



ON  
THE NATURE  
OF  
INTELLIGENCE

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# In-Sight Publishing

## **On the Nature of Intelligence**

## IN-SIGHT PUBLISHING

*Publisher since 2014*

Published and distributed by In-Sight Publishing  
 Fort Langley, British Columbia, Canada  
[www.in-sightjournal.com](http://www.in-sightjournal.com)

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 In-Sight: Independent Interview-Based Journal.  
 Not a member or members of In-Sight Publishing, 2020  
 This first edition published in 2020

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## Independent Cataloguing-in-Publication Data

*No official catalogue record for this book, as an independent endeavour.*

Names: Jacobsen, Scott Douglas, Volko, Claus, & Rosner, Rick, authors

Title: On the Nature of Intelligence / Scott Douglas Jacobsen, Claus Volko, & Rick Rosner

Description: British Columbia: In-Sight Publishing, 2020.

Identifiers: None (epub).

Subjects: | BISAC: PHILOSOPHY / General (PHI000000)

Classification: LCC (None) | DDC (None)

p. cm.

Not printed but available on the internet at [www.in-sightjournal.com](http://www.in-sightjournal.com)

1 3 5 7 9 10 8 6 4 2

*Designed and implemented by Scott Douglas Jacobsen*

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## Acknowledgements

*To three generations of women who support and tolerate me - my mom, Ruth, my wife, Carole,  
my daughter, Isabella.*

**Rick**

*To the memory of Dr. Uwe Rohr*

**Claus**

*To the love in my life, forever lost and kept.*

**Scott**

**In-Sight: Independent Interview-Based Journal**

## Chapter 1: Computational Intelligence

**Scott Douglas Jacobsen: Claus meet Rick. Rick meet Claus. The topic is “The Nature of Intelligence” for this discussion. Claus, you are a programmer, medical scientist, and expert in computational intelligence. That is, you have the relevant expertise. Therefore, it seems most appropriate to have the groundwork, e.g. common terms, premises (or assumptions), and theories within computational intelligence, provided by you. To begin, what are the common terms, premises (or assumptions), and theories within computational intelligence at the frontier of the discipline? From there, we can discuss the nature of intelligence within a firm context.**

**Dipl.-Ing. Dr. Claus D. Volko, B.Sc., M.D.:** Hello Scott, hello Rick, I am happy to be around with you.

Computational intelligence is a subdiscipline of computer science that has the aim to enable computers to make autonomous decisions based on reasoning. So computers should ultimately display behavior which human beings would consider “intelligent”. The primary assumption of computational intelligence is that intelligent behavior can emerge from computation. Techniques scientists use in this subdiscipline include neural networks, machine learning, search algorithms, metaheuristics and evolutionary computation.

Nowadays a lot of computer scientists specialize in machine learning. It is a subdiscipline of computational intelligence in which the computer is trained to solve classification and regression problems on its own. There are three types, supervised learning, unsupervised learning and reinforcement learning. In supervised learning, the computer is given a training set, based on which it learns to classify data or compute a regression curve. After the training, the computer can classify new data of a similar kind on its own. In unsupervised learning, the computer tries to find ways to classify data by itself. One type of unsupervised learning is known as clustering: the computer is provided with data and has to come up with categories which subsets of this data can be assigned to. Finally, reinforcement learning is a type of machine learning in which the computer gets a “reward” for correct behavior and sees to it that this reward gets maximized. Nowadays you often bump into the buzzword “deep learning”; that is a superset of various variants of machine learning having in common that they employ neural networks. Deep learning techniques have recently yielded a lot of success, e.g. in gaming. For instance, the program AlphaGo which beat one of the best Go players of the world a couple of years ago employs deep learning.

In general, speech recognition, image recognition and natural language processing are considered real-world applications of machine learning. Machine learning algorithms are used for optical character recognition (to process handwritten texts), for controlling computers by voice (as it is already possible in Windows 10 using MS Cortana) and for automated translation (e.g. Google Translate).

Commonly used search algorithms include the Minimax algorithm and Alpha-beta pruning, which is an optimized variant of the former. These algorithms allow the computer to traverse through a search tree and decide which path to take in order to arrive at the optimal result as quickly as possible. Such algorithms are regularly used in computer games in order to make decisions how the computer-controlled opponents should act.



I personally specialized in metaheuristics and evolutionary computation in my studies. Metaheuristics is a programming paradigm for solving combinatorial optimization problems that comprises various algorithms which allow to speed up computation while not guaranteeing that the (globally) optimal solution is found. This is useful when working with computationally hard problems, such as NP-complete or non-polynomial problems, where it would take a lot of time to find the global optimum and where it would be acceptable to find a solution that is very good, although it is not the global optimum. Some examples of metaheuristics include variable neighborhood search, simulated annealing, tabu search, and branch-and-bound. In general they have the disadvantage that they sometimes get stuck in local optima, that is solutions that are better than all of their “neighbors” but still far from the global optimum. To overcome this obstacle, metaheuristics have built-in mechanisms to rapidly move away from local neighborhoods and try to find a better local optimum elsewhere.

Evolutionary computation is a variant of metaheuristics that is based on the idea of Darwinian selection. So it is a range of algorithms inspired by biology and mechanisms such as mutation. One interesting subtype of evolutionary computation is genetic programming, in which the computer creates new programs itself and selects the ones that seem to work best.

All of this is supposed to make the computer behave in an “intelligent” manner. And researchers working in this field are becoming increasingly successful: Some computer programs already achieve an average score in intelligence tests designed for human beings. And yet, the computer lacks one thing man has at his/her disposal: self-awareness. Computers may be able to think, but they are not aware of their doing so. That is why it is still ethical to turn off or throw away a computer, while of course it is not ethical to kill a human being.

Computational intelligence, just like human intelligence, relies heavily on logic, which is why lectures on formal logic, history of logic and non-classical logics make up a large part of the computational intelligence curriculum at university. A computer is excellent at computing logical conclusions from given premises, but it lacks the ability to come up with new ideas of its own. It can only draw conclusions from data that is given to it. Of course, it is debatable whether human beings are really different in this aspect. Perhaps it is also the norm for human beings to be only able to come up with new ideas by combining knowledge and experiences that have previously been acquired in a creative way.

**Rick Rosner:** *The general question for Claus and me is the nature of intelligence and Claus has talked a lot about it because it is his field, which is computational intelligence. Claus, you talk about various forms of computational intelligence and AI. I just want to talk a little bit about – I think most people who don't work in the field, like me, who think about AI they think about robot butlers or a robot girlfriend. Often, it is a human-type brain in a human type body. Or, at least, something you can talk to. (We did this interview many months ago, and I've taken a shamefully long time to go over my comments. But in that time, I think the public has become much more aware of machine learning. We may not understand it, but more and more we know it's not just robot girlfriends.)*

*Then when people who work in the field of AI and machine learning talk about that stuff, I don't think you mean fully conscious human thinking. I think you mean various forms of very powerful computation, which may or may not embrace an ability to improve performance through self-feedback or machine learning. I have a friend who says by the year 2100 there will be a trillion AIs in the world.*

*But that doesn't mean a trillion robot butlers or girlfriends. He means a trillion machine intelligences of various types, with most of them engineered for specific functions and most without consciousness. Sophisticated computational devices will surround us. It's been predicted that sidewalks will have chips in them to record pedestrian traffic to help city managers know how to deal with pavement durability and congestion issues, and who knows what else. But that doesn't mean that the sidewalk will be conscious. It would be a sad life for a sidewalk chip that has to be conscious 24/7 of itself being a sidewalk.*

*A conscious sidewalk would be overkill. Though it wouldn't be overkill to have sophisticated tallying technology in a sidewalk, especially in a future when such technology will be cheap.*

*When it comes to consciousness versus machine intelligence, I think what I believe about consciousness is closest to Minsky's Society of Mind with massive feedback among the brain's various subsystems. Today, machine learning and AI do not include the massive amount of shared information among expert subsystems that goes into having a fully fleshed consciousness. The option is not there yet. And even when it is, AI for most tasks will not require the massive and intricate information-sharing that constitutes consciousness. However, in the farther future, more than a century from now, information processing will be so powerful, ubiquitous, highly networked and flexible, that consciousness will not be considered as special as it is now. It could be something that is or is not present in parts of a system at a given time, depending on its immediate information-processing needs.*

**Volko:** First, before answering Scott's new questions, I would like to comment on Rick's statement regarding consciousness.

I think that Rick is right in that artificial intelligence enables computers to make very complex computations, but that it does not make the machines conscious.

There has recently been an article about this matter in Singularity Hub (<https://singularityhub.com/2017/11/01/heres-how-to-get-to-conscious-machines-neuroscientists-say/>). Quote from this article:

“Consciousness is ‘resolutely computational,’ the authors say, in that it results from specific types of information processing, made possible by the hardware of the brain. [...] If consciousness results purely from the computations within our three-pound organ, then endowing machines with a similar quality is just a matter of translating biology to code. [...] To Dehaene and colleagues, consciousness is a multilayered construct with two ‘dimensions:’ C1, the information readily in mind, and C2, the ability to obtain and monitor information about oneself. Both are essential to consciousness, but one can exist without the other. [...] Would a machine endowed with C1 and C2 behave as if it were conscious? Very likely: a smartcar would ‘know’ that it’s seeing something, express confidence in it, report it to others, and find the best solutions for problems. If its self-monitoring mechanisms break down, it may also suffer ‘hallucinations’ or even experience visual illusions similar to humans.”

I personally tend to be highly skeptical about this statement. I doubt the basic assumption that “consciousness results purely from computations”.

It is not easy to explain what consciousness is. I can only speak for myself: I have a strong feeling that “I am something (or someone)”. I “hear” my own thoughts, I have the feeling that I can control them, as well as my actions. I doubt that this can be just achieved by computation. In this context, it may be interesting that Drs. Vernon Nepe and Edward Close recently proposed a

“theory of everything” which they called the “Triadic Dimensional Distinction Vortical Paradigm” (see also: [http://vernonneppe.com/world\\_of\\_9\\_dimensions.aspx](http://vernonneppe.com/world_of_9_dimensions.aspx)). They stated that reality has three dimensions of space, three dimensions of time and three dimensions of consciousness – nine dimensions in total. I have, admittedly, not studied this theory in detail yet, having had other priorities in my life so far, but I consider the notion that there are three dimensions of consciousness, whatever that is supposed to be, highly interesting. A similar proposition has been made by physicist Dirk Meijer (“The mind may reside in another spatial dimension”, see [https://m.theepochtimes.com/uplift/a-new-theory-of-consciousness-the-mind-exists-as-a-field-connected-to-the-brain\\_2325840.html](https://m.theepochtimes.com/uplift/a-new-theory-of-consciousness-the-mind-exists-as-a-field-connected-to-the-brain_2325840.html)).

Also, the highly renowned theoretical physicist Edward Witten recently stated: “I tend to think that the workings of the conscious brain will be elucidated to a large extent. Biologists and perhaps physicists will understand much better how the brain works. But why something that we call consciousness goes with those workings, I think that will remain mysterious.”

(Source: <https://blogs.scientificamerican.com/cross-check/world-s-smartest-physicist-thinks-science-can-t-crack-consciousness/>)

**Jacobsen:** When I reflect on the nature of intelligence or the subject of the conversation for us, Claus, you focus on computational intelligence as this amounts to the field of specialization for you, which interests me. Rick, you wrote for broadcast television, specifically as a comedy writer for late-night television, for more than a decade. Your examples represent popular culture examples because the cultural stew of Los Angeles, California, where you live, worked, and continue to independently write with me. Of course, we discussed these examples in previous publications.

