position themselves in the playing field of technological development and eventually create better technology.

Moving through the seven stages we will learn that new technology may seem artificial at first, but as it rises from the base of the pyramid towards the top, it can become so accepted that we experience it as a vital or even a natural part of our lives. Further on I will discuss how this naturalization of technology provides an important new perspective on the relationship between people, nature and technology. But let us begin by discussing the various stages of the pyramid. Starting at the base, we may ask: If lower stages need to be fulfilled before the next stage can be attained, then what would be the absolute bottom level at which technology can function? Surely this has to be the envisioned stage.

Pyramid of Technology – How Technology Becomes Nature in Seven Steps

Level 1: Envisioned

The lowest and most primary level at which technology can exist is the envisioned level. All technology is born in the human mind. Prior to the engineering, production and acceptance of any technology, there has to be an idea, dream or vision of how our existing capabilities can be extended. Many of the technologies that are commonplace today have spent an extensive amount of time in the envisioned stage. Think, for example, of geostationary communication satellites, which enable today's global communication networks. Science fiction writer Arthur C. Clarke proposed the concept of a geostationary communication satellite in 1945 (Clarke, 1945). This idea lingered in the envisioned stage for almost two decades before Sycom 3, the first geostationary communication satellite, was launched in 1964 and used for communication across the Pacific starting with television coverage of that year's Summer Olympics.

While some technologies are implemented immediately after being envisioned, others remain indefinitely stuck in this stage. Cold nuclear fusion, teleportation, time traveling, or human-powered wings have all been a feature of our collective imagination for some time, but due to their infeasibility, they have yet to rise to a higher level on the pyramid. Although many technologies never make it out of the envisioned stage, they are still valuable as reference points for our imaginative capacity and desire to augment our bodies and minds. More than any other, the envisioned level is a dream stage, the province of

artists, poets, science fiction writers and other visionaries. Although more practically oriented people sometimes underestimate this stage, it is in fact the birth chamber of all technological innovation.

Level 2: Operational

The second lowest stage at which a technology may linger is the operational level. Here, an operational prototype or proof of concept exists, but it isn't widely applied, let alone accepted. Lab-grown meat – sheets of muscle produced from cultured animal cells – currently resides at the operational level. Some researchers predict a bright future for in vitro meat as a more sustainable, animal friendly alternative to raising livestock (Post, 2011). Although it is currently possible to grow small pieces of muscle tissue in the lab (Van der Schaft et Al, 2011), it remains extremely expensive and elaborate to do so. More research and funding are required before lab-grown meat can rise to the third level, if ever.

Other examples of technologies currently residing in this stage are the quantum computer, wireless electricity and engineered microbes that turn plant waste into oil. They've proven to work in the lab, but are far from being applied. Tragically some high potential technologies are stalled in this level, because the perspective on being applied – and hence making money – is too flimsy for investors. More than any other level, the operational level is the home of fundamental engineering research.

Level 3: Applied

Once a technology moves out of the lab and into society it attains the applied level. An example of a technology that has just entered this level is the Google Glass – a piece of eyewear packed with electronics and a semi-transparent visual interface that adds a layer of information onto your normal vision. At the time of writing, only a happy few techies have had the chance to buy and try a Google Glass. Despite the enthusiastic responses of those early adaptors, it remains to be seen if we will soon all be talking to our intelligent eyewear.

The transitional stage between invention and acceptance is often underestimated. Countless technologies are stuck in the applied stage for decades before moving up to a higher level of societal acceptance, or falling back into a merely operational level. Sometimes a technology is stalled in the applied phase for economic reasons. Solar cells, for instance, were of marginal use for years before they became cost-effective enough to be widely applied. Other technologies are stuck in the applied stage due to principles, like nuclear energy, which is widely applied but has never truly been accepted because of the moral objections against nuclear waste and the perceived risks of nuclear disasters. The electric car is another example of a technology that, not only due to the limits of its energy cells but also due to opposition from the gasoline-powered vehicle industry, took a long time before moving through the applied stage (Paine, 2006). Although electric cars

date further back than gasoline-powered cars (Kirsch, 2000), the mass production of the more powerful combustion engine superseded and pushed the electrical car back into the operational level. Only recently, sustainability awareness, longer lasting batteries and the desire for clear air in cities, are initiating a comeback of the electric car.

