

Chapter Title: Why do we need to expand our understanding of reality?

Book Title: The Universe, Life and Everything...

Book Subtitle: Dialogues on our Changing Understanding of Reality

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Published by: Amsterdam University Press

Stable URL: <https://www.jstor.org/stable/j.ctv8pz9v8.4>

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2 Why do we need to expand our understanding of reality?

Why would we need a new world view? The only possible reason is if the old one is failing, and let's be realistic: our classic, Newtonian, deterministic view of reality has been hugely successful. It has brought us modern science. It brought us the industrial revolution. It has revolutionised technology, medicine, agriculture, all aspects of our world. Why would we critique it? First of all, our thinking is so rooted in this paradigm that we have forgotten that it *is* a paradigm, a way of viewing the world, and not fact. As such, there may be other, perhaps complementary, ways to view the world that are equally useful and that may extend our understanding beyond what we can achieve using our conventional view. Second, there are areas in which our paradigm is beginning to falter, aspects of our reality that it does not fit. Yet, we are very attached to our world view, so we do not always want to recognise that it may be flagging. This chapter outlines three areas where our paradigm is reaching its limits to explain why we need to expand it. Furthermore, it gives some examples of how attached people are to thinking in terms of the classical paradigm.

Consciousness

One of the most obvious problems with our current paradigm is that it cannot account for consciousness. Matter, including, biological, living matter, is built up of molecules and atoms, where the latter are the building blocks for the former. Yet these building blocks are inanimate and there is no reason in science that certain configurations of them would acquire awareness, consciousness, or indeed be alive.

It is hard to give a comprehensive definition of consciousness, as it is a complex phenomenon. However, as different scientists

and different disciplines use the term in different ways, it is necessary to say something about it. In this book, the term refers to having a 'sense of self', in the sense of feeling like an individual. In daily practice, the term is also often used as a synonym for 'awareness', in the sense that we can be conscious *of* something. To illustrate the difference: a mosquito may well be aware of a hand moving rapidly in its direction, yet it is hard to imagine a mosquito reflecting on its 'mosquito-ness', in the way that we can reflect upon ourselves. This book uses the term consciousness in the second sense. When it means to refer to the first sense, the term awareness is used. In the dialogues, the authors have noted which word was used.⁷

The classical contemporary view is that awareness and consciousness emerge from brain function. Yet the mechanism for this emergence is not understood and efforts to localise consciousness in the brain to date have been unsuccessful.⁸ It is of course possible that our techniques are simply not advanced enough and that at some point in the next ten to twenty years it will simply show up. But the experience of the last twenty years suggests this is unlikely. It is telling therefore that more and more scientists of consciousness are advocating panpsychism, the idea that consciousness is universal and may even be an organising principle of the universe⁹. Consciousness and the failure of the classical world view to account for it was a feature of all the dialogues included in this book. Sarah & Ton discussed the problem with the classical view of man with Alex Wendt:

7 In Dutch, the word *bewustzijn* refers to both consciousness and awareness. Therefore, the difference in meaning is not an issue in the dialogues with Herman, Herma and Erik.

8 See for example an editorial in 'Frontiers in Psychology' by two leading consciousness researchers entitled 'Still wanted: the neural mechanisms of consciousness'.

9 For example, the 2014 article in *Scientific American* by Christof Koch, the chief scientific officer of the Allen Institute for Brain Science in Seattle. See References & further reading.

Ton Baggerman: [...] my clients are much more interested in working around meaningful wholes than my colleagues in psychiatry, who are trained to think in terms of chemicals, protocols and the DSM.¹⁰

Alex: Yes, that is a very mechanical materialistic view of the human that I find completely alien.

Sarah: It has nothing to do with the human experience.

Alex: Nothing! The problem with the classical model of man is that classical man is dead. Classical physics was specifically designed to model non-alive phenomena. If you use that model to talk about human beings, you are basically talking about people as if they are dead.

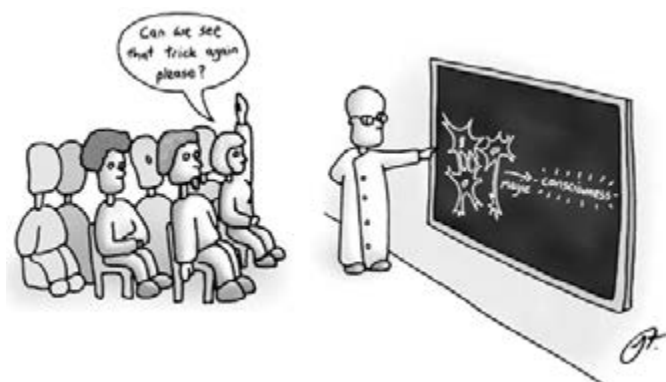
Henry Stapp made a similar point in his 1993 book 'Mind, Matter and Quantum Mechanics', where he described that according to the classical view of reality people are essentially zombies, or 'walking automatons', as they have no consciousness or free will:

This rigid enforcement of the classical physical laws entailed [...] that men's thoughts could have no effects upon their actions: that each human body, being composed of pre-programmed atoms, is an automaton whose every action was predetermined, long before he was born, by purely mechanical considerations, with no reference at all to thoughts or ideas.¹¹

For Sarah, the problem of consciousness has been a theme in her life. In talking to Ton, she told him how she became interested in this puzzle:

¹⁰ The DSM (Diagnostic and Statistical Manual of Mental Disorders) is published by the American Psychiatric Association and aims to supply a set of standardised criteria for the classification of mental disorders. It is relied upon heavily in psychiatry, by clinicians, pharmaceutical companies, policymakers and legislators alike. The latest version, DSM-5, appeared in May 2013.

¹¹ Mind, Matter and Quantum Mechanics, page 183.



My interest in consciousness stems from my teenage years when I began to wonder how it was possible that I feel like a self inside a body, and not like a body creating a self. That is how I became interested in the brain and brain function. I read psychology at university and naturally gravitated towards neuroscience. I had a very scientifically oriented upbringing and for a long time I thought the answers to these questions were to be found in science. We have such beautiful techniques, can image the functioning brain and even track neurotransmitter systems in action. But eventually I realised that all the research we were doing, and that I was doing, was not going to lead to us discovering the neural basis of psychiatric symptoms. That is because psychiatric symptoms are considered to be emergent, in the same way that consciousness is thought to be emergent, a mere side effect of brain function. Neuroscience cannot explain these strongly emergent phenomena.¹² And my gut instinct was telling me we need a new model of consciousness.

12 Strong emergence is a form of emergence where the constituent parts are not recognisable in the emergent phenomenon. Consciousness is considered strongly emergent as aspects of the physical brain (or body) are not recognisable in it. Sand dunes are an example of weak emergence, where sand, water and wind come together to form them, albeit in unpredictable patterns (hence the term emergence).

Ton: So you found that you had assumed that your work, and science more generally, would provide the answers to your questions and that it was too limited?

Sarah: Yes, I came to the conclusion that psychiatric research has not been able to explain the emergence of psychiatric symptoms from biology. So I started to look at consciousness research, a relatively new field that developed in the 1990s after Francis Crick¹³ spoke out and said that consciousness was a phenomenon worthy of scientific research, and by now the field is 25 years old. It faces the same problem as psychiatry: there is no answer yet to how consciousness emerges from brain function. They are going round and round in the same circles as we are.

Ton: Do I understand correctly that you think you have a greater chance of finding answers if you take your gut instinct seriously? So, is what you are saying that modern-day science asks the wrong questions?

Sarah: I am saying that modern-day neuroscience uses the wrong model. The model is 'we are our brain', which basically states that our consciousness is the result of brain function or even an artefact of it. It renders us zombies in a purely physical world, with physical form. It says our sense of consciousness is caused by our brains, and any sense of free will is an illusion.

In my thinking – and I have tried to limit myself to the nature of consciousness, rather than to address the nature of reality, because, let's be honest, I'm not schooled to address that. You may wonder whether I am schooled to address consciousness, but at least I'm closer (*laughs*) – but I do think, and that is what I hope to work on the next few years, that we are using the wrong model in neuroscience, including in psychiatry.

Ton: What is it that is wrong with the 'we are our brain' model?

13 Francis Crick was world-famous for discovering the double helix structure of the DNA molecule with James Watson in 1953. They received the Nobel prize for their work in 1962.

Sarah: Well, there is no definitive evidence that we *are* our brains. There is a correlation between what your brain does and what you experience. But it is a huge assumption that what the brain is doing is *causal* to what you experience. And not only that it is causal to your experience of who you are and how you are, but also to the experience of seeing the teapot on the table. I see the teapot because of what my brain is doing. There is some truth to that of course, because if my brain were to stop working right now I would no longer be able to see the teapot. But there is this assumption that there is an objective external reality, a 3D world with a teapot in it that I also walk around in, and that when I see the teapot it is a somehow realistic rendition of it. All those sorts of assumptions...¹⁴

Ton: ... they are simply not discussed, there is a lot more to say about them? It sounds like all sorts of philosophical considerations are just not taken into account?

Sarah: That's right.

Ton: So, neuroscience just ignores that reality is much more complex, ignores ontology?¹⁵

Sarah: My field, psychiatry research, tends to. The field of consciousness research takes it into consideration more. There you have philosophers of mind who think about these issues. Some of them seem to be gravitating towards panpsychism as a mechanism for consciousness. Chalmers¹⁶ has said that the bottom-up explanation of consciousness emerging from brain function is simply dissatisfying, because it does not address our

¹⁴ This type of assumption of an objective (external) reality is relatively common in the natural and biological sciences, but contrasts with relational theory approaches that place more emphasis on the relationship between observer and observed or between agents. These are more common in philosophy and social sciences and include phenomenology, but have also been applied in physics, quantum mechanics and biology.