I note a few main points – and this may run into more and more questions. One is the division between more general and more specified applications for human utility. One former example being the robot butler. Something tasked for a broader set of purposes to serve human beings. One latter example being sensors on the sidewalk tied into some central processor underneath a city. Some things with a specific task and nothing more. According to Rick’s friend, there could be one trillion of these AIs, mostly, by 2100. Nonetheless, both assume functional utility to people.

However, taking off the late Marvin Minsky point with the society of mind, what about the butler? The robot butler could be upgraded with additional processing to have self-awareness beyond the rudimentary, even have a rich personality and internal dialogue life – able to entertain guests in the home as it serves them dinner. Rick, how might this play out? How has this played out in popular culture representations or in science fiction portrayals?

**Rosner:** *Bear with me – I’ll get to the robot butler. The same friend who says that we’ll have a trillion AIs also says that technology is driven by sex, meaning that the internet is as developed as it is today because, among other things, it is an efficient pornography delivery system. To put it a nicer way, our humanity, via market forces, will continue to drive technology, even as we become what has been called transhuman. Whatever we turn into, we will still want friends and companions. We will be deeply embedded in social/computational networks. For the past 10,000 years and more, we have been the planet’s apex thinkers. That is changing. The new apex thinkers will be alliances between humans and AIs. As we grow in information-processing power, we will have AI friends and work partners. Eventually, much of future humanity + AI will*

*become subsumed in a planet-wide information-processing thought blob, out of which individual consciousnesses will bud off, go about some business or pleasure, and possibly be reabsorbed. It'll be weird but not a dystopia – positive values will continue to be embodied in the inconceivable swirl.*

*Most science fiction misses the mark. Someone said something like, “Science fiction is the present dressed up in future clothes.” It’s hard to predict and present the full, crazy complexity of the future. Star Trek basically presents the people of today (well, the mid-1960s) having standard adventures but on other planets with people in body paint and on a starship with doors that go “whoosh.” Star Trek is not what 250 years from now will look like – it’s incompletely imagined, with an emphasis on what is acceptable to TV executives and exciting to viewers without breaking the production budget. There’s a new show on Netflix called Altered Carbon, set 300 years in the future. According to Altered Carbon, people of the 24th century will have smokin’ hot but largely unaugmented bodies (20 hours a week at the gym + diuretics) and will spend much time naked or in nice underwear, humping, shooting and torturing each other. And the streets are grubby and rainy and neon-filled, because Blade Runner. (At least Blade Runner 2049 doesn’t pretend to be the future – its creators think of it as a meditation on the future – a bleakly poetic futuristic fantasia.) The denizens of the real 24th century will be highly transformed, inside and out. They probably won’t be as interested in sex as we are – there will be so much else for them.*

*Science fiction (movies and TV) does what’s easy. That includes actors portraying robots and rainy, Blade Runnery streets. Few productions attempt complete futures. I think Her is good because it’s set 10 to 15 years in the future, so there hasn’t been enough time for much to change. I like some authors because their futures seem more weird or complete – Neal Stephenson, but he doesn’t always write about the near future. The Diamond Age might be Stephenson’s best version of a near future, but it’s already 23 years old. In 2007, Clooney was supposed to make it into a series for the Sci-Fi Channel, but it didn’t happen. Charles Stross is good, particularly Accelerando. Cory Doctorow is good. David Marusek – especially his short story, “The Wedding Album.” Margaret Atwood, Ramez Naan, Paolo Bacigalupi, William Gibson. Blood Music, by Greg Bear, but it’s 33 years old. Women are underrepresented on my list, so, some links. Of course, most of these authors haven’t attempted all-encompassing versions of the near future.*

*<http://ew.com/books/27-female-authors-sci-fi-fantasy/>*

*<https://www.bustle.com/p/the-9-best-sci-fi-fantasy-books-written-by-women-in-2017-according-to-amazon-3255319>*

## Chapter 2: Autonomous Computational Engines

**Scott Douglas Jacobsen:** Claus, as computational intelligence research is a subdiscipline with computer science, the specialization in computational intelligence would, seems to me, imply the end goal of the robot butler example. An autonomous machine still with a utility defined by human needs and wants at any given moment.

I see this as the main point of contact: the notions in general culture and an end goal of the experts in computational intelligence. One question for you, Claus, out of “neural networks, machine learning, search algorithms, metaheuristics and evolutionary computation,” what one is the dominant methodology?

In the long-term, which one or set of them will likely provide the foundation for a fully autonomous machine? As a sub-question, why did you pick the latter two – metaheuristics and evolutionary computation – to focus research questions for yourself?

Also, does anyone within the field, or even outside who has valid thoughts about the field, disagree with the fundamental assumption about intelligent behavior arising from the basis of computation? It seems hard to disagree with the fundamental premise, but it seems wise to ask about it. Also, Claus, and sorry for more questions for yourself at the moment, your final statement struck me:

**A computer is excellent at computing logical conclusions from given premises, but it lacks the ability to come up with new ideas of its own. It can only draw conclusions from data that is given to it.**

Of course, it is debatable whether human beings are really different in this aspect. Perhaps it is also the norm for human beings to be only able to come up with new ideas by combining knowledge and experiences that have previously been acquired in a creative way.

Within computational intelligence research, if the assertion amounts to human beings as computational engines or information processors with the ability to create or generate premises, compute conclusions from the data, e.g., integrated sensory experience, connected with the premises, and act or behave in the world from those conclusions, then human beings would have one distinct trait from other computational intelligences – in some large set space of possible computational intelligences given current technology and methodologies, which would be the ability to “come up with new ideas.” Of course, you note this is in question, as well.

What may be the computational basis for the creation or generation of suited to circumstance new ideas? Or if, as some think, this generation of new ideas is something machines cannot do on their own, what would differentiate this trait of human computation from other computation known now? Rick, many of these questions apply to you too.

**Dipl.-Ing Dr. Claus D. Volko, B.Sc., M.D.:** The dominant methodology is definitely neural networks in combination with machine learning. As a matter of fact, neural networks is not a new concept. It has been around for decades. But the big problem connected with it was the inability of this method to classify data sets that were not linearly separable, as pointed out by Marvin Minsky, Oliver Selfridge and Seymour Papert (Minsky, M. L., & O. G. Selfridge, 1961,

“Learning in Random Nets”, in C. Cherry (ed.), “Information Theory: Fourth Symposium (Royal Institution)”, London: Butterworth, pp. 335 – 347; also see “Unrecognizable Sets of Numbers” (with Seymour Papert), JACM 31, 2, April, 1966, pp. 281-286).

To my knowledge, it is mostly thanks to the achievements of a couple of researchers including Geoffrey Hinton that this problem was overcome. Hinton published a paper about the backpropagation algorithm already in 1986, but it took until about 2011 that the new technique of “deep learning” became well-established, resulting in great successes, with artificial intelligence becoming stronger and stronger ever since. Interesting enough, Hinton himself has recently turned to be skeptical of backpropagation since he believes that this is not the way the human brain really works (see also: <https://medium.com/intuitionmachine/the-deeply-suspicious-nature-of-backpropagation-9bed5e2b085e>).

Even if it is right that the human brain works in a different way, I am convinced that the technology we have now would suffice to create fully autonomous machines, at least for serving certain defined purposes. However, when I have recently been at a demonstration of a language-processing robot here in Vienna, I was disappointed to see that the robot failed to recognize either of the words that had been spoken to it by the demonstrator. Still we should acclaim the progress artificial intelligence has made. Not only is Google Translate quite good already, there is also a website founded by German computer scientists called [www.deepl.com](http://www.deepl.com) which is an even better translator of text documents, especially from German to English and from English to German. When I write my blog postings in German, I use this website to obtain an English version fast. The results need some post-processing, but far less than similar translation programs would have required only ten years ago.

The reason why I focused on metaheuristics and evolutionary computation during my days as a graduate student was mostly that I found these approaches to be fascinating, especially as I also have a background in biomedical sciences and a good understanding of Charles Darwin’s Theory of Evolution. Also, I am one of those people who are especially interested in algorithm design. I tend to believe that I have a special talent for that. For instance, I recently developed and implemented a complete mesh voxelizer from scratch, starting with the underlying algorithm. That is, a computer program that takes a description of a three-dimensional geometrical object (e.g. a cone, a sphere, or something even more complex) and converts it into a (possibly huge) set of identical blocks.

I am not aware that anybody working in the field of computational intelligence disagrees with “the fundamental assumption about intelligent behavior arising from the basis of computation”. If somebody disagrees with this fundamental assumption, then I guess he or she does not work in the field. Otherwise his/her behavior would be inconsistent.

Regarding your remark about human beings having “one distinct trait from other computational intelligences”, namely “the ability to come up with new ideas”, Ray Kurzweil wrote about this in his seminal book “The Singularity Is Near”, from 2005. He stated that human intelligence is particularly good at pattern recognition and that this is something machines are still weak at (although I must say that machines have dramatically improved on this in the past decade, just thinking of unsupervised learning and clustering). By contrast, according to Kurzweil machines are particularly good at storing huge amounts of data and retrieving this data within a very short time. That’s what he considers the strength of machine intelligence.

It is difficult to answer your question what is the computational basis for the creation of new ideas. I must say in this context that I am a big fan of the Swiss psychiatrist Carl Gustav Jung who invented the Jungian Function Theory which the Myers-Briggs Type Indicator and Socionics are based on – I consider him the greatest genius of all times (see also: <http://geniuses.21stcenturyheadlines.com/>). Carl Gustav Jung defined eight psychological functions, one of them being introverted intuition. This function is defined as follows (from <http://personalitygrowth.com/introverted-intuition/>):

“Introverted Intuition (Ni) deals with understanding how the world works through internal intuitive analysis. Ni relies on gut feelings and intuition about a situation to help them understand. Introverted Intuition does not look at what is seen. Introverted Intuition forms an internal map and framework of how things work. The map is slowly adapted and adjusted over time to allow the user to get a better sense of the ‘big picture of things’ and what steps to take to get the desired outcome. Introverted Intuition will take pieces of abstract information and make sense of it. It is not interested so much in concrete facts, as it is with the essence of ideas and theories, and how they all fit together. They are very good at recognizing patterns. [...] Introverted Intuition asks questions like ‘what’s really going on here?’ or ‘where have I felt this way before?’ Introverted Intuition is one of the toughest functions to explain to someone else that doesn’t have it. Because of this, Ni has been labeled as ‘mystical’ and ‘psychic.’ And sure, it can appear that way to others, but it is more complex and involved than just ‘magically’ coming to conclusions.”

So, the human ability to come up with new ideas is related to what Carl Gustav Jung called “introverted intuition”. How this exactly works, science has not found an explanation for yet. We are still in the time of hypothesis generation regarding this aspect of the human psyche.

However, as already mentioned, machines do have the ability to discover non-obvious properties of given data, as is employed in the “clustering” method. For instance, if you feed a machine with data regarding name, eye color, size and weight, a machine might find out correlations between e.g. eye color and weight that would possibly be non-obvious for a human being.