The electric car example shows that a technology doesn't enter the pyramid in isolation, but always moves within a larger context of competing technologies. Its success is typically dependent on its ability to adapt and transform an existing playing field and out compete established technologies. Energy-saving light bulbs, for instance, would have never reached the applied stage if they didn't have the same fittings as the traditional light bulbs they are bound to replace. In 2012, after more than a century of lighting up the world, the European Union banned the production and retailing of most common types of light bulbs. This legislation effectively pushed the incandescent bulb down the pyramid from the accepted level into the applied level. Having replaced candlelight and gas lamps a little over a century ago, the electric light bulbs are now in turn being superseded and driven in to nostalgia by emerging competing technologies.

While technologies that rise into the accepted stage from a lower level are still perceived as new, unfamiliar and artificial by the larger public, technologies that slide down from higher regions of the pyramid are considered nostalgic and outdated. Examples of such falling technologies, besides the already mentioned light bulb and candlelight, are steam trains, vinyl records, fax machines and hot air balloons. You might occasionally come across them and make use of them, but they are no longer part of our everyday existence.

Level 4: Accepted

From cars and telephones to cash dispensers and GPS, accepted technologies are part of our daily life. These technologies have reached a significant level of reproduction, standardization and familiarity within society. In contrast to the lower levels of the pyramid, entrance into the accepted phase is primarily dependent on how a technology is perceived by its users. At this level, its social and cultural role is of great importance.

As a technology reaches the accepted phase, it makes the profound transition between being seen as new and artificial, to being seen as normal and familiar. While controversial technologies like nuclear energy have great difficulty entering this level, other technologies like television, mobile phones and microwave ovens gained their acceptance almost effortlessly. Why? Presumably this is because they seamlessly connect with existing habits, traditions and intuitions of its users, while presenting a clear benefit in comparison to existing technologies like cinemas, landline phones or stoves. Sometimes new technologies are even deliberately designed to mimic the behavior of older technologies in order to ascend to this level of the pyramid. For instance, the digital bookshelf on the iPad tablet computer refers to a traditional, physical bookshelf, helping to familiarize people with electronic books – even though, in the long run, electronic books may push paper books and wooden bookshelves down the pyramid of technology into obsolescence.

Clearly, the extent to which technologies are accepted is largely culturally defined. While some people get lost driving without a GPS system, others may have never heard of it. While some may view a dishwasher as a basic, routine feature of everyday life, in many areas of the world it is still perceived as a wondrous and extravagant machine. As a general rule, accepted technologies are part of our daily life, but are not yet a lifestyle. As soon as a technology becomes a mandatory part of our lives it rises to the next level.

Level 5: Vital

In the upper reaches of acceptance, technologies become vital. At this stage, they have been so incorporated into our lives that they feel like second nature. Only a few decades ago, mobile phones were an unfamiliar new technology. Many of us still remember questioning whether we really needed to buy our first one. Today however, they are such a part of our daily routine that it feels as though we are missing a limb if we accidentally lose or forget them. Even though your mobile phone isn't implanted in your body, it is nonetheless part of your lifestyle and identity. You immediately miss it when it's gone. Will a similar dynamic unfold with the recently launched Google Glass, which promises to enable everyday augmented reality, but is currently still residing in the applied level.

A technology moves from the acceptance stage into the vital stage when its disappearance would cause a lifestyle-changing crisis for its users. These technologies are primary, essential and undisputed. Large cities, for example, are dependent on water and sewer systems. The city itself is on the verge of becoming a vital technology, with over 50% of the world's population living in urban areas. Other examples include electricity, money, antibiotics, the printing press and arguably the Internet, which rapidly reached the vital level after its invention some 50 years ago. Vital technologies often facilitate infrastructures upon which technologies at lower levels depend. Without electricity, there

would be no Internet. Without Internet, there would be no email. Without the financial system, there would be no cash dispensers.