¹⁵ Ontology is the branch of philosophy that deals with the nature of being and reality. Asks questions like what entities may be said to exist. See Lexicon.

¹⁶ David Chalmers is a well-known philosopher of mind working in the area. See https://en.wikipedia.org/wiki/David_Chalmers

experience. It does not address why it is *like* something to be human.¹⁷ There is a qualitative aspect to being alive: when we see red, we experience redness, the same for other colours, or for music or for beauty. Such subjective experiences are called qualia. Similarly, it is *like* something to be us and neuroscience has no explanation for that, or for any qualia for that matter. Chalmers has suggested that we should consider consciousness a fundamental property of our universe, in the same way mass and energy are fundamental. That at least brings it into the realm of scientific investigation.

Herma is a Jungian psychotherapist and has been working on the mind-body connection. This is what she said about it:

I am currently running a course for health professionals with two people who are very experienced at using the physical angle to address blockades in your body, particularly those that arose before you had language to express yourself. In the West, if someone has a stiff neck and shoulders, we massage them. That way, you are assured clientele, because they need to come back every two weeks! In Eastern medicine, they see that sort of tension as an imbalance in energy, where too little energy in the opposing area early in life led to the blockade. They then relax it by just touching the client in that area and instructing him to breathe towards it. By doing that you can redirect energy to a neglected area. If you do that, you can feel them relax. It is even reflected in our language. For example, in Dutch, we have a saying 'I am holding onto my heart' to express nervousness or anxiety.¹⁸ But if you let go of your heart, enlarge your heart, the tenseness in neck and shoulders relaxes. Those are beautiful things to learn, to experience with a small group of people working together. That is the real body/mind connection...

17 Originally in the *Journal of Consciousness Studies*, in 1995. See References & further reading.

18 *Ik houd mijn hart vast* in Dutch.

I can still be surprised by what it can do. People don't need to regress to their childhood, to the way things were at home, to investigate whether their parents were good to them and all that. People can just be in the here and now, breathing and crying and it can be a healing experience. It can be beautiful.

Ton is a psychotherapist, and therefore works directly with people and their perception of 'being someone'. When Sarah and Ton first discussed this book in late 2015, he put it like this:

Sarah: Do you see the beginnings of the shifting paradigm that the other contributors to this book mention in your own field, of psychotherapy?

Ton: Hardly! Psychologists have always been keen on finding scientific grounds for what they do. I think basically that is overcompensation for the unscientific or at least un-Newtonian scientific aspect of working with real problems of real people. Of course what actually happens in psychotherapy is never going to be quantifiable and predictable in a classically scientific way. I think every psychologist knows that. But to be taken seriously as a profession, we have to keep up appearances and be scientific about it. And that has always meant classically scientific. As such, psychologists are not very likely to be the first ones to adopt a new paradigm since they already feel vulnerable to criticisms of being unscientific.

Sarah: How then do you think the classical paradigm has been translated to psychotherapy?

Ton: One way is by classifying our clients' problems in terms of 'disorders'. There is a system of classification, the DSM – Diagnostic and Statistical Manual of Mental Disorders – that has been the standard for decades now. It started off as a kind of inventory of frequent patterns of behaviour. It was meant to enhance professional communication in psychiatry. The way it is used now suggests that like in medical practice, clients' experiences and problems and the way they go about dealing with them, are disorders. And just like in medicine, we all want to fix a disorder,

don't we? So, this suggests that if we apply the right medicine or protocolled therapy to a specific DSM disorder, it will be cured.

It is a profoundly classical mechanistic way of thinking about the human condition. And it is so very convincing too, because it has so often been very successful! Even now as I am saying this, I am thinking: how can you disagree? What could be wrong with thinking about it in this way?' It makes me anxious to even suggest I might not agree. I worry I could be caught in the act, and be put away as a quack. That is how commonplace and dominant this classical approach has become.

Sarah: So, what do you consider the limitations of applying the classical paradigm to psychotherapy to be?

Ton: Well, first of all we know from modern-day quantum physics that the classical paradigm is wrong in assuming that mind does not affect matter. Our intentions and the way we attribute meaning in our lives affect our surroundings in a very real way! In my field, where mind is so very prominent, we need to broaden the classical paradigm to include it as soon as we can. Now that is the kind of meta-argument you can respond to by saying that as long as it works, it doesn't matter which paradigm you use. And it is hardly an issue anyway since the classical way of looking at the world has become automatic and self-evident.