**Rick Rosner:** *Claus comments that he has been skeptical of backpropagation because he does not consider this the way the human brain really works. Evolution is opportunistic. We can assume brains in general take advantage of anything that works.*

*That is easily made and energetically efficient. Evolution will follow easy, effective pathways, which may mean brains have more than one computational/information-processing strategy.*

*Because evolution not being a conscious force does not give a crap. Things that work tend to persist over time. There is discussion here about the strengths and weaknesses of machine intelligence.*

*I feel like that is somewhat entangled with information processing machines still being really primitive. That when they come into their own. They will have roughly the same abilities as the human brain.*

*It is that we are at such a beginning point. Being able to store data is barely machine intelligence. Comparing computer data storage to the brain is like comparing a pulley to an engine. I’ve talked with you (ed. Scott) about this a lot.*

*I was arguing with my buddy, Lance, last night about free will. I don’t see how free will can exist since thought has to be based on the information. I also don’t see why it is needed.*

*I prefer informed will: knowing why I am thinking everything I am thinking and without being subject to bias that I am not aware of. But when it comes down to it, I think machine thinking – not the thinking of machines now, but machines in the future or human-machine hybrids, or super powerful genetically tweaked humans in the future – will all be thinking based on the information.*

*I think Claus talks about it, as it is stated. Thought is a form of information processing. It is not this magical other thing. When you get powerful enough and flexible enough information processing, it is the equivalent of thought.*

*Free will is like a concept left over from a time before people thought in terms of information.*

**Jacobsen: Claus, in correspondence, you wisely wanted to redirect the conversation from artificial intelligence and computational intelligence into the more substantive unsolved problem of human intelligence in the context of a full framework for explanation.**

**Given the redirection from one sub-topic of artificial intelligence to another in human intelligence, to Claus and Rick, what defines human intelligence to you, e.g. parameters, limits, capabilities, measurements, observational markers, empirically verifiable general factors, and so on?**

**How does artificial intelligence differ from human intelligence? Can artificial intelligence replicate human intelligence in another substrate? If so, why does this seem possible in theory? If not, why does this not seem possible in theory?**

**Does intelligence amount to the currency of the universe? If so, how? If not, how not? How does human intelligence compare to other primate and mammalian intelligences? What appear to be the probabilities for extraterrestrial intelligences? How might human and other known intelligences shed light on the possible range and variety of extraterrestrial intelligences?**

**Volko:** These are very interesting questions, thank you for asking them. First of all, I have recently watched a TED talk with Jeff Hawkins, a former IT entrepreneur who turned into an AI and brain researcher ([https://www.ted.com/talks/jeff\\_hawkins\\_on\\_how\\_brain\\_science\\_will\\_change\\_computing](https://www.ted.com/talks/jeff_hawkins_on_how_brain_science_will_change_computing)). In my opinion, the definition of intelligence he provided in his talk is very reasonable. He stated that intelligence is all about making predictions. Indeed that is the case when solving IQ test tasks. You are presented with a list of numbers, for instance, and have to guess what numbers will follow if the principle the number pattern is based on is continuously applied. The same goes for tasks involving patterns, verbal analogies etc.

In fact there are many different definitions of intelligence, which is also why it is sometimes difficult if not even impossible to compare IQ scores obtained in two different tests. My late father, who had studied psychology at university (even though he did not complete the degree), used to prefer the definition that intelligence is the ability to get by novel situations not experienced before. Of course, this definition is compatible with Hawkins' definition, since getting by novel situations requires to make predictions.

In his recent book "Life 3.0 – Being human in the age of Artificial Intelligence", Max Tegmark, a professor of physics at the MIT, defines intelligence as the "ability to achieve complex goals". He states that intelligence is multi-faceted and cannot be measured by a single IQ value, and also that while machines are superior to humans at particular types of intelligence such as arithmetics



and a couple of strategy games (Chess, Go), there are various forms of human intelligence where machines have not reached a comparable level of performance yet, such as artistic intelligence, scientific intelligence, and social intelligence.

I personally prefer Hawkins' definition of intelligence. In my opinion, many researchers and of course also laymen make the mistake to use the term intelligence for all sorts of abilities while in reality, intelligence is only a basic cognitive talent that may be required for accomplishing various sorts of intellectual tasks, but intelligence is not to be confused with these intellectual abilities themselves. Also, when Howard Gardner talks about multiple intelligences, I would say that much of what he calls types of intelligence is abilities which, of course, may be related to intelligence (the ability to make predictions), but general intelligence is only a basic requirement for developing these abilities, and the abilities themselves (such as social skills or musical talent) go way beyond intelligence as such.

For instance, as a child I was fond of computer games, and so it happened that I ended up trying to make computer games of my own. Computer games mainly consist of three components: graphics, music and code. I tried all the three things, but it turned out that I have only talent for code. Thus, I am able to create working computer programs, including games, but without assistance from other people, these games are destined to have rather weak graphics and music. I am intelligent, I usually score very high on IQ tests (as Rick can confirm, the two of us once took part in the beta-testing session of a novel, experimental numerical IQ test, and in this beta-testing session Rick obtained the second highest score of all 86 participants from the world, all having an IQ of 135 or higher according to traditional IQ tests, while I obtained the third highest score). Yet I lack talent at graphic design and music composition. Programming, however, comes natural to me. Probably that's not only due to my level of intelligence but because I also have a special talent for algorithm design, which goes beyond what traditional IQ tests measure. After all, I also got to know some people scoring very high on traditional IQ tests who failed to solve basic programming exercises when they were required to do so in mandatory university courses for beginners.

So, there are some researchers who perceive intelligence as a set of general and several sets of special abilities (also called *g* and *s*, respectively), but I do not adhere to this notion. In my opinion, intelligence should be called cognitive talent and intelligence testing should be all about the basic ability to make predictions from given data. In this context, of course that is also what machine learning does, especially unsupervised learning and clustering. For this reason, it is definitely justified to call machine learning a form of (artificial) intelligence. When the computer makes predictions based on given sets of data, the computer in fact does behave in an intelligent manner. Being able to make intelligent predictions, on the other hand, does not imply being a life-form equipped with consciousness and self-awareness, as I have already stated.

I do not think intelligence can be called the currency of the universe. A currency is something that can be used to exchange goods. But intelligence cannot be used for that purpose. That said, I do think that animals are intelligent as well. I even think that animals are self-aware. I have a German Shepherd dog myself (hi, Archie!), and as my mother keeps saying, my dog seems to be able to understand everything that is going on around him and every word we are saying to him. Animals have something to them which machines such as computers do not yet have, even though machines are already able to make intelligent predictions. I am a strong advocate for animal rights, and I have even been pondering over bacterial rights recently, bacteria being a life-form themselves as well (Charles S. Cockell has published a few papers dealing with that matter,

if you are interested, which can be freely downloaded from the Internet – I am corresponding with him these days as I am working on a related new scientific theory on my own, which is supposed to shed light on new ways of treating infectious diseases and cancer).

It is possible that there are also intelligent life-forms in outer space, but what makes me a bit skeptical about that is simply that we have not encountered any of them so far, at least not to my knowledge. However, even if we have not met extraterrestrial life-forms yet, that of course does not suffice to conclude with certainty that there are none. The universe is huge, so who knows what may be existing in a remote place where no man has ever gone before. I personally consider the SETI project a good thing, and I would also be ready to donate computational power to it if it was not the case that I am already donating my computational power to research projects in biomedical science (protein folding).

**Rosner:** *This whole section is about machine intelligence versus human intelligence. I think the thing that differentiates them currently is that human intelligence; we perceive the world in great detail because our brains have  $10^{10}$  neurons each with  $10^3$  dendrites.*

*So, in a lot of situations, the brain has reality constructing resources to spare. We do not notice the graininess of perception because our brains are big and powerful, though not infinitely big and powerful.*

*When you have so much perceptual and simulatory and, as Claus mentioned, predictive resources to throw at the world, you get good results without necessarily being conscious of mental strategies and algorithms.*

*You get a seamless feeling simulation of the world. I agree with Claus and the TED Talk guy, and Lisa Feldman Barrett who wrote *How Emotions Are Made*. She said the brain's primary objective is to predict the world to allow you to most efficiently address the world.*

*Our brains answer the questions: what is going to happen next? What do I need to do with what is going to happen next? But given our brains are so powerful, we tend not to see the mechanics of thought in everyday life.*

*Say you are a thief and part of your caper is that you need to duplicate a key, if you are trying to duplicate a key, and if you only had tools that came out of Minecraft, for instance, they'd be blocky and clunky, and you would have to come up with a special strategy to duplicate the key.*

*In caper movies, you need to a wad of wax. The graininess of the wax, the scale of the particles in the wax, are smaller than the scale of the notches in the key. The graininess of that is not noticed.*

*You have material that you press the key into that has  $10^{10}$  atoms per millimetre. We do not notice the graininess. As machine intelligence becomes more powerful, we will less and less notice the graininess of the products of intelligence.*

*You can see that in video games. You started with one pixel with Pong. Then you went to these rough blocky things like the creatures in Dig Dug and Pac-Man. Now, we are deep into the or beyond the Uncanny Valley with most video games.*

*People look perfectly fleshy and have the right body dynamics. There is a lot of coding that has delivered that, but it is also in combination with raw computational power.*

**Jacobsen:** I paid attention to Hawkins for some time several years ago, almost a decade now. He talked about some models – some related to intelligence and others not, created by others and himself, as revolutionary at the time. It seems interesting to me, too.

**Claus and Rick,** you both perform exceptionally well on tests of general intelligence. The performance on the tests, on average, translate into general life performance or standard success metrics. If somebody performs well on an IQ test, they tend to succeed in school and life.

This seems truer than in the past with the Fourth Industrial Revolution and the knowledge economy: both ongoing. Each requires more education. Those who perform well on IQ tests tend to perform well in school, so better in the knowledge economy compared to others.

With the subject of human intelligence, I want to focus on the big pool of failed theories. What about the theories purported to explain human intelligence better than others but with failure in predictive validity?

Those theories with claims to validity, but do not predict success in different domains of human endeavour. In short, what theories claim to measure human intelligence while these lack the empirical evidence to support them? Claus, you touched on some. This may narrow the field of possibilities down a bit.

Also, if we can mathematicize the processes of the universe with descriptive laws, then we can mathematicize the processes of parts of the universe with descriptive laws. If the human brain and consciousness are part of the universe, then we can (in theory) mathematicize the brain and consciousness with descriptive laws.

This seems to lead to the main point about human intelligence within the bigger topic of the nature of intelligence: a set of descriptive laws for the processes of the human brain and consciousness, so human intelligence as well.

With such a set of descriptive laws, it would encapsulate human intelligence by implication. As we simulate the parts of the universe in digital computers, e.g. galactic mergers, rotation of planets around stars and satellites around planets, and so on, with the descriptive laws programmed into a digital computer, this may extend to human intelligence too.

Does this lead to an inevitable conclusion with human intelligence as replicable inside a substrate including digital computers with such a set of descriptive laws for human intelligence programmed as an algorithm into a digital computer?

Any speculations on the early form of this algorithm?

**Volko:** I am aware of some historical attempts at intelligence testing that have more or less failed. For instance, Francis Galton, the founder of the science of human genetics, invented some practical tasks such as guessing the weight of an item and believed that the majority of common people would fail these tasks. However, in reality the majority of the people he tested passed. So this test was not an adequate intelligence test assuming that the distribution of intelligence follows a Gaussian curve. I also know that in the middle of the 20th century, it sometimes happened that vocabulary tests were used as intelligence tests. In reality vocabulary tests give an advantage to people of a particular social class and lifestyle. I recall I once saw a test sheet from the 1950s and was unable to define some of the German words from this test (my native

language is German) despite having a good general education. Some of these words were simply old-fashioned and not in use nowadays, and some, as said, referred to everyday items of people of a particular social class with a particular lifestyle which are more or less unknown to other people. I also recall that when I was learning English at high school, it was easy for me to memorize philosophical and scientific terms because I was interested in these things, while I had a hard time to memorize words that were about kitchen equipment, for instance. It is the same situation with these vocabulary tests – they are definitely not suitable for testing intelligence without bias.