The border between the accepted and the vital level is typically vague due to personal and cultural differences. Once a technology has reached the vital level it is fundamentally rooted in society. At the accepted level, technologies may easily slip down to a lower level on the pyramid because they are outpaced or driven into nostalgia by newly emerging technologies. In contrast, only major cultural changes or disruptions will drive vital technologies down the pyramid. Historical examples of technology that passed this stage would be agriculture, the wheel, sewage systems and electric lighting. More recently, digital computing, the Internet and mobile phones have entered the vital stage. Since vital technology cannot be easily removed, we have to carefully consider the desirability of such technologies before making ourselves dependent on them. They not only impact the lives of individuals but also society at large and, more often than not, future generations. Therefore, rather than naively entering into a dependent relationship, it is important to develop a good overview of the pros and cons of any technology that's knocking at the door of the vital level.

Level 6: Invisible

What more is there to gain after a technology has become vital? Truly successful technology becomes invisible. It is no longer recognized as technology at all. Rather, it is woven into the fabric of everyday life to such an extent that it becomes indistinguishable from it (Weisser, 1991). Consider writing. The ability to capture spoken language into a symbolic representation is an ancient information technology that made our thoughts and voices physical and permanent. Today, writing is omnipresent in most countries. Not only books, newspapers, magazines, and digital screens convey written information, but also street signs, billboards, and graffiti. Although young children still need extensive time and effort to master reading and writing, it's difficult to imagine modern life without it. Writing technology is so successful that we don't even recognize it as a technology anymore. Money, clothing and agriculture are also technologies that have become invisible. While they were invented thousands of years ago, and had a noticeable impact on the lives of our ancestors, today we no longer recognize them as technology. Within the invisible stage technology moves from the conscious realm – where we recognize it as a tool that we deliberately use – into the realm of the unconscious, where it becomes an invisible partner in our existence.

Level 7: Naturalized

While the technologies at the base of the pyramid feel artificial and alien, halfway up the pyramid they've become familiarized and accepted up to the point that we start to experience them as second nature. Technologies that further rise towards the top of the pyramid become vital and subsequently invisible. The ultimate level a technology can achieve is to become naturalized. As with Maslow's original pyramid, however, this summit is rarely attained. Most technologies climb no higher than halfway up the pyramid before they either stabilize or are pushed back down to lower levels by newer, emerging technologies. Some technologies, like sewers and digital computing, have climbed up to the 'vital' stage. Only a handful of technologies, like writing, are so integrated and omnipresent that they are no longer experienced as technology.

Naturalized technologies have moved beyond being a vital tool or habit within our society: they are so integrated in our lives we consider them part of our human nature. Perhaps the best example of a technology that is entirely naturalized is cooking. Here, cooking doesn't refer to specific baking technologies like the microwave, but to the basic principle of heating food. Today we think of cooking as a universal aspect of human nature, but some 200,000 years ago, when early humans first started cooking, it was an innovative new technique. Without cooking a modern human being would have to eat five kilos of raw food to get enough calories. By pre-digesting our food before it is eaten,

cooking allowed us to absorb more calories from the food we ate, and to expend less energy in the process. According to the gut-brain swap hypothesis, which has been described by Aiello & Wheeler, the human digestive tract shrank while the brain grew, as successive generations of our hominid ancestors relied on cooking (Aiello & Wheeler, 1995). The work of cooking and tending a fire may have even given rise to pair bonding, marriage, the household, and even the division of labor (Wrangham, 2010). Cooking changed the course of human history. Second nature became first nature.

Misty Summit

Overlooking the entire pyramid there are some important lessons to be learned about our relationship with technology. For one, it is striking that the technologies at the summit of the pyramid aren't perceived as technology by most of us: as if the peak of the pyramid is occluded by a cloth of mist. Typically, when we think or talk about technology we mean the technologies on the lower levels of the pyramid. Yet, if we are to reflect on the role of technology in our lives, or more specifically, what role we want it to play, it is important to understand the bigger picture. While the partial perspective on the lower levels of the Pyramid of Technology may serve to explain today's popular view on technology as an unnatural and artificial phenomenon, the misty higher levels demonstrate that technology takes a more profound position in our human existence than most of us realize. At the top of the pyramid linger the technologies – like cooking, clothing, agriculture, the clock – that have become such unconscious and intimate entities in our existence that we consider them part of our human identity.