A more direct argument has to do with the importance of the common ground on which client and therapist work in the context of therapy. I think we therapists can do much better than to define therapy as essentially talking to a client who is no more than a bunch of non-living atoms. For one thing, that is not at all the experience the client has, or the therapist for that matter! So, there is a lot going on in therapy that the therapist is not supposed to use if she adheres to professional standards. That is twisted and it hampers the therapeutic process. I think we should be keen to investigate new scientific insights that will allow us to take our experiences and consciousness seriously. And such a scientific paradigm is here already,¹⁹ there is no

¹⁹ Ton is referring to quantum mechanics.

question about it! We need to investigate it and its implications for opportunities to become better therapists.

There will be more on how a new world view might help explain consciousness in Chapters 4, 5 and 6. For now, let's follow Ton's lead and turn our attention to modern-day physics and its implications for the way we view the world.

Modern-day physics: where 'in with the new' does not mean 'out with the old'

The second clue that we need a new world view comes from developments in physics in the twentieth century. At the beginning of the last century, there were monumental shifts in physics that have had a major impact on modern-day physics. One might argue that the developments sparked by these discoveries culminated recently, when Nobel Prize winner Gerard van 't Hooft²⁰ and colleagues published a paper questioning the existence of locality and causality ('t Hooft et al., 2016) and Erik Verlinde used his theory that the underlying structure of reality is information to predict gravity as an emergent phenomenon from it (Verlinde, 2016). This was remarkable as it forgoes the need to postulate dark matter as a means to make the math of galaxies and the universe work. At this point, this theory has not yet been supported by astrophysical observations, but it does illustrate what a shift in thinking can do to a scientific field and how great the consequences may be.

In talking to Erik Verlinde about his work, he said the following about why we need a shift in our thinking about the physical realm:

20 Gerard 't Hooft and his former mentor Martinus Veltman won the 1999 Nobel Prize in Physics for elucidating the quantum structure of electroweak interactions.

Newton and his contemporaries had a very mechanical world view, and it allowed them to affect some very concrete things in the world around us. For example, engineers that build cars use Newton's laws to do so. Anything we build in our world, bridges, houses, dams, it is all based on Newton's laws. Furthermore, we are not saying Newton's laws were *wrong*. Even Einstein, when he said it was time to replace Newton's theory of gravity did not say it was wrong. He just said that in certain circumstances things worked differently. There are always data that do not fit the theory. But I think in cosmology we are seeing rather a lot of data that do not fit the theory. We are moving towards a new description and theory.

I think everybody asks themselves now and then 'where does it all come from?' How does the universe fit together is a question that people ask themselves. There is a cartoon by Sidney Harris of a man by a big telescope. In the first half of the cartoon, a caveman is looking at the stars. They are both wondering 'where did it all come from?'



We have always asked that question, it is what led us to try to find out how everything fits together, and it is what led us to develop beyond cavemen. All the technology we have developed

was ultimately motivated by that question. But it is a question we still haven't really answered.

The two early twentieth-century discoveries that are at the base of the current shift going on in physics were Einstein's theory of General Relativity and the formulation of quantum mechanics.

In his *Theory of General Relativity*, published in 1915, Albert Einstein argued that space and time are neither independent nor absolute. Instead, they are closely related to each other and subjective: two persons travelling through space at very different velocities experience different courses of time. Apparently, some of the characteristics of an observer – speed, in this case – affect what is observed. But how is that possible if time and space are absolute and independent, as classical physics has always assumed?

Another fundamental shift in physics arose in 1900, when Max Planck discovered that energy comes in basic, fixed minimal 'packages' instead of as a continuum that can be further subdivided infinitely.²¹ At first glance, this might seem to confirm the classical idea of a nature being composed of 'building blocks'. However, Planck's discovery posed some serious problems to Newtonian science: first, it meant that the assumption that nature could always be further reduced was wrong. Up until that time, physicists had assumed that one could always take the analysis down one further level if one could only build a better measuring device up to the task. Planck's discovery defined the lower limit of precision for any scientific measurement, simply because – by definition – it is impossible to design an instrument of sub-quantum size. When Sarah & Ton talked to Henry Stapp, he gave a brief history of quantum physics which they share with you below:

21 Max Planck won the Nobel Prize for his work on quantum physics in 1918.

Henry: In 1900, Max Planck was studying the properties of electromagnetic radiation, and discovered that the world had properties that were incompatible with the ideas of classical mechanics: energy came in minimal quantities (quanta) and sometimes behaved like particles in addition to waves. Then Einstein discovered the photo-electric effect and this emphasised that visible light, which at that time was thought only to behave as waves, also had particle-like characteristics.²² The next important step in the development of quantum mechanics was Bohr's 1913 model of the atom.²³ In this model, the atom is like a miniature solar system, similar to the way it is still taught in schools today. But the orbits of the electrons around the nucleus turned out not to spiral into the centre as classical mechanics predicts. In fact, gravity did not appear to have an effect on them at all. Instead, they stayed at a certain distance for a long time and then suddenly jumped to another distance with the emission or absorption of a photon. So, this model accommodated some of the basic quantum-mechanical properties that had previously been discovered: radiated energy comes in discrete packets that enjoy both wave-like and particle-like properties.