I am also aware that many people have tried to “mathematicize” the universe and come up with their own “theories of everything”. Again, the problem with most of these theories is that they fail to come up with plausible explanations of the phenomenon of consciousness. Science in fact often assumes a “naturalist” worldview suggesting that everything that happens in the world can be explained by observable causes. I tend to believe that the focus on the physical world and the rejection of the possibility that something might exist out of the physical world, in a kind of immaterial world that cannot be observed with our five senses, is the reason why this approach to understanding the world will never lead to a complete explanation of everything. On the contrary, I do think that we need to speculate and enter the domain of metaphysics if we want to obtain a coherent theory of how the world might actually work. In this context, let me clearly state that I do not reject religion, I only reject dogmatism and the social mechanisms of enforcing a certain set of beliefs on other people and suppressing the non-believers. I myself am not religious, I have not even been brought up in a religious fashion, yet I do not consider myself an atheist but rather am of the opinion that there is something we cannot observe, something we probably cannot even measure indirectly (at least not without distortions and artifacts from other origins), and this could be called a “divine force” or God. I agree with atheists that it is silly to imagine God as an omnipotent old man with a long white beard, but I do believe in some sort of “divine force” that is stronger than anything else in the world, and that is why I consider myself a theist. The term “God” may be used as a metaphor for this “divine force”.

However, it might in fact be possible indeed to describe human intelligence by some set of laws, and by programming computers to obey these laws, computers might be equipped with the ability to come up with predictions just as human beings do. I actually believe that what we call human intelligence is a function of the brain, or perhaps of the central nervous system. While I am not sure whether consciousness is a product of the brain or whether a conscious “persona” or “psyche” exists in an immaterial world we cannot perceive with our sensory organs and is only, in some way, attached to a brain, I believe that the brain is the “computer” that enables us to make intelligent predictions. So what intelligence tests measure is a property of this “computer”.

At the moment I am spending some of my spare time reading about the “Cognitive-Theoretic Model of the Universe”, which is a “theory of everything” invented by the autodidact Christopher Langan. I have acquired only a basic understanding of this rather complex theory so far, but I am definitely able to say that it is an interesting read and I am particularly curious about learning how Langan explains phenomena such as consciousness which science fails to explain so far, and which science, as long as it limits itself to phenomena observable in the physical world, will probably never be able to fully explain.

Regarding the question what the algorithm employed by the human brain to make intelligent predictions might be, I would like to mention again that Geoffrey Hinton, the inventor of backpropagation, has recently stated that his own algorithm is definitely not the way the human

brain works and that the artificial intelligence community should see to it that a replacement for it be found as soon as possible. To my mind, the only thing that can be definitely said about how human intelligence works is that the process of making predictions is basically a search algorithm in which syntactically possible, but contextually wrong solutions are excluded until only one solution remains, or until only a few solutions remain from which the brain chooses the one that appears to be the most reasonable one. Differences in human intelligence may be due to differences in the efficiency of the search algorithm employed by the proband. Efficiency is not only about raw speed. If you have the talent to come up with ways to exclude more possible solutions at the same time than other people, you will find the right solution sooner than another person with the same “raw processing speed” of the brain. Human intelligence definitely is not all about “raw speed”.

The more powerful computers become, the more possibilities, of course, we will have to simulate complex things such as human intelligence and possibly even living organisms. In the past year, I have read several papers and books about artificial life. This is a branch of science that is still in its infancy. While artificial intelligence has made tremendous progress since 2010, even though it will still need another revolution until we will have artificial general intelligence that matches or even surpasses human intelligence, not much progress has been made in the simulation of living organisms since the field of artificial life was coined by Christopher Langton (not the same person as Christopher Langan) 30 years ago. I have been even a bit surprised to see that the artificial life community nowadays mainly focuses on evolutionary algorithms, one of the things I learned about in my computer science studies, instead of trying to simulate living organisms. But a reason for this is certainly that it still requires an enormous amount of computational power even to simulate a few hundred nanoseconds of the folding of a protein. That is why existing artificial life systems are usually highly abstract and have little to do with actual living organisms. An exception to this rule might be the Open Worm project, which tries to simulate the nematode *Caenorhabditis elegans* in a computer and about which new publications appear on the Internet now and then.

As you wrote that people who score high on intelligence tests usually perform well at school: I can confirm this from my own experience. I was a very good student and even graduated from high school with a straight-A record. What I, however, would like to state in this context is that high intelligence does not seem to give you a benefit when studying things you are not really interested in. I recall I had a hard time memorizing things I was oblivious to, such as some areas of biology and geology. However, it seems to me that people who perform well on intelligence tests usually also have a rather wide range of interests. That is why they are able to acquire knowledge about many things without really having to study hard. And yet, scoring high on an intelligence test does not always imply that you will eventually become a polymath one day. There are many other factors that are relevant as well, such as your personality and the (social) environment in which you grow up.

**Rosner:** *The field of intelligence testing and the related field of statistics have had pasts that are questionable, but they are even worse than that. A lot of the people associated with statistics and intelligence testing were racist or trying to reach racist or try to support racist conclusions.*

*Pearson, apparently, was racist. I do not know the whole history of this. If you want to read a history of this, though it is obsolete, then you can read Stephen J. Gould's *The Mismeasure of Man*. That book is probably close to 40-years-old now.*

*There might be more recent books that talk about this better. Pearson is the guy who came up with the Pearson Coefficient,  $r$ , which is a huge part of statistics. Apparently, he was not a great guy.*

*I question the need for intelligence testing in a modern context. There are many measures of people. I can go along with IQ testing if you are using IQ testing for its original purpose – the purpose imagined by Binet when he came up with the idea, which is getting kids help in school, either because they are smarter than average or not as smart as average. Beyond that, when you start talking about national IQs and national average IQs, all that stuff is racist and doesn't help anybody except racist assholes.*

*There is not much need for improvements in human intelligence testing. The rate at which technology is galloping along and the rate at which we will merge with information processing technology means we do not need anything as old school as everybody knowing their IQ to three purported digits.*

*Technology is making a lot of us stupider via social media and texting all the time. But in the aggregate and in the long run, technology is making us smarter. Native intelligence will be less and less of a factor.*

*What will be more and more of a factor will be how well we merge with the technologies and the technological social structures of the future, we are already seeing that. I call the 2016 election the first AI election. The American election was a complete mess because of all sorts of technology that we do not have a handle on yet. The social media manipulation of opinion. The angry electorate because of jobs lost in part due to automation.*

*America continues to be – and anywhere where Russia had gotten its cybernetic and social media cyber paws – in semi-turmoil. England is a mess with Brexit. Russia has its paws over that too.*

*Russia tried to mess with France's election. When Western nations lose power because we are governed by idiots and everyone is pissed at everybody else, Russia somehow gains power.*

## **Chapter 3: Consciousness and Human Nature**

**Scott Douglas Jacobsen: Thank you for the thoughtful and thorough responses, both of you. It is a treat.**

**Perhaps, based on reflection from the responses from Claus, the nature of consciousness may not need explanation to know the functional basis of human intelligence, where the hows for the information processing of the human brain would account for human intelligence on a functional level without the whys.**

**The whys, the larger explanatory structure, would require an expanded conversation on human consciousness, consciousness generally, and, maybe, the metaphysics mentioned in the responses of Claus.**

**The conversation leads to some preliminary pivots and recaps in the conversation for me. (Please bear with me, this will be repetitive.):**

**A large portion of artificial intelligence will remain narrow, in the near and middle future, in its function and less rich in the sub-system information exchange seen in the operations of the human nervous system.**

**Complex computations seen in artificial intelligences permits very complex information processes while these do not make them conscious. Consciousness may not amount to computations alone.**

**A planet-wide information-processing thought blob may mark the far future for us.**

**Hollywood gives misleading images of future people. Humans plus AI in the future may appear unlike us in surprising and unpredictable ways.**

**The dominant methodologies in Claus's expert view remain neural networks tied to machine learning in the mainstream of the field's studying these and similar phenomena.**

**Machines seem stronger than humans at massive data storage and rapid information retrieval. Intelligence does not equate to speed and relates more to efficiency.**

**The computational basis for the creation of novel ideas remains a difficult question to answer.**

**Different theories of intelligence abound with various degrees of success. Some theories of intelligence failed outright. IQ predicts educational success based on the personal experience of Claus.**

**The nature of intelligence seems bigger than and includes both artificial intelligence and human intelligence.**

**The knowledge of the workings of the brain could suffice in a functional explanation of human intelligence with zero coverage of human consciousness in the theory. The field of artificial life remains too inchoate to suffice on the issue of human intelligence.**

**This leads to the next stage of the discussion. The first on artificial intelligence. The second on human intelligence. The third prompted by Claus on a larger-than-physical or natural explanation, a metaphysical perspective.**

**External to and including physical and natural explanations, what about metaphysics?**

**If knowledge of the functional operations of the brain through some algorithm comes from the sciences relevant to its discovery and implementation in a digital substrate, then the algorithm may explain the processes of human intelligence while consciousness may remain an unsolved problem without explanations outside of the material or the physical, and the natural, as Claus noted with metaphysics.**

**In this, metaphysics may play a role in a theory of consciousness and of the brain (and human intelligence), especially of the brain and human intelligence if the aforementioned algorithm is incorporated into it.**

**Where the larger framework for the understanding of the hows of the brain within the physical sciences can derive more satisfactory explanations with an infusion of metaphysics, this leads to another line of questioning while remaining tight to the subject of the nature of (artificial and human) intelligence. I have three big interrelated questions on reflection.**

**What would comprise a metaphysical explanation for the human brain and intelligence? How would this metaphysical explanation of the human brain and intelligence incorporate the naturalist explanation of the human brain and intelligence?**

**Why would this metaphysical explanation be more satisfactory than a physicalist/materialist and naturalist explanation of the human brain and intelligence? (I apologize for my repetitions.)**

**Volko:** Your summary of the debate so far is very good, well done. Regarding your questions: Well, as I said it is primarily the phenomenon of consciousness that seems to require a metaphysical explanation since it appears to be something that exists out of the physical world. By contrast, I do not think that human intelligence needs a metaphysical explanation. When it comes to making intelligent predictions, the human brain seems to be a computer based on biology. It is not that we do not understand how the human brain works at all. On the contrary, the fact that machine learning and neural networks work suggests that we might at least have a tiny, tiny clue about the actual workings of the human brain. Neural networks, after all, are based on several scientific hypotheses about how the human brain might work, such as Hebbian learning. Probably Geoffrey Hinton is right when he says that backpropagation might not be the algorithm employed by the human brain, although it has been proven to work quite well, but that does not mean that the researchers who believed that neural networks would model the human brain are totally wrong. I believe that the question how the human brain is able to make intelligent predictions will sooner or later be solved, at least sooner than the question what makes us conscious beings and what “we” actually are.

To my mind it is just the phenomenon of consciousness for which there will probably not be found any explanation by scientists who restrict themselves to naturalism or physicalism.

I myself have recently invented a metaphysical model of the human organism that is based on the view that there are three components which make a human being: the psyche, the body and the brain (where, when I am talking about the “brain”, I also imply the other components of the central nervous system and the endocrine system). While the body belongs to the physical world and the psyche to some sort of immaterial world that is hard to define, the brain, as a mediator between these two worlds, somehow belongs to both of these worlds at the same time. There might even be a component of the brain which anatomists cannot perceive since it is located in



the “immaterial” world. Most of the rest of the paper which I have written about this model is based on the assumption that there is a symmetry between the psyche and the body, i. e. everything that applies to the body has an analogon with the psyche and vice versa. For instance, I deduce from these assumptions that not only does the body have metabolism, as we all know (eating, drinking, breathing,...), but that there is also a sort of metabolism related to the psyche, which is equally essential for life. This “metabolism” might be related to dreams, ideas, thoughts, and fantasy. We seem to be hunting for these “nutrients” during sleep and while “daydreaming” – that might even be the reason (or at least one of the reasons) why we sleep at all. After all, it is well-known that sleep deprivation over a certain period of time is fatal. Moreover, with this metaphysical model I also managed to explain Carl Gustav Jung’s personality theory as well as the “model of stress induced steroidal hormone cascade changes” and a couple of related scientific hypotheses my late friend and mentor Dr. Uwe Rohr and I came up with and published about a couple of years ago. Metaphysics is definitely not nonsense! I am aware that people who develop and publish about metaphysical ideas of their own are often viewed upon with suspicion, which is why many scientists avoid doing so, fearing that otherwise their career might be harmed, but to my mind, the problematic thing is not the people who develop these ideas but those who are intolerant against whoever and whatever deviates from the ideological beliefs of the mainstream. History has repeatedly shown to us that this attitude is not a good thing (thinking of Copernicus, Galilei, Bruno,...).