As the mist around the summit of the pyramid dissolves, we realize technology is not some add-on to our lives we might one day decide to discard and live without. Since the origins of humanity we have employed technology. We are technological beings by nature (Gehlen, 1988; Plessner, 1975) and similar to the bees and the flowers that co-evolved in a symbiotic relationship – the bees spread the pollen from the flowers and

help them propagate while gathering their nectar – humankind is intertwined in a co-evolutionary relationship with technology.

This brings an entirely new perspective on the relationship between people, nature and technology. While we traditionally see nature and technology as opposites, like black and white, we now learn that our technologies can be naturalized over time. Throughout human history we practised technology to emancipate us from the forces of nature – this starts with building a roof above our heads to protect us from the rain, or wearing animal furs to survive in a colder climate – yet, as our technologies become successful they in turn constitute a new milieu, a new setting, that may eventually transform our human nature.

Why Is It So Lonely At The Top?

Now that we have the complete overview of the pyramid before us, a simple yet important question springs to mind: Why is it that so many technologies stall halfway up the pyramid or even drop down, instead of ascending to the summit. Why is it so lonely at the top? The easy answer would be that any summit is by definition difficult to triumph. It takes a lot of luck and time to reach the summit of the pyramid. Point taken, yet, could it be that our lack of awareness of the misty higher levels plays a role as well? After all, it is not only ordinary people who have a naïve or at least limited understanding of technological development. Many professionals, whether they are inventors, engineers, visionaries, designers or entrepreneurs, who claim to improve our lives with innovative new technologies, also seem to have a one-sided focus on the lower stages of the pyramid.

If you are a professional working in the field of innovation and technology you could ask yourself the question: At which level of the pyramid am I the most active? It turns out specific levels are occupied by specific professions and some levels are more crowded than others.

1) The envisioned level houses visionary artists and science fiction writers. Think of people like Jules Verne who helped define the science fiction genre with books like

20,000 Leagues Under the Sea and who famously said: “Anything one man can imagine, other men can make real”.

2) The operational level is the domain of principle scientists and inventors like Nikola Tesla, who pioneered wireless electricity as early as in 1891.

3) At the applied level we find engineering entrepreneurs, like Thomas Edison, who was half inventor, half businessman.

4) The accepted level is where we see a lot of activity from designers, user experts and marketing people. Steve Jobs is an example of someone who has done great things at this level. Although he didn’t invent the MP3 standard and the Sony Walkman already existed for decades, he nonetheless managed to combine these technologies in the utterly accessible and utterly successful iPod.

5) The vital level is a bit more difficult as we see relatively little activity there. Arguably a politician like Barack Obama is operating at this level, with his efforts to turn healthcare into a basic right, while at the same time aiming to get rid of the notion that guns are a vital accessory for every American.

6) The invisible level is pretty much ignored by the traditional technology professionals, however, its proper functioning is maintained by schoolteachers who teach kids reading, writing, clock reading and, nowadays, digital skills also.

7) At the naturalized level we seem to have a vacancy. I could not think of a profession that has a clear focus on the summit of the pyramid. Does this level maintain itself like a natural ecosystem?

Although I emphasize that this overview is somewhat of a simplification, as most professionals don’t constrain themselves to a single level of the pyramid, it is surprising that none of our traditional technology professions have their primary focus on the upper levels. Would the summit be more accessible if there were more experts active on these higher levels?

Before we get into that issue, we first have to address another question: “Is it desirable for more technologies to rise all the way to the top?” In short, the answer is: “Yes, but with a footnote.” While technologies at the middle levels of the pyramid can be successfully used and may improve our lives, they still need our conscious attention and often maintenance. Technologies at the top levels are more powerful as they’ve become part of our human identity and operate on a subconscious level. This makes them extremely powerful, but also risky. In order to understand why, it might be helpful to compare technologies with children.