But it turned out that when they looked at the model in more detail, they couldn't make it work. There were a lot of different experiments and if you added details to the model to explain the results from one experiment, then it could no longer explain others. Nobody was more keenly aware of this than Niels Bohr, who had invented it: as the inventor, he was of course particularly concerned whether it worked or not. Then the young Werner Heisenberg²⁴ came to work with Bohr in Copenhagen and he was surprised. He had previously worked with Sommerfeld and Born,²⁵ and they thought that it was a great model and that it worked, but Bohr had realised that it did not. Heisenberg, still

22 Albert Einstein received the Nobel Prize for this discovery in 1921.

23 Niels Bohr received the Nobel Prize for this work in 1922.

24 Nobel Prize for Physics 1932.

25 Nobel Prize for Physics 1954.

young and full of energy, pinned the problem down to the idea that the process of acquiring knowledge about the atomic system was in fact changing the system, an idea known as the observer effect. Furthermore, there was a limit to the accuracy with which complementary properties of the system could be measured, the uncertainty principle. Up until that time, people regarded observing trivially: it was commonly believed that you directly grasped the reality behind your experience. However, Heisenberg determined that the process of acquiring knowledge about a system actually *changes* the properties of the system you are inquiring about. So, that brought human consciousness into the dynamics in an entirely new way: these new insights were not just about an observer disturbing the object of observation, it was about actually causing changes in what you were observing.²⁶

To illustrate what this means with an example: in order to see an electron orbiting the nucleus of an atom we shine light on it. The light is then reflected by the electron and captured by our microscope. If we want to observe the electron in its natural state, we cannot use too much light, because the energy of our light beam might push the little electron out of its orbit, leaving us with the observation of it fleeing the scene. In fact, in order to be able to see the electron in orbit, our light beam would need to be smaller than one quantum of light and – as Planck had discovered – that is impossible.²⁷

²⁶ The most widely accepted, original interpretation of quantum mechanics, known as the Copenhagen interpretation, does not reserve a role for consciousness *per se*, and neither do the two currently widely adopted interpretations, the realist and instrumentalist interpretations. It is an ongoing debate in quantum physics whether conscious measurement is necessary to collapse the quantum probability wave, or whether a non-conscious measuring instrument suffices. Henry Stapp is one of the quantum physicists who argues conscious measurement is necessary, along with Paul Dirac (Nobel Prize 1933), Niels Bohr (Nobel Prize 1922), Wolfgang Pauli (Nobel Prize 1945) and even Max Planck himself.

²⁷ Example borrowed from Werner Heisenberg in his 1962 book *Physics and Philosophy*. See References & further reading.

Henry continued: The key point to understand here is that this discovery placed the observer and his choice of question directly in the dynamics of the system being observed. And this was back in 1925! This was the key innovation in the transition from classical mechanics to quantum mechanics, the very idea that our probing action – we do an experiment designed to probe some properties of a system – changes the system we are probing. The implications are huge and have not been carried over into our current scientific thinking.

As is perhaps evident from the number of Nobel Prizes awarded in the area, quantum mechanics has been catalysing new insights and developments in physics, as well as philosophy for over a century now. Within physics, the classical concept of a world full of elements that exist independently of one another is no longer tenable. The certainties of objective and infinitely replicable cause-and-effect relationships have had to be abandoned, in favour of a relative and probabilistic paradigm. In the weird world of subatomic particles, they do not exist as objects. Rather, they pop into existence, at different locations, as a result of measurement, and they can be ‘entangled’ with each other, where measuring one instantly determines the fate of the other. This interaction is instantaneous, meaning that information is transferred faster than light, and as such it is not causal in the classical sense. Einstein famously called this ‘spooky action at a distance’.