**Rosner:** *It’s close to a fundamental principle of existence that simple, self-consistent systems are durable and common. For instance, numbers are highly self-consistent, simple in many ways, and fantastically common in their pertinence to the world. Just about any time you have a bunch of real-world objects, there is a specific number of objects in that bunch.*

*One-ness pervades the world – the idea that each thing, considered alone, is one thing – as does two-ness for groups of two things, and so on. As Godel proved, mathematics can never be proved to be entirely self-consistent, but math – particularly arithmetic – is self-consistent enough that it is one of the primary ways we define the world. Numbers, being simple, easy, and self-consistent, arise everywhere.*

*Similarly, there are simple systems for machine learning – for AI. I have very little knowledge of these systems. I can say they incorporate layered feedback, but I’m kind of BSing when I say it. However, I’m not BSing when I say that human-created, algorithm-based machine learning at micro levels is quite similar to human cognition at micro levels, because simple, effective systems arise again and again in a variety of contexts.*

*Evolution is opportunistic – it stumbles onto simple, durable systems, including those for information processing and learning. (Obviously, some heuristics will be better for specific types of information processing than others.) In a nutshell, machine learning and brain learning are convergent (with some task specificity).*

*For a very nice constructivist analysis of emotions, see Lisa Feldman Barrett’s How Emotions Are Made. It implies that world-modeling – predicting – is a massive do-it-yourself project in conjunction with blankish but imprintable brain strata and personal plus cultural experience.*

*Unlike Claus, my performance in school was all over the place. I had good years and bad years. I had close to a straight A record in high school. Until, I completely melted down over my inability to get a girlfriend, then my senior year was a lot of Fs.*

*It took me until age 31 to graduate from college because of extreme fecklessness. People should know feckless now because of the Samantha Bee versus Trump thing.*

*I suspect that consciousness is an inevitable consequence or aspect of sufficiently broadband information sharing within a self-consistent system. A system like our brains and like the universe itself, where every part of the system is at least roughly aware of every other part of the system.*

*That part of the awareness of the system Being aware of itself. That has, in the past, stood in for consciousness. That is erroneous. You can have a conscious system that is not conscious of itself. If you take the example of a security system, that watches over a set of warehouses with such high level information sharing and information processing, and receiving, and understanding of information.*

*That it is super conscious on what is going on in all of those warehouses. That system would not necessarily have to be aware of itself, as the thing that is observing. You would expect it to be somewhat aware of itself, of its cameras, of it self-monitoring to make sure that it is functioning properly.*

*But it wouldn't have to be overly aware of what it is in comparison to its being highly conscious of the things going on in the warehouse. Consciousness is basically being so aware of a linked set of a ball of information. That is generally linked.*

*All the information in our consciousness is linked by being related to us. We are the consumer. All the information we consume and process is related because it is information that has come to us. Some of that information less highly entwined with other information.*

*For instance, a sitcom or watching of the first episode that you happened upon at random. The information in that sitcom. It doesn't particularly pertain to us. It is linked to the rest of our consciousness because it is what we are watching at some point in the day.*

*Because we are experienced TV viewers. The whole thing, everything is roughly linked. Some things are more central to us than others. But it is it his ball of relevant or semi-relevant information. We are able to process that information from so many different angles.*

*We have so many different sub-modules that we are able to analyze and appreciate that information related to other stuff so thoroughly that it gives a feeling of well-established reality to what we are experiencing.*

*Somewhere in that sloppy description of consciousness is a more strict idea of consciousness. It is a broadband real-time sharing of information among systems that analyze that information to the extent that you experience a fully-fleshed reality.*

*Even that is a pretty loose definition of consciousness, that is still what consciousness is. It is not just the definition that is a little loose. Consciousness itself is not a strictly structured phenomenon. It is a phenomenon that arises where you have information thrown into a central hopper, when there are unconscious processes like walking and breathing, usually.*

*They do not become conscious. The more complicated or dramatic stuff gets thrown into a central hopper where it becomes part of your awareness. It is important enough that it becomes part of your consciousness and becomes available for analysis by all your sub-systems.*

*It is under the general principle that you need to be aware of your world and will suffer for not being aware of it, even to the point of making fatal mistakes. If you drive, and if you look around at other drivers a lot to get pissed off a lot, like I do, you see quite a lot of drivers who are out of it to some extent.*

*It used to be that most of the drivers who I saw who seemed to be out of it had health issues. Either they were drugged up or they were so physically unhealthy that it was affecting their mental processing.*

*This was a wild and cynical guess. It was watching other drivers as they attempt to drive and seeing that they seem to be glazed over and not as present in the world as you would want other drivers to be.*

*Nowadays, they are out of it because of their digital devices. I am sure there are a lot of drugged up drivers, but they have been demographically overwhelmed by people who think they can drive while texting – but are really severely hampered because their attention has been sucked into their devices. They do what I call half driving.*

*They approximate the behaviours of driving, but they drive 15 miles under the speed limit. They wander in and out of lanes. They stop three cars behind the stop bar at a light. They have a very crappy internal representation of their driving environment because their attention is elsewhere.*

*It illustrates the point because they are driving dangerously. It is not as dangerously as the people who drove when the predominant modes in the 70s were hauling; now, everyone, as I said, drives slowly and all our cars have 8 or 10 airbags in them, so the fatality has been dropping.*

*Anyway, information enters your central awareness because it demands attention in order to live safely and advantageously within the world. That process – I would assume under evolution – of the development of powerful consciousness has the potential to evolve again and again.*

*It offers the organism that possesses it such an advantage and because there is such sharing and processing of information. We see this in eyes. Eyes have evolved a bunch of separate times over the course of evolutionary history.*

*I do not know much about the evolution of consciousness or intelligence. However, it has evolved at least twice. Where we have super intelligent primates, which include us, there are super intelligent octopuses too.*

*They didn't become smart at the same time or along the same lineage because octopuses evolved from molluscs, which are super dumb. Dumb to the point of I am not sure even if some of them have brains. I know starfish do not have brains.*

*I think molluscs may give up brains once they are situated some place. There be some strict principles as to what consciousness is, but I guess that they are not strict hardware rules for how to get to consciousness. You can get it a bunch of different ways.*

*I am shamefully ignorant about machine learning. Except it involves these various strata of feedback of loops, where when you get a good signal. Then you are achieving what you want to achieve. The linkages that help the system get closer to its objective.*

*Those linkages are strengthened. But I would guess that organically, and probably mechanically, there are quite a few ways to establish those feedback systems.*

**Jacobsen:** You raise some points of intrigue. However, before discussion on the metaphysics point, I want to talk on a footnote point. You wrote, "...the problematic thing is not the people who develop these ideas but those who are intolerant against whoever and whatever deviates from the ideological beliefs of the mainstream."

**A straightforward statement with extensive meaning.** From the perspective of an academic, e.g. tenured professor at an institution, what might prevent deviation from the mainstream?

**From the view of a someone without academic protections, e.g. a student or a lay person, what might prevent deviation from the mainstream? Of course, the definition of "mainstream" does not confine itself to the academic alone, whether staff, administration, or students. Also, how may everyone break from the mainstream in order to facilitate creativity and novelty in thought when standard models of a system seem insufficient to solve the problems?**

**To metaphysics, what factors may comprise the sustenance of the psyche in the model proposed by Dr. Rohr and yourself? If Hebbian associative linkages, neural networks, backpropagation, and machine learning models help with comprehension of the workings of the brain, how might these physicalist and naturalist frameworks integrate with the aforementioned metaphysical model of the human organism with the psyche, body, and brain?**

**Dipl.-Ing. Dr. Claus D. Volko, B.Sc., M.D.:** My general impression is that if you do not comply by the mainstream views, you risk having a hard time in life. The mainstream views are mostly defined by the government, the educational institutions, the media, and partly also by religious institutions. I have made the experience that many people are very intolerant against anything or anybody that does not fit in their views of the world. I even met some people who hated me for stating my opinion in an Internet forum because they did not share my views – note that I did not contradict a statement of theirs, but simply stated what I was thinking without knowing, and without being interested in what the views of these (self-important) people were. Once a German university professor told me that in Germany, for instance, you will not get employed by a state-owned company (e.g. a university) if you expressed certain views on the Internet which are incompatible with the official government doctrine (e.g., pro-eugenics views). In my opinion, this policy is by far the greater scandal than somebody stating pro-eugenics views in an Internet forum... I have to add that I have been somewhat spoiled since my mother was a teacher employed by the municipal government of the City of Vienna, and my father had a position at a privately-owned company that was also pretty secure. That's why I realized only late that unless you are overwhelmingly rich, you are always dependent on the good will of other people. Even if you are a skilled worker and do your job well, your employer can sack you for some arbitrary reason, or, if you are a young adult who has not been employed yet, it might – if you have bad luck – even happen that you will never get employed and thus be dependent on your parents or on social welfare for the rest of your life... This does not only concern people from socially disadvantaged backgrounds, but people from all walks of life.

For this reason, some people might prefer to keep their mouths shut and never express their true views to the public. But that attitude would make me unhappy. I love the debate. It is something that is almost as vital for me as food. So that is why I often behave in a somewhat unreasonable manner and state openly what I think. As already mentioned, this has had the effect that there are

quite a lot of people who don't like me (well, the term "enemy" might be an overstatement, fortunately). In fact it has already happened once that somebody I was discussing with on the Internet contacted my employer and tried to damage my reputation. Fortunately my employer was so convinced of my abilities, and in need of them, that he was not impressed. As a matter of fact, I made a lot of effort during my student years to get to know as many intelligent people as possible so that I could broaden my (and their) horizon and also get to know views neither shared by my parents or contained in books or magazines I was reading. I made a lot of bad experiences, most of all with local people from Mensa Austria – they are among the worst people I've met, to be honest. Perhaps that is because requiring an IQ in the 98th percentile or higher is not a sufficient selection criterion. In fact, I have made far better experiences with people in societies with stricter selection criteria than Mensa, such as Infinity International Society, Global Genius Generation Group, and VeNuS Society. In any case, I have gotten to know a lot of people, and in the course of the time I have stopped communicating with those who seemed to have a bad character, so now I am mostly in touch with rational people of good nature, and I am quite happy with my situation. It hardly ever happens any more that I am misunderstood, that statements of mine are deliberately misinterpreted or placed out of context, that people react emotionally when I express a view they disagree with, etc.