Technologies As Children

If we compare technologies with children (Kelly, 2011), the technologies at the lowest levels are like babies that need to be nourished. The mid levels resemble young kids that constantly seek our attention. They can be beautiful, exciting and delightful, but they also nag us at times and are not as mature as the technologies at the top levels, which are like full-grown friends or partners in our lives. Imagine how delightful it would be if all technology in our life would operate on such a mature level: We would have 100% risk-free clean energy, fast and silent transport without traffic jams, haute cuisine food printing, telepathic speech interfaces; life would be grand. The footnote we must add is that the technologies we allow up to the highest levels aren't neutral. They transform our identities and become part of who we are. This doesn't always resonate with our human strengths. A good example here is the clock. Its invention allowed the measurement of time intervals shorter than the natural units of the day, month and year. This helped us to schedule meetings with great precision, but it also conditioned us to live with the clock and stick to exact units of work and leisure, which may have resulted in more stress and a detachment from the here and now. Similar footnotes could be made with agriculture that, some theorists have argued (Zerzan, 1994), may have decreased the variety in our diet, weakened the bone structure of the human skeleton and increased the chances of infectious diseases. In saying that, it would be difficult, if not impossible, to verify such claims and, in any case, we can hardly begin to imagine a world without agriculture today.

Carrying on with the comparison of new technology as a child, you could ask yourself for every new technology you encounter in your life, if you would be willing to marry it as it matures, or more precisely: if you would allow your own children to marry it, and your children's children for that matter. Although it may sound absurd, we could ask if our far ancestors – who centuries ago first experienced technological innovation like clothing, agriculture or money – would have endorsed a marriage with these technologies. For us, this has never been a question as we were all born in a world in which money, clothing and agriculture already existed and a divorce from these technologies would be difficult and painful. Hence we must be selective of which technologies we allow to reach the upper levels, as they not only affect our everyday life, but also, very likely, the lives of our offspring.

So how do you create technology that will not only improve the lives of your fellow members of society, but also the lives of generations yet to come? That is a huge responsibility. Perhaps technology professionals don't focus on the higher levels of the pyramid because they are too modest? This could be, yet, we would be better off if they did pay more attention to the higher levels. The limitation of many of today's technology practice is that it doesn't go full circle. Rather than realizing technology to its full potential, we settle for half-baked solutions. We dream of telepathy, but settle with the mobile phone. We dream of flying like a bird, but end up in a crowded airport. If only we would dare to pursue our dreams and carry technology through to its full potential, we could do better.

I hope the Pyramid of Technology provides us with a model to envision where the technologies we develop today might eventually take us. For every new technology we

encounter, we can already extrapolate a potential path through the levels of the pyramid. We can ask questions like: Does this technology have the potential to rise to the top? What actions will have to be taken to get it there? How will it mature? How will it empower us? How will it extend our senses? How will it resonate with our intuitions? How will it transform us? Will it benefit humanity as a whole? What are the risks? What can we win, what might we loose? What dreams will it realize? Clearly the answers to such questions will not always be easy. Yet, they should give us some relevant discussion points and hopefully provide us with some leverage in the co-evolutionary game people and technology are now caught up in.

If we can put our minds to creating technologies that have the potential to one day mature and rise to the summit of the pyramid, this will give us a clear guideline on where we want technology to go. As these technologies mature and climb the pyramid, they will in turn transform us. Hence, we need to project the best of our humanity onto them. We will not immediately get it right. There will be pitfalls, but at least we will know where we are going. Luckily, we can already be sure of one thing: in the long run, any sufficiently advanced technology will be indistinguishable from nature.

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References

Aiello, Leslie C.; Wheeler, Peter (1995): The Expensive-Tissue Hypothesis: The Brain and the Digestive System in Human and Primate Evolution, Current Anthropology Vol. 36, No. 2 (Apr., 1995), pp. 199-221, The University of Chicago Press. http://www.jstor.org/stable/2744104

Clarke, Arthur C. (1945): Extra Terrestrial Relays – Can Rocket Stations Give Worldwide Radio Coverage? Wireless World October 1945, pp. 305-308

Gehlen, Arnold (1988): Man: His Nature and Place in the World. Columbia UP
(original print: Der Mensch. Seine Stellung in der Welt. Frankfurt, 1966.)

Kelly, Kevin (2011): What Technology Wants. Penguin Books. ISBN-13: 978-0143120179.

Kirsch, David A. (2000): The Electric Vehicle and the Burden of History.
Rutgers University Press. pp. 153–162. ISBN 978-0-8135-2809-0.

Maslow, A.H. (1943): A theory of human motivation. Psychological Review 50(4), pp. 370-96.