One of the most difficult aspects of quantum physics to grasp from our classical way of thinking is that *measuring* a particle is what causes it to take shape. It is the act of observing that brings it into existence. Until then it only exists as a ‘probability’, or a likelihood. This is crucial, because without an observation, there is no reality to observe, only a probability. This aspect is what has led Henry Stapp – as well as some other leading quantum physicists – to argue that consciousness is central: there needs to be somebody (an observer) to make the observation. Of course, it is possible that this need for an observer to bring reality into being

only applies to the tiny scale of subatomic particles. However, that seems unlikely, as our larger, directly observable physical universe is built up of particles that are made of atoms that in turn are made from these subatomic particles. Furthermore, it seems strange that reality would take on different physical forms depending on the scale. And finally, it is notable that the math of quantum physics is now being used to study human cognition. For example, in the field of psychology quantum math has been shown to predict the way humans make decisions better than classical probability theory, solving some of the paradoxes in the field (e.g. Bruza et al., 2015). One of those is the so-called Linda problem: here subjects are asked to rate which of two options is more likely. They are told that Linda is a bright and outspoken woman who participated in demonstrations against nuclear weapons and discrimination in college. They are then asked which is more likely, (A) that she is a bank teller, or (B) that she is a bank teller and active in the feminist movement. Subjects reliably pick option B, even though (according to classical probability theory) the conjunction of two probabilities, both of which are smaller than 1 should always be smaller than one of the constituent options. Quantum math on the other hand predicts that option B is the more likely outcome.²⁸ The math fitting does of course not mean that human cognition is a quantum phenomenon, but it is suggestive that quantum processes have been shown to be involved in a number of biological processes, including photosynthesis and the ability of some migratory birds to navigate.²⁹

Overall, the implications of quantum mechanics for our understanding of the world at our scale are yet far from clear. However, it is noteworthy that some of the quantum phenomena that seem so strange to us at first glance are actually similar to

²⁸ For a full explanation, see the paper by Bruza and colleagues listed in References & further reading.

²⁹ For a comprehensive and very accessible account, read Al-Khalili & McFadden's *Life on the Edge*.

events we encounter every day, for example in social interaction. In the dialogue with Herman Wijffels and Herma van der Weide, Herman noted:

I am reading a book on quantum biology. What is fascinating is that the quantum world looks very different than the world we perceive. In it, you have entanglement³⁰ and superposition³¹ for example. I suspect those phenomena are equally present in our world. We just cannot observe them if we use our usual, classical outlook. That is the real point, that we have a certain outlook and therefore perceive the superatomic world as being very different from the subatomic one. In the subatomic world, there are quantum processes that we are beginning to uncover scientifically. Something happened this week, and I said to Herma: 'this reminds me of subatomic entanglement'...

Herma: Yes, one of us was thinking something and the other said it.

Herman further underscored that we need a new scientific paradigm, saying the old one is so engrained we seem to have forgotten it is a paradigm at all. To some people, it seems to be beyond question that the classical world view is the true shape of reality. He also pointed out that needing a new paradigm does not mean that we should do away with all aspects of the old one. It is not that the reigning paradigm is completely false. Rather, it is incomplete.

Herman said: Some people say everything is going wrong, that we have done it all wrong, with the environment, for example. That is not the way I see it. I think the scientific paradigm that

30 Entanglement is the tendency of quantum systems to be entwined in such a way that when a property is measured for one of them, the value for the other is simultaneously determined regardless of physical distance. See Lexicon.

31 Superposition is the property of quantum systems to be in two states (or two locations) simultaneously. When measured, the system 'collapses' into one or the other state. See Lexicon.

we have been using has been very productive. It was exactly what we needed at this stage of our evolution.

To put it very prosaically: until the Middle Ages, people in Europe, in this part of the world, believed that as long as you did what the church said, you would go to heaven and be rewarded there. With the Enlightenment, certain people stood up to say: 'Maybe we can think of a few things to make it pleasant here, on earth, too.' I may be putting it a bit bluntly, but it is essentially what happened. People like Descartes and Newton worked on these ideas, and they were very productive. It resulted in increased awareness. But the effectiveness of that formula became problematic when it became so successful that we started to change our circumstances in a meaningful way. Now we are ready for the next stage in our evolution, to develop more awareness of how we shape our world. The way I see it is: the scientific paradigm was good. But as always when something works too well, it was so successful that at the end of its life it has started to lead to perversion, and it is therefore time to move on to the next paradigm. I view everything that is happening in the world in that light.

Let me give you an example: both socialism and capitalism are materialist daughters of the Enlightenment. Pure socialism has already disappeared. The odds are that capitalism in its pure form is also going to disappear. We are simply ready for the next phase. What is important now is how we develop our awareness and that we let go of paradigms that belong to the past era, such as atomism³² and the dichotomy between body and mind. We must let those go. It is all about finding the trans-position. We should not abandon rationalism, but we need to become trans-rational. Really, it is the next round of bringing awareness into matter. So, of course, it raises a question that was unsolvable in the past: What *is* consciousness? What *is* awareness? Is it something that arises from matter, or is it something that precedes it?

32 The idea that everything is separate and independent. See Lexicon.

Alex Wendt said something similar when asked why the new paradigm is taking its time to take hold.

Sarah: Quantum physics has been around for a century. But it has taken a long time for these ideas to begin to penetrate. Why do you think there is so much resistance? Obviously, some of these ideas are very complex, but they have been around for quite a while now.