To answer your questions, I do think that people working in academia are especially under pressure that everything they state in public more or less matches the views of the government and what is considered the "scientific mainstream". If you are able to read German, you might in this context be interested in an article which the Austrian TV company ORF published a couple of years ago, the title being "Kein Jude, kein Linker, kein Positivist" ("No Jew, no left-winger, no positivist"). The article can be found at the URL <http://sciencev2.orf.at/stories/1726786/index.html>. It deals with the policy of Heinrich Drimmel, who served as a minister in the Austrian government for a long time, one of his areas of responsibility being the Austrian state-owned universities (note that until the beginning of the 21st century, there were no privately-owned universities in Austria). Mr Drimmel was a member of the Christian Democratic Party and he actively chose people with political views similar to his own for open positions at university. It was almost impossible to become a university professor in Austria if you were a Jew, a left-winger or an adherent of the positivist philosophy as long as he was in office (from 1946 until 1964). I was studying at university from 2001 to 2013 (I was studying for such a long period because I completed two independent graduate degrees, in medicine and computer science) and even during my days as a student, I had the impression that especially the medical university was dominated by members of the Christian Democratic Party and also that it was easier for young alumni to get a job at the university upon graduation if they were a member of this party or one of the organizations associated with it. This was especially hard for me as I had learned at high school to think more like a Social Democrat, as most teachers had been members of the Social Democratic Party or the Greens. In the end I rejected both Social Democracy and Christian Democracy and adopted views that could be classified as classical liberal or libertarian. As a matter of fact, there are quite a lot of people here in Austria who have made similar experiences as I have, and we founded a new political party devoted to classical liberalism a couple of years ago. The first time we tried to get into Austrian Parliament, in 2013, we succeeded at once. At least I am happy that there now is a party in parliament that more or less shares my views.

In fact, I believe that people not working in academia (including university graduates working in the private sector) have more freedom to disagree with the mainstream and develop their own

ideologies since they cannot be made accountable for their publicly expressed opinions to the same degree as e.g. a university professor can be. A university professor delivering lectures in front of hundreds or thousands of students has to carefully watch what he or she is saying. After all, he or she is supposed to represent his or her subject of expertise and is expected only to state things that match the current “state of science”. By contrast, a person working in the private sector usually does not have such a large audience as a professor anyway. Moreover, for the evaluation of the job performance of a person working in the private sector, e.g. a software developer, other criteria are far more relevant than whether his or her opinion matches what is currently considered the scientific mainstream or the “politically correct” world view. Of course, if somebody works in the public sector, at a state-owned company, this situation might again be different.

Regarding metaphysics, I have recently written a paper called “The Synthesis of Metaphysics and Jungian Personality Theory”, which I published at my personal homepage ([www.cdvolko.net](http://www.cdvolko.net)). In this paper, I mentioned the scientific theory developed by Dr. Uwe Rohr and myself since it can be embedded in this metaphysical framework. Basically, we proposed that there are two types of steroidal hormones. One type adapts the organism to stress reactions. These hormones increase physical performance (temporarily) but more or less “shut down” the psyche, which may eventually lead to severe mental disorders. The other type adapts the organism to physical threats such as infectious agents or cancer. These hormones boost the immune system while temporarily decreasing the physical performance. This theory fits very well into my metaphysical framework, considering that there is a symmetry in the relations between the psyche and the brain on the one hand, and the brain and the body on the other. In other words, everything that applies to the body seems to have a correlate with the psyche and vice versa.

I see no problem in integrating scientific theories about the human brain, such as Hebbian learning, with my metaphysical model.

In general, I would like to encourage as many people as possible, especially intelligent people, to follow my example and develop their own worldviews instead of adapting themselves too much into the mainstream. This will not only enrich their own intellectual lives but also the intellectual lives of others.

**Rosner:** *In general, you’re talking about the future of intelligence with your ten things. I read an article, recently. It was attacking the apocalyptic fears of Elon Musk and others about war with the robots – us vs. AI.*

*When you and I, Scott, started talking about this stuff 3 or 4 years ago, no one was worrying about AI on the horizon. I have been fairly heartened that some of these other billionaires have been talking about it.*

*This article attacks these fears by saying that all of these billionaires are afraid of AIs. They are behaving the way these billionaires do themselves, being viciously competitive in business. These guys have projected their business behavior onto future AI and are afraid of it.*

*They think that future AI may act like aggressive, predatory A-holes, basically. That makes for an interesting article. I think that those fears should be thrown up into the constellation of all possible hopes and fears for future AI.*

*Where I was trying to think of the right phrase, which isn't, it is close: "The future with AI will be a perilous flowering." All sorts of new forms of existence will come into being, which will be awesome and also hard to negotiate.*

*It will be hard. We will not be living in the world of 12th-century shoemakers. A shoemaker knows how his life is going to play out if he is lucky and does not get the Plague. He is going to make shoes until he dies at age 56.*

*As long as he makes shoes, and does not get embroiled in a war or bitten by a rat, or a flea on a rat, he has a pretty straightforward rest of his life. The future with the flowering of all this new stuff means that individual little conscious blips in the maelstrom of newness.*

*It is like a Cambrian explosion. The Cambrian explosion was after all the big dinosaurs got wiped out. I may have this wrong. The Yucatan meteorite wipes out the dinosaurs. It wipes out 90% of species.*

*I know I have this wrong. At various points in evolutionary history, there have been mass extinction events. At those points, life has evolved new strategies. It leads to these crazy flowerings that lead to all these new forms competing to find their niches.*

*What might happen in Cambrian explosion, which might take 80 million years, it will happen with an AI explosion that will occur in a century or two. All these crazy changes will take place on the scale of months and decades and within individual human lifetimes or lifespans.*

*It is like the shoemaker having to go from making shoes to podcasting to having his brain downloaded into a module to get sent to Alpha Centauri. Our individual lives, we will have to scramble.*

*We will have to scramble to find temporarily – we hope – 'footing.' Everyone will search out their islands of stability within this burgeoning world. It will be like now, but 50 times worse. Now, we do not wake up every morning.*

*It is like, "Crap! How am I going to get through the day with 80 apps on my phone?" There are still large degrees of stability within our lives. Smartphones have changed a lot of the flavor of daily life.*

*But we still do the same crap that we have all done. We shop for stuff. We eat. We sleep. We try to hook up. It is going to become more hectic and weird. Let me mention, we have been touching on the structure of thinking, intelligence, and consciousness.*

*I would like to bring up Bayesian logic and statistics. Bayesian statistics is something widely misunderstood, including by me. It doesn't mean I can't talk about it. It means how you order the world based on past experience and incorporation new information into that.*

*It is a fairly straightforward formula. Where I always think about it in terms of fake ID because I spent 25 years in bars trying to catch people with fake IDs at the door, my rough or general assumption about the frequency of fake IDs, which was based on long experience during the 80s and 90s mostly in popular, was that about 1 person in 90 would come to me with a fake ID.*

*What I would do, I would try to look at the person and the ID and then ask questions to put this person who is initially part of a group with a 1 in 90 fakenesses into a subgroup where almost nobody has a fake ID or almost everybody has a fake ID.*

*Then I would decide whether to let them in or not. For instance, I ask the person what their star sign or Zodiac sign is. If they do not know it, they enter a subgroup based on professional experience. Well over 90% of those people have a fake ID. Then I ask them what year they graduated high school.*

*If they get that wrong and do not know their sign, they enter a group where well over 99% of people have a fake ID. If the person did not look pretty young, I wouldn't be asking them that question in the first place.*

*If they get those questions right and look over 27 or 28, then they go into a subgroup, where less than 1% or 1/10th of 1 % of people have a fake ID. Occasionally, I would still catch a person obviously still old enough using a fake ID.*

*Someone who lost their real ID and went back to using their fake ID. Or some crazy stuff, I asked a guy to write his name including his middle name. He misspells his middle name. I am like, "This is bullshit. It is your name." He goes, "No, no, no, no, I was in a softball accident. I got hit in the head. I have got brain damage."*

*I think, "Alright, yeah." He goes away. 20 minutes later, he comes back with an inch-thick stack of medical documents showing he was in an accident. So, I brought him a pitcher of beer to add to his brain damage.*

*Another guy had a beautiful signature. Then when he signed it, it was an illegible scrawl. He said, "Dude!" He showed me his hand. He accidentally skied over the hand and severed the nerves. He has got these deep grooves over the top of his hand.*

*That subgroup of people. Occasionally, you find people who defy the group classifications. But it is a powerful tool because most people did not forget their ID or ski over their hand. There are two things with Bayesian logic.*

*One thing is the initial estimate based on life experience or instinct, or whatever, of what you think the landscape is. When I first started working in bars, since my job was to check for IDs, my assumption was a certain fraction of people were going to be bullshitting me based on the nature of the job.*

*That is a prior weighting that goes into Bayesian stuff. The rest of Bayesian stuff is using a formula based on either instinct or accumulated experience to put people into subgroups with each subgroup having a different probability for the event that you're looking for.*

*It is a powerful way of classifying the world. It is done naturally in your brain. Your brain probably classifies the world in a bunch of other ways. Any way that is helping your brain will exploit given the economics of the brain.*

*The Bayesian considerations come into play, where your brain and millions of years of evolution of the brain. All this has developed this system of a somewhat rewirable information processing structure, which has these built-in Bayesian factors.*

*Your brain wants to rewire itself in view of new experiences. It is not a good strategy. It is not good for your brain to rewire itself completely every time something new happens. There is the weight of past experience and the thinness of new experience and the cost of rewiring.*



*It is all a Bayesian system of your brain, and evolution, trying to make the best of the equipment and the mental economics that it has to contend with. That is, the cost of running your information processing system.*

*When I talk about mental economics, I am talking about the limiting factors on our brain. Obviously, the rise of humans has proven that it is a good strategy to have a big brain. It might be even better to have bigger brains, but we are limited by how big of a brain you can squeeze out of the mom without killing the mom.*

*Our heads are as big as they can be to get out of the mom. The mom's pelvis has to snap into two to make way for the head. The kid's head, the plates of the skull have to overlap each other temporarily as they come through the birth canal squishing for a few minutes.*

*The brain or your noggin has to grow fantastically once it is out of the mom. Being born, it puts an upper limit on brain size. Energy considerations, your brain uses a huge amount of the calories that you consume.*

*If everybody is going to die because in the wild they cannot find enough calories to feed their brain, that is a crappy system. There are limiting factors. There are the informational factors. You are dumb if you keep rejiggering your brain as you pay attention to each leaf that falls into your path.*

*Also, and some other points, information processing including AI will get fantastically cheap, which means it will be annoyingly all over the place – largely market driven. If you can sell ten percent more refrigerators if they can talk to you, then they will talk to you?*

*Your car keys will talk to you. A lot of things we would find ridiculous talking to us will talk to us. They will do things that we do not even think about or find ridiculous that are useful. Like objects will find themselves or talk to us, they will do things.*

*Lost objects, they will find themselves. You can buy systems like that now. You can put RFI stickers on stuff that you lose all the time. You can have an app that helps you find all your frequently lost stuff. You can have an app in the future for that.*

*We will be annoyed. As AI and information processing gets cheap, consciousness will get cheap, which will lead to a loss of respect for human consciousness. Humans will still have pride of place. We will still be the king shits of the world.*

*We will be slightly less king shits. We will be hybrid forms of humans plus powerful forms of augmentation technology. They will be the new king shits and potentially the mean girls of the world.*

*It will be a scramble to find islands of security and safety. It will be hard to keep your money if you do not move because of the fast economy. It will not be an economy to fully employ everybody.*

*It may be needed to provide people with some free money, which drives conservatives crazy that anybody would get anything for free. But maybe, there is a utopia of the future, where everybody can plug into shared information processing processes and earn some money that way.*

*Just as likely as that, the world will run in all sorts of various automatic ways, which do not need the ability to do macrame. You might have to take some guaranteed minimum wage.*

*Conservatives, like my buddy Lance, are worried about encroachment and the end of America with immigrants taking all our stuff.*

*I think there is more zero-sum thinking in conservatism than liberalism. I think history is on the side of things getting cheaper as automation and productivity continue to increase. Compared to 100 years ago, clothing and food cost 1/4 of what they did versus the average wage to the point where 2/3rds of Americans are overweight because food is cheap and delicious.*