Paine, Chris (2006): Who Killed the Electric Car?, Documentary, Plinyminor, Electric Entertainment, Papercut Films. http://www.imdb.com/title/tt0489037/

Plessner, Helmut (1975): Die Stufen des Organischen und der Mensch:
Einleitung in die philosophische Anthropologie. Berlin: Walter de Gruyter. (Orig. Pub. 1928.)

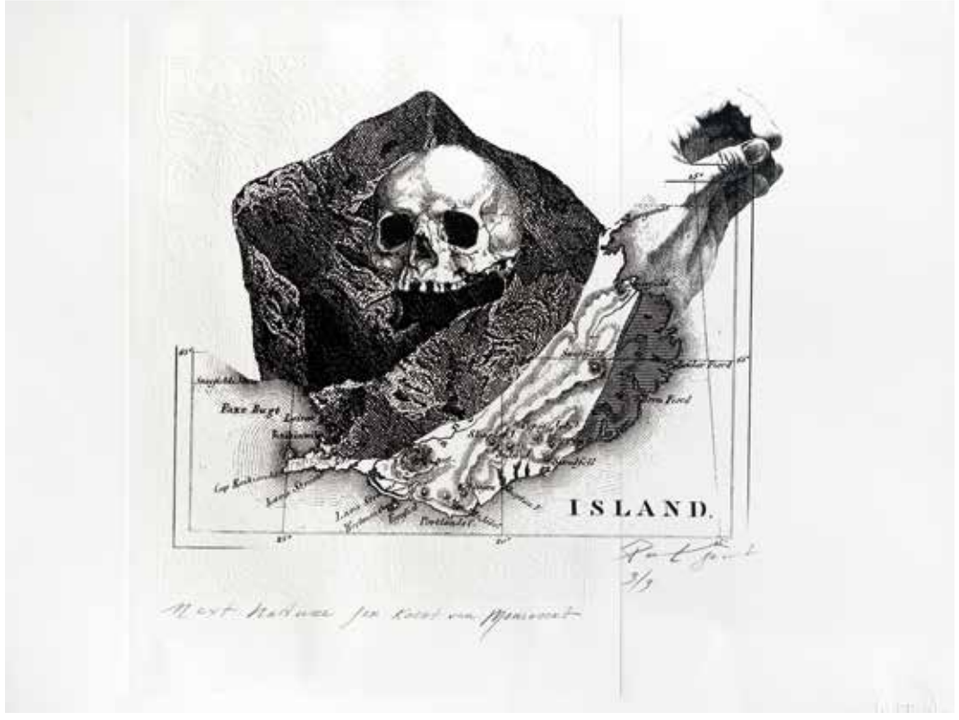
Post, Mark (2011): Meet the New Meat. Lecture at Next Nature Power Show, 5 November 2011, Stadsschouwburg Amsterdam. http://www.youtube.com/watch?v=V20B38a6RTg

Schaft, Daisy W.J. van der; Spreeuwel, Ariane C.C. van; Assen, Hans C. van and Baaijens, Frank P.T. Tissue Engineering Part A. November 2011, 17(21-22): 2857-2865. doi:10.1089/ten.tea.2011.0214.

Weiser, Mark (1991): The computer of the 21st century. Scientific American, pages 94–100, September 1991.

Wrangham, Richard (2010): Catching Fire: How Cooking Made Us Human, Basic Books, ISBN-13: 978-0465020416

Zerzan, John (1994): Future Primitive. Colombia: Anarchy Magazine, 1994



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In 2009 Eindhoven University of Technology (TU/e) launched the Eindhoven University Lectures. Each academic year a prominent scientist is invited to hold a series of lectures, aimed at third year bachelor students from all disciplines.

The guest lecturer should present a topic which is not covered by the regular curricula at TU/e. The series aims at broadening the horizon of academic education for TU/e students.

TU/e offers its students an education with a sound scientific basis and an educational climate that stimulates the development of intellectual and social skills.

Platform for Academic Education

As a tradition, the last lecture in the series is a public lecture and is part of the program offered by Studium Generale. The Eindhoven University Lectures are initiated by the Platform for Academic Education, with the support of the TU/e Executive Board, organized in close cooperation with Studium Generale.