Alex: I think part of it is that there are principled arguments that these quantum effects should not appear at the macro-scale, because of decoherence³³ and other quantum effects. So there is good intellectual reason to be sceptical. However, I think a lot of the resistance is sociological. People have invested careers and graduate training in a certain way of thinking. And it happens to be a way of thinking that works pretty well! So there is no reason to give it up quickly. Also, there is a kind of 'new-age' feel associated with the quantum work. That doesn't help. But I think it is just a matter of time. I am an optimist. I look at my students and they are quite interested. My colleagues? Less so. But then, that is exactly what you would expect.

Erik said something similar: There is a lot of philosophy behind this that I think many physicists are probably not ready for. They like to look at equations. And they learnt all sorts of things from textbooks that they are persisting in...

Sarah: I think that applies to scientists more generally...

Erik: The shift in thinking is happening very slowly, because people hang onto their old ideas.

Erik also expressed his hopes for what a new paradigm might bring us: I hope this new paradigm will bring us closer to a new answer to that age-old question. If you ask people out in the street today 'Where did this all come from?' the majority would

33 The tendency of quantum systems in superposition to collapse into a 'classical' state as a result of interaction with their environment. See Lexicon.

say 'from the Big Bang'. Because that is the story we all learn in school.

Another Sidney Harris cartoon I like shows a room of people listening to somebody preaching about the Big Bang 'It was HOT, and then there were all these Quarks, and...' and they shout 'Hal-lelujah'. It makes the point that the theory has almost become a religion.



Religions arose to answer that same question: where does it all come from? It is part of our nature that we want to have some sort of genesis tale, an origin story. I think the big bang theory is a scientific version of that tale, but now positioned at a specific point in time. But to me, logically, it makes very little sense. How can something arise out of nothing? And there are other problems with it. There are all sorts of things that bother me about it conceptually, and I hope and expect that the direction we are taking will provide a different answer. I think emergence will turn out to play a big part in that, because the phenomenon of emergence shows us that things don't come out of nothing, but that they always come out of something. So, another way to

ask the question 'Where did it all come from?' is to ask 'What is the underlying language, the underlying structure of reality?' So that is my hope, that if we ask people in the street a century from now 'Where did it all come from?' that they will give a different answer.

We are part of life on our planet

From the above, it is clear that everybody who participated in these conversations feels we need an extension of our scientific paradigm, because our understanding simply does not explain all the data. Perhaps however, the limitation of the old paradigm is clearest in the crises we are currently facing on our planet. Our mechanistic, materialistic way of thinking has led us to capitalise on the resources of our planet. It has brought us our modern way of life, with relatively great wealth, science, healthcare and industry. But this approach is also reaching its limits as is evident in the environmental and humanitarian crises we are facing. Perhaps that is the most urgent reason we need a paradigm shift: not because of academic debates on the nature of consciousness or the possible implications of quantum mechanics for our understanding of ourselves, but because we need to realise that we are part of the system that is our planet and our behaviour affects our surroundings. In speaking to Herman and Herma:

Herman: One example is that in the industrial age, mechanics were the most important metaphor. The challenge was to fit people within that metaphor, and the result was rather forced, with human bodies envisioned as machines that could be fixed when broken, for example. Now the time is arriving that we need to use organic metaphors, where things are organised in an organic, natural way. We are moving away from pyramids and hierarchies to network organisations. Instead of having energy production and distribution centralised, we are moving towards harnessing energy everywhere, and distributing any surplus through the

network: that turns it into an organic system. This principle will apply to many things; the world will self-organise in the next era. The Internet is an example of that. In fact, it is probably the best example we have. The world is going to change following the example set by the Internet. One consequence will be that the meaning of traditional national states with boundaries will decrease. The stately organisation is an industrial invention stemming from the industrial era and industrial thinking.

I consider the European Union an exercise we are conducting to learn how to live in a context where the national borders still exist, but no longer determine everything. Of course, that understandably also leads to an opposing tendency, a nationalist reflex if you will.³⁴

Sarah: Of course, a backlash.

Herman: But every time there is a problem, we come to the wrong conclusion that we need to solve it ourselves. What we need is to collaborate! That doesn't just apply to Europe; it applies at the global scale. We need to realise that the problem we are facing is a global problem! We need to address it globally. It is this sort of thing that the current increase in awareness is about. The throngs of refugees arriving on our shores are really telling us: 'People, we have a global problem! If you come to our homes to fight, to take away our energy sources (oil), then you will find there are consequences.' So that is the message: 'Address the situation! You need to shift to producing your own energy as soon as possible.'

Currently, the world is full of signals like that. Only we keep trying to reduce them to our classical world view, our classical paradigm and it no longer fits.