*I predict a future of abundance, where science fiction makes all sorts of fantastic predictions. Things that will be awesome when they arrive. But when they arrive, they are beat-up, sucky, and grubby and made cheesy by market forces and advertising.*

*Still with some awesomeness left intact, Idiocracy shows a future where people are in some ways taken care of. But everybody is an idiot. All the crap they consume is crap. We will have a future of abundance. It will have a tinge of grubbiness and crappiness.*

*But it will also be awesome. One dumb example, there are all these tall skinny skyscrapers along 57th street in New York City for billionaires. They all look roughly the same. These tall glass buildings sticking up.*

*Somebody put together an architectural plan or proposals for one of these things that would be gargoyles all the way up. It would be computer generated and computer created. You wouldn't have to have craftsmen chipping away at marble or granite.*

*The gargoyles would be 3D printed and have this fantastically ornate 96-story building looming weirdly over 56th street. We will get a bunch of stuff like that. Weirdly ornate, fantastically intricate, AI-generated stuff, that will be awesome, fantastically beautiful, but also both grubby and creepy.*

*The self-containment of consciousness will erode. There is this saying that is particularly unhelpful, which is "no man is an island." It means nobody exists in isolation. Obama got in trouble for saying something like this when he was addressing a bunch of entrepreneurs while president.*

*"You didn't build this," he said, "We built this all together. You're business, which you built. You did not build it alone." When he said, "not build alone," that had all the conservatives jump on him, saying, "Socialist! Treasonous!"*

*No man is an island. It means that we all benefit from a shared civilization. But when it comes to consciousness, that saying doesn't work at all because we all are islands because we are all trapped inside our skulls.*

*Almost all our information skulls are done within our own brains. But that is eroding, slowly at first via our apps. You do not have to hink, "What is the best way to get from here to Glendale?"*

*Because you have a thing on your phone that will do the thinking for you. We have dozens of things that do little bits of thinking for us. We have dozens of other things that do little bits of thinking for us.*

*We have more immediate ways of sharing the products of our thoughts. We can post videos. We can text all the time. Those still leave our consciousnesses more self-contained. But more bombarded by information 24/7.*

*That self-containment is going to erode as we come up with better and better technology to link our information processing apparatuses more directly. So, the saying could be, with regard to consciousness, “Every man, or woman, or person, is an island, but less and less so,” until we have access to what have been calling the worldwide thought “Blob” of the future.*

**Jacobsen: This seems like an important side road to pursue to share experiences. Thank you for sharing your experiences, I am sorry for your short-term losses, but also happy for your long-term wins.**

**If we look at these sectors of societies – “the government, the educational institutions, the media, and partly... religious institutions,” these sectors, and some of the personal stories told by Claus, bring some new dynamics to the conversation.**

**Highly and even exceptionally – as noted by the case with Claus – intelligent people around the world become abused in deed and emotion and word, held back in their academics and professional advancement, labelled with epithets, left unemployed – and unemployable – with intimidation from employers and then given the boot, silenced by legitimate threats of violence, and taken to task in public media if becoming of particular note in the public discussion, even found dead in some cases.**

**In terms of the government, the politicians, the campaign managers for the politicians, and the political party representatives lesser in authority than the leaders in the political parties will remain beholden to the party lines and policies, but also to the impression of acceptability to the constituency of some of the questioning members of the opposition.**

**Politicians want the votes of their constituency and the opposition, so this seems natural and an extension of the need to appease as many people as possible to acquire the necessary votes to win in an election.**

**In terms of the educational institutions, the emphasis on intellectual conformity seems strong to me. I know administrators, professors, and instructors who will state one thing in public and another in private, which seems like a self-protective mechanism in order to survive in the academic world, in the university system, because this amounts to the only world known to them.**

**If an administrator, professor, or instructor sacrifices the comfort of post-secondary or tertiary educational professional life, especially with the surrender of personal finances, time, potential opportunities, and energy into the development of an identity within the university system, then the lack of experience or contact with the external-to-academia world can make the transition difficult, emotionally and financially, and possibly impossible.**

**Which relates to the media, “impossible” if they spoke out on a particular issue sensitive to the general public, of which the public may harbour false views about but which the theories and empirical findings show clearly. The university system across the world needs the finances, and so approval, of the public, which creates, in a way, an apologist class who comfort and cajole in public fora in order to bridge semi-true/semi-false middle grounds between public opinion and the empirical findings in some domains.**

**The same for the students who need to acquire the credential or qualification from an accredited polytechnic university, research university, or college, where, as you note Claus,**

students perform most often for their livelihood and would forsake honest discussion in order to pursue and further their professional lives – too risky, too often, not to otherwise.

Scandals within student unions occur at a consistent rate without public mention, where only some become mentioned and the number of smaller physical, emotional, and verbal abuses to individuals in the student union happen because of the potential threat of those who speak out about abuses of power or may hold different opinions in private from the other student union members.

I recall several experiences within a student union, and as a student in contact with other students, instructors and professors, and administrators at a number of universities, and as a young research professional in different fields, where certain intellectual or ideological lines shall not be crossed and if stepped over the proportional consequences can be expected. It seems the same for university professors via the example from Claus.

These resulted in lost job opportunities, educational time, money, intimidation, and so on – the myriad listed aforementioned forms and techniques of social control, essentially all of them to be frank. The interesting thing, I do not think these techniques for social control within the academic system amount to conscious processes with most people inside of the university system most of the time.

The techniques of intellectual and ideological control seem like tense-stress reactions, which need to release in some form, to people who disagree with the individual.

My suspicion, the views do not equate to views alone but to views embedded in personal identity, where a disagreement with the university system status quo comes across as a disagreement, an affront and offense, against the person in academia as an individual – who often claims to speak for a group without legitimate justification, and so an affront and offense to the group as a whole, which suffices for attack on the individual with the disagreement.

The classical liberal and libertarian viewpoints properly understood, and the private sector compared to the public sector, may provide more freedom in intellectual and professional life, respectively.

With respect to the metaphysics and the nature of intelligence, with a touch on consciousness, these topics, for example intelligence, may not enter into the proper empirical discussion via their presentation in governments, in the university system, and in the media. For example, “We have theories of intelligence x, y, and z. Yesterday, we learned about x. Today, we will learn about x. Tomorrow, we will learn about z. You decide for yourself on the relative merits of it.”

These are presented as if on the same empirical plane. Then students leave the classroom, in an educational example, into an academic culture, especially in the social sciences, oriented towards a default of liberalism and non-nativist perspectives, which influences the perspectives on intelligence, for one within-topic discussion, in spite of the merits of the theories of intelligence relative to their empirical support and respect within the field of intelligence studies and the study of individual differences.

With all of this said, the main message seems to me the importance of independent thought, where some large institutions and social structures work against this to the detriment of the society and the deviant individual at times, which Claus encourages – and me too. This

leads right into the domain of metaphysics and the nature of intelligence and consciousness once more.

**What if we take an inverted approach to the question of metaphysics? Rather than an emphasis on metaphysics in order to gain insight into the natural and physical basis on intelligence, what about the things known in the natural and physical world about intelligence to garner knowledge about the traits of the metaphysical world? A simple set of extrapolations from the known to theorize about the metaphysics around intelligence and consciousness – open question.**

**Volko:** I doubt that what we know of the natural and physical world will lead to new insights into metaphysics. Metaphysics is mainly about the immaterial world that seems to co-exist with the physical world. If this immaterial world does have an impact on the physical world, then its effects may be studied with the scientific method. But from a logical point of view, we only perceive implications, and can only speculate about the causes.

**Rosner:** *Claus talks about metaphysics as if it's the influence of the immaterial on the material. Another way to look at it would be them would be the influence of form on the material world.*

*The principles of existence which I think have a strong basis in the avoidance of contradiction. The things that are best at existing have the least self-contradiction. Starting with small time and space scales, you have quantum entities, quantum particles, which exist probabilistically.*

*They are not macro enough exist with indisputable certainty or near certainty. There is the de Broglie wavelength, which is inversely proportional to mass. The example always is given in beginning physics is to calculate the de Broglie wavelength of a baseball.*

*It contains roughly  $10^{26}$  atoms. Consisting of so many particles, its existence and position in space is indisputable. A baseball is definitely there in a way an electron is not. An electron is this piddly thing, which is hard to pin down, according to any measurable characteristic.*

*Quantum physics is perhaps the closest to metaphysics of any modern scientific theory. Relativity is up there too. Where there are aspects of each that are impinged upon by basic principles of what can and cannot be, which also encompasses the principles of information because information is basically what exists when you strip everything else away.*

*Something is either yes-or-no, one of two states. That is the tiniest bit of information that you can work with, the tiniest clear bit of information. You can get smaller if you are willing to deal with nebulosity.*

*I believe metaphysics impinges on the real. I believe now is the time to look at metaphysics, where it hasn't been for the past 3 or 4 centuries of science because concrete aspects of science have returned or flourished. The concrete aspects of the world.*

*It has paid off ridiculously well. Metaphysics hasn't paid off at all. But we have reached the point, where we have Relativity and Quantum Mechanics which are impacted by the principles of existence, which means it's time to get into metaphysics once more.*

*Because we have reached the point in science where it can productively encompass metaphysics. Earlier parts of this discussion were talking about how really smart people don't necessarily flourish in the world.*

*At some point, the correlation between intelligence and academic/financial/relationship success & happiness – positive correlations – peak, below the level of really, really smart part, so that among people who would be considered super smart; you see a wide assortment of life situations and outcomes from super great to super miserable.*

*There are structures. Society has evolved to accommodate the range of skills people have, which is a Bell Curve and most people have middling skills. Because society runs on the middling, it is likely that people who are on one side or the other of middling will run into trouble.*

*Society has structural protections against being in constant turmoil. If you look at American society now, it is an example of what happens when previously existing structures that helped give stability are under assault by, to a large extent, new media.*

*The Internet has cooked our brains. People can't make the measured judgments or reasonable judgments to the extent that they used to, because we have not yet developed the ability to reasonably evaluate and react to new media.*

*There is also the disruption in employment caused by advances in technology. But, in general, when you look back at an apparently more stable time in society, like the 50s – though you could argue it was only stable on the surface, the 50s has the reputation of being a time of great conformity.*

*People who attempted to defy it didn't have much in the way of resources. Now, any kind of lunatic can go online and find all sorts of peers and support for disruptive behaviour. But in the 50s, people who didn't conform and had fewer resources were more isolated.*

*You have famous stories of people who didn't conform suffering extreme penalties. Alan Turing who basically won WWII for us. He was forced into suicide because the cops or the authorities found out that he was gay, and then chemically castrated him with hormones and wrecked his body, made him sad, and then he died from cyanide.*

*It was just for the minor non-conforming character of not being gay. Some of the things that deny super smart people success reside in society. Some of those things reside in the smart people themselves and a bunch of it is a crazy or messy interaction among everything.*

*The example I always think of, and I don't know if it is any good, imagine if the realtors. Smart people tend to be drawn to smart people disciplines like Chess and Go. Modern examples would be coding.*

*So, if you look at the area of selling real estate, not as it is now, but say any time until ten years ago, realtors are generally not brilliant. But if smart people were somehow driven to embrace selling real estate in the way that they are pushed to study higher math or like chess or science fiction, the real estate market would be entirely disrupted.*

*Within the last ten years, it has been entirely disrupted because smart people methodologies are disrupting everything. Once you bring AI technology and internet technology to a field, it completely disrupts the field, like the field of paying somebody drive you some place.*

*The cab industry is destroyed. All retail is under siege, bricks-and-mortar retail, because you can go on eBay and get something on a price that is driven down based on everyone having access to this technology rather than simply getting something close enough to what you want in a store.*

*Structures that middling society had erected are all getting their asses kicked by outlier technology.*

## Chapter 4: Explanatory Frameworks

**Scott Douglas Jacobsen:** With everything, we could continue forever. However, the discussion started on January 25, 2017 with an email from me. In other words, that seems like a long time for the discussion to come to fruition at this point. Maybe, we can close.

We typed about artificial intelligence, human intelligence, intelligence, and the relationship with mathematics and metaphysics. This kept the conversation forward into consciousness. If I take the summaries from before and include some new ones, and if I bring these into statements rather than points, these may help with the final questions from me.

Human intelligence and artificial intelligence amount to two distinct but overlapping forms of information processing. Human intelligence has strength in pattern recognition and novel idea production. Novel idea production may need more than computation alone. Artificial intelligence has strengths in data storage and speed. Intelligence relates more to efficiency than speed. Intelligence encapsulates both human intelligence and artificial intelligence. Theories of intelligence fail and succeed in different areas. IQ, or general intelligence tests and scores, predict educational success.

In near future, artificial intelligence will remain narrow. Neural networks and machine learning will continue to characterize the development of artificial intelligence. Media will continue to misrepresent the future of artificial intelligence and people. In far future, general artificial intelligence may emerge. Narrow artificial intelligence will exist more than general artificial intelligence. These technology trends may lead to a planet-spanning data processor.

Comprehension of the brain could explain human intelligence without consciousness. This may help create human intelligence in computers. Consciousness may require more than physical and natural explanations. "More than physical or natural explanations" leads to metaphysics. A natural and physical theory, or algorithm, could explain human intelligence. However, for consciousness and intelligence in general, metaphysics seems necessary.

What barriers – e.g., methodology, epistemology, academic bureaucracy, limitations in general intelligence, personality flaws in lack of persistence or conscientiousness, hindrance of creativity from various means, inadequate technological tools, insufficient evidence, and so on – may exist to the discovery of the explanatory framework?

If any of the listed examples, can you elaborate, please? What scientific discoveries and technological capabilities hint at the emergence of a theoretical framework for these more general comprehensions of intelligence writ large?

Once these come to the fore, on the assumption the natural philosophy and philosophy provide the basis in the future, how might influence the perspective on the nature of human intelligence and, subsequently, human life?

Why would these discoveries influence the notion of personhood for human beings and artificial life seen in better representations of science fiction? Claus, you are a theist. Rick, you follow, more or less, Reformed Judaism, which implies a God. Final question, why would the natural and physical explanations for human intelligence and artificial



**intelligence, and the eventual framework for consciousness and intelligence in general, align with a theistic view of the world?**

**Dipl.-Ing. Dr. Claus D. Volko, B.Sc., M.D.:** I think that all the things you mentioned can be barriers hindering the discovery of the explanatory framework. I especially think that certain tabus that are widespread in our Western societies prevent thinkers and researchers from really questioning what is considered established knowledge, having quasi-dogmatic status. I am quite ambivalent about the “skeptics” movement, for instance. On the one hand, it may be true that many people are uncritical of pseudoscience and esoterics, and so it might be a good idea to make them aware of the limitations of these approaches and explain why the scientific method is more credible. On the other hand, adherents of the “skeptics” movement sometimes fail to see the limitations of science itself, and fail to be equally “skeptical” about science as they are about pseudoscience.

To me it seems real progress is not coming from mainstream science but from fringe groups that are not afraid of questioning or even rejecting scientific dogmata and “thinking out of the box”. I would like to direct your attention to the aforementioned “Triadic Distinction Dimensional Vortical Paradigm” invented by Drs. Neppe and Close and the “Cognitive-Theoretic Model of the Universe” by Christopher Langan. Admittedly, I have not studied them in detail yet and am thus not able to rate their credibility. But at least they seem to be attempts that go into the right direction.

Both Drs. Neppe and Close and Christopher Langan happen to consider themselves theists. Actually the terms atheist and theist may be a bit misleading. While Drs. Neppe and Close and Christopher Langan may perceive themselves as theists primarily due to their religious upbringing and their motivation for inventing “theories of everything” that admit the existence of some sort of “deity” may be due to this as well, I was not brought up in a religious fashion. Yet I feel awkward about calling myself an atheist and have decided some time ago to identify myself with “theism”. In my case, it is not that I believe in any God persona bearing resemblance to man, but that I simply assume there to be things that can be considered “divine”, or “divine forces”, which cannot be explained by a naturalist or physicalist approach alone. This view is actually rooted in my own “childhood religion” which I invented as a young boy. Nota bene, this does not mean that there will never be any explanation for these “divine forces” that might be considered “rational” by a large proportion of humanity.

Actually I tend to believe that thanks to backpropagation and deep learning, we are currently experiencing a true revolution in domain-specific artificial intelligence, while it might still take at least yet another revolution until what people such as Ray Kurzweil or Max Tegmark call “Artificial General Intelligence” will arrive. Another technology that is going to have a big impact in the next couple of years is gene editing (CRISPR/Cas9). Eventually it might lead to “designer babies”; this is primarily a matter of legislation, since currently it is outlawed in most Western countries to genetically modify human embryos. Moreover, 3D printing will revolutionize the way things are manufactured. Quantum computing is still more fiction than science, although it has also made some progress in the past years. I think it is these technologies that will shape the world the most in the next ten years. I myself have also been working on a theoretical framework for an alternative to treating bacterial infections with antibiotics, keeping the bacteria alive instead of killing them, but reprogramming them (converting them from “parasites” to “symbionts”; that is why I am calling my framework “Symbiont Conversion Theory”). This might evolve to a new trend in medicine and it might solve a great problem as

physicians are to an increasing extent confronted with “superbugs” that are resistant against many different sorts of antibiotics. My theory also concerns cancer treatment, since cancer cells can themselves be considered parasites that could possibly be converted into symbionts.

**Rosner:** *You say that my thinking aligned with Reformed Judaism. To some extent, that is right. Nobody knows what Reformed Judaism thinks about anything. It is so reformed that it has no philosophical underpinning.*

*My actual thinking is that the model of consciousness being an inevitable and unavoidable aspect high-level information processing. That is something I subscribe or ascribe to. With my limited imagination, I cannot imagine any other system of existence, except for things being entangled with high-level information processing and with consciousness almost always being associated with that.*

*It means that existence, including the universe, is lousy with or peppered or speckled with consciousnesses, but with no consciousness or no entity having absolute god-like powers. But with powerful entities being able to do all sorts of stuff, including, at some level, the ability to create little universes.*

*But that every entity is subject to the rules of existence, which include the rules of consciousness and information processing. So, the structures of thought and information processing are replicated or peppered throughout the universe and embodied in the universe itself, in my thinking, but with omnipotence not being a thing.*

*Nobody gets to be omnipotent. Nobody gets to be a God-god. Entities may be god-like because they have been around so long and incorporate so much information-processing power, so that they are vastly more powerful than we are. But they are still subject to the principles of existence.*

*So, throughout history, people had a pretty stable idea of what makes a person. A person is somebody who is a body with a brain and where everything that brain thinks about is pertinent to that person, and is a reaction to that person’s sensory input plus the information processing that goes on in the brain plus what philosophy you adhere to – some transcendent mind stuff.*

*But everything is personal to that person. Everybody’s thoughts are relevant to that person and locked into the processes going on in their skull with the possibility of some addition of a personal mind in some other realm helping things out.*

*Now, more and more people do not believe in that other realm. More and more people believe that everything that happens can be explained by what happens in the brain. Everything relating to personhood is linked to an individual brain.*

*That is going to get its ass kicked in the next few centuries as information processing is able to move out of individual brains and then we get to link up. That processing has already been going on to a – not great extent because we do not have really any brain device interfaces beyond our five senses yet – decent extent because the relationships with our devices or with other people as mediated through our devices are much more informationally intense.*

*Much more information is being exchanged among people and among people and their devices now than ever before. Information processing will, eventually, not be isolated in individual brains and, instead, will become distributive, mutable, changeable, from moment-to-moment and with that the notion of discrete personhood will be eroded.*

*When we're all linked together and thinking together and we're spitting out tasked consciousnesses and AIs for specific tasks, budding them off and sending them off and then bringing them back in and integrating them again, it is going to look like a big crazy lava lamp rather than marbles of individual awarenesses locked into individual skulls.*

*Those barriers will come down. It will look like a lava lamp with people merging and unmerging and then importance of individual consciousness declining as we become part of this global thought cloud, which isn't to say that we're going to live in some dictatorship of thought.*

*The story that sums this up the best is *I Have No Mouth, and I Must Scream* by Harlan Ellison, where one giant artificial consciousness, robot brain, has taken over the world and is taking people prisoner and torturing them 24/7 for its own perverse amusement.*

*That is the most dystopian version of a worldwide thought cloud taking over and oppressing everybody. Instead, the worldwide thought cloud will, for the most part, set individual consciousnesses free to mash up with other consciousnesses.*

*It sounds scary. But it is like everything else, driven by market forces. By the time every aspect gets to us. It will be made grubby by capitalism. Nothing ever hits us as pure wonder because it takes a while to get to us, and then it comes in the form of being offered by T-Mobile.*

*The barriers to understanding consciousness and the other context of information processing, which encompasses the business of the entire universe – the barriers to looking at that stuff and getting it right – are that it has been considered a super hard problem for thousands of years and everybody's got it wrong for thousands of years, to the point where two people do not mean the same thing when they talk about consciousness.*

*When people talk about a car or a dog, there might be some small issues needing clarification. When one person talks about a car, they may be including truck. That could be cleared up with a conversation between people, maybe in a legislature when trying to figure out what to do with driverless vehicles.*

*The idea of "car" is easily clarified. The idea of "consciousness" can mean a gazillion different things. People tend not to bother with it. To even bring up consciousness has, for a couple hundred years, made people wary that you may hear some flaky astrological theory of the vibes of stuff, and how trees and rocks have their own awareness; consciousness has been associated with a lot of garbage thinking and unclear thinking.*

*Also, as a more philosophical level, it has been thought of as something too hard to figure out, to the point that in the 1930s psychologists or people looking in the field of brain performance in psychology decided to do without any theorizing altogether and then invented Behaviorism.*

*It said, "We are not going to think about it. We are going to consider the brain a black box. Then we will consider anything coming out of the brain as not thinking but reflexes." So, the barriers, historically, have been that it is too hard of a problem and people had all sorts of unclear and wrong ideas about what it is.*

*A third thing is that people did not have the experiential background to properly deal with consciousness and frameworks for information processing. Information Theory didn't come around until Claude Shannon in the 1940s.*

*I think part two of the questions about what are some hints for going after it now. The big deal now is that we live in a or are in an ocean of information processing now. At least, when we*

*weren't in an obvious way before, maybe 30 years ago; now, everybody walks about with a super powerful information processor in their hand.*

*We get to watch the real-time operation of high-powered information processing devices. Everybody has a better idea of how all this stuff works because information-processing is basically the biggest industry in the world in the world right now and will continue to be; it will suck up more and more parts of our lives*

*There are people working things. We will have a biotech revolution that will be the application of high powered information processing technology to the systems of the human body. Everybody, now, has a better idea of how consciousness works because we see how our devices work and approach tasks.*

*The analogies are not perfect but they are better than what people had in the 19th century or in the BC years. We have all these analogies via our devices that are very powerful in helping us understand how our minds work with the switching from app to app being similar to switching from focus to focus, from driving and the light or the asshole in front of you when he/she slams on their breaks.*

*Or what is more common now, the times when people come to a near stop when everyone is texting. Consciousness becomes solvable because we have the technology and we have the experience to go after consciousness now.*

**Jacobsen: Thank you for the opportunities and your times, Claus and Rick.**

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