Alex had the following to say on states and the nature of 'statehood': One of the criticisms of my International Relations work was that I ignore the uncertainty states have regarding another

34 Note that Herman made this comment in October 2015, well before the Brexit and Trump winning the US presidential election.

state' intentions. My response was: Well, actually there is not that much uncertainty out there. States are pretty certain most of the time what the other's intentions are. Some theorists (realists) have had to exaggerate the difficulty of knowing intentions in order to make their theory work. Clearly sometimes we don't know the other's intentions. We do get tricked sometimes. But my guess is that Canadian leaders never doubt that America is not going to attack them tomorrow.³⁵ There is just no uncertainty there. I think that is probably the norm rather than the exception. And that would follow from entanglement at the state level, by which I mean that there is shared, collectivised knowledge. In such a world view, there would be a lot less uncertainty and therefore a lot less conflict.

In all, I think accounting for such shared knowledge is going to require a complete shift in our world view. Not only of our relations among ourselves, but also of the way we perceive our relationship to nature. Our view is going to have to become much more about stewardship, organic in its nature. It is not about dominating nature and forcing nature to reveal her secrets. These kinds of metaphors are just all wrong.

Sarah: Unhelpful?

Alex: Unhelpful, yes.

Ton: They have reached their limits.

Alex: Yes!

Herman added: One of the biggest facts of our time is that we people have a multitude of ways to end life, and on a great scale. In the history of mankind, we have never had so many methods available to us. We have atomic bombs, biological weapons, but also to just keep on living the way we are. But I think the most logical interpretation of the purpose of life is to make the best of it, to pass it on as best we can. Maybe there will be a global disaster with a meteorite, similar to what happened with the dinosaurs that opens up new avenues for life. It is possible. But until it does, it

35 This statement also predates Trump winning the 2016 US presidential election.

is our job³⁶ to make something of it, the way people usually want to with their own lives. That is why I am so invested in sustainability.

Herma: It is urgent, too, if we want to continue in this form. At the same time, there are films of life being born on the South Pole in deep groves under the sea, forms of life that have been dormant there for millions of years, they are beginning to appear. They will stay there until the earth changes so much that they get their chance to develop.

Herman: One possibility is to resign ourselves to what is happening. If we keep this up, it will be a journey to the end of the road. But on the other hand, we have acquired all the insight, all the knowledge and all the technology we need to live decently. What is necessary now is that a critical mass of people becomes aware. For that, we need to provide information. We need to offer enticements. There are all sorts of ways. People who are in a position to need to set a good example, to make the change necessary. Take energy, for example: the way the energy market currently is means that in large parts of the world, solar energy is actually the cheapest form available. Yet it is hardly used, because people are not aware and it is in the interest of gas companies not to inform them. And it continues! In terms of resources, in thirty to forty years' time, we should find ourselves in a situation where we have a surplus of energy available. If we have a surplus we can then apply it to other purposes, such as desalinating seawater. That water could then be used to irrigate deserts, which will in turn boost the available biomass. That way we can provide not only more food but also materials for making new products, chemically etc. In short, the field that is opening up is full of opportunities!

Ever since the Enlightenment, we have developed a very linear approach. We think linearly, we organise our society linearly. But in fact, reality is made up of circular processes! So, we are

36 In Dutch, Herman said *opdracht*. A (perhaps unintended) reference to the bibliography Jan Smit wrote about Herman's life that carries the same title. It translates as 'The calling, or the many faces of Herman Wijffels'.

intervening in a circular world using linear processes. That was alright when there were so few people on earth that the planet was essentially an infinite source for them. But that is no longer the case. So, our job is to transform ourselves from the linear creatures that we have become, to change our ways so that they fit in the circular nature of our environment again. And that basically applies to all areas. So, healthcare needs to do what the term suggests: take care of our health, instead of intervene once it has gone wrong. Healthcare as we know it is heavily biased towards curing, not preventing. Of the 90 billion Euros we spend on healthcare annually in the Netherlands, 86 billion goes to curative interventions. So, that is how I view the world. We had a good model that worked well for a while, but now it doesn't fit anymore. We are ready for the next release in the process of civilisation that makes up the history of humankind.

In conclusion, in the dialogues that make up this book, all participants shared the view that it is time to reinvent our scientific paradigm, so that there is no longer a gap between 'us' and 'nature', or between 'us' and 'them'. Our new paradigm will need to address why it is *like* something to be us, to be conscious. It should be less mechanistic and more organic, and, as we have seen, the people in this book share the intuition that developments in physics may provide part of the basis for it. In the remainder of this book, the contributors speculate what form this paradigm might take. However, first we need to reflect on language. One of the most difficult aspects of writing this book – and of having these dialogues – was finding common terminology. Too often the participants spent a lot of time explaining what they were trying to say, using the same terms for different ideas or different terms to express the same idea. The next chapter addresses this problem, and discusses the approach taken to deal with it.

