

Good evening,

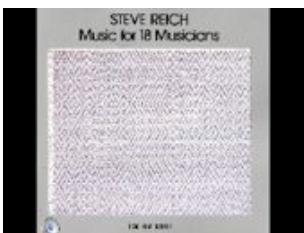
I would like to invite you to come with me on a journey through space and the soul.

I would like to share with you some new insights from neuroscience, the science that investigates the human brain and mind. These new insights may sometimes seem trivial, sometimes esoteric, but in fact they are truly provocative and they should reshape the way we look at the world and at ourselves.

But let's start with a beginning.

This is a beginning.

Doorbell



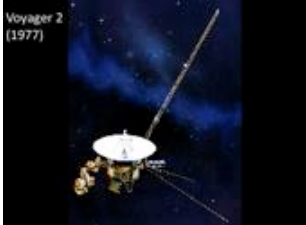
These very familiar sounds, these four notes taken from the Big Ben Bell melody, although they are senseless in themselves, are very appealing and carry lots of meaning. They create expectations for something interesting to come; they are a prelude in every meaning of the word. A very similar sequence of notes was used by Steve Reich in his masterpiece Music for 18 musicians. As there is a lot of repetition in this piece, the musicians need a clue that announces the next variation. This clue is provided in four notes played on a vibraphone. The melody and the sound bring the doorbell tune in mind, and also the meaning and the feeling of expectation. I don't know if Steve Reich did this consciously.

A very intense example of the strong expectational quality of these four notes is this.

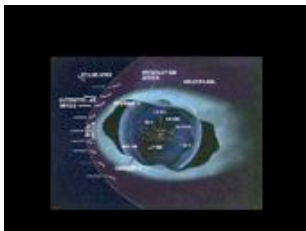


One of the voyages of the Starship Enterprise takes Captain Kirk to a strange, destructive space entity called V'Ger. In this movie clip, we will discover what V'Ger stands for.

V'Ger is revealed to be Voyager 6, a space probe launched back in the 20th century. Voyager 6 has never existed.



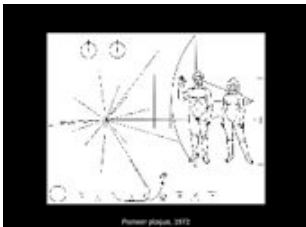
In the 20th Century, only Voyager 1 and 2 were launched into space, namely in 1977. Thirty-four years after their launch, these two probes are still in working condition. They are now billions of kilometres away from earth and they have left the solar system.



But let's go back to Star Trek. On V'Ger's metal plaque that is cleaned by Captain Kirk we can see a familiar engraving on the left hand side. It is a depiction of the location of the sun that is identical to the one that was attached to Voyager 1 and 2, and to the space probes Pioneer 10 and 11, launched in 1972.



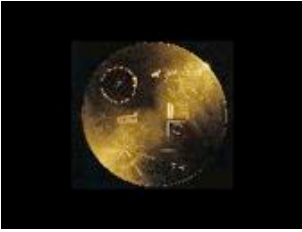
These plaques were specifically designed to inform intelligent aliens about earth and humans. Let's take a look at the plaque that is attached to the Pioneer probes.



Some of the depictions are very self-evident; others are more difficult to read. We immediately recognize the naked man and woman. As you may know, at the time, the nudity of the man and the woman were the subject of debate. Some thought it was immoral to show nudity to aliens, some thought aliens would not recognize humans as most people wear clothes. It is significant that the man waves his hand. This comes as a very meaningful gesture to us, but it is completely impossible that an alien would have the faintest idea that this means something, let alone what it would mean. Behind the man and the woman, we recognize a schematic drawing of the Pioneer probe, indicating its size as compared to the humans. Below, we recognize the probe, with an arrow indicating the planet that it was launched from. Arrows are handy tools but how could an alien understand its meaning? The arrow symbol comes from the arrows that we used to attack animals and each other. Arrows have to do with intelligence and physical agility, but also with aggression, typically human characteristics. So all of this is too much from our own perspective to be understood by aliens. For the smart aliens, there is a schematic representation of Hydrogen. On the left hand side, the star-like diagram that is also on V'Ger, defines the location of the sun in relation to 14 pulsars, whose pulse frequency is expressed in binary code. But Voyager had more to offer than Pioneer: it had the Golden Record.



Here we see it attached to the exterior of the space probe.



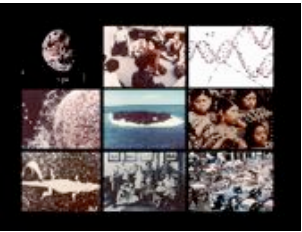
On the sleeve of the record we recognize the star and the Hydrogen diagrams once more. But what could be the meaning of the concentric circles and the line below it? Can you guess it? It's not the solar system or the atomic structure. It's just a drawing to show the aliens how they should put the needle on the record.



The Golden Record itself is a gold plated 12' phonographic disk with selected sounds and images from the earth. As you can see, it's already a little bit scratchy. The sounds on the disk are a mix of greetings to the extraterrestrials in all kinds of languages, the sounds of rain, whales, cars, and music from Peru over Azerbaijan to Bach and Blind Willie Johnson.



Playlist



The images on the record show scientific diagrams and photographs from all over the world. The images have the typical look of '70s propaganda magazines from important countries, like the United States and the Soviet Union.



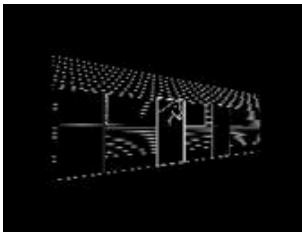
A typical image for this type of magazines is a black woman looking through a microscope.

To me, all of this is very meaningful and very moving, especially the music, which is a truly beautiful selection I think. The images look more dated, but as I was a teenager in the 70s, a lot of memories come back to me as I look at them. So actually the real meaningfulness of the Golden Record is quite personal. Possibly you feel different about it. So how could we ever have the faintest idea of how an alien would understand this? Now we're talking about the more subjective, emotional aspects of this series of sounds and images, we assume it is logical that aliens would find this more difficult to grasp. But the misunderstanding goes much further. I would like to focus on image No. 72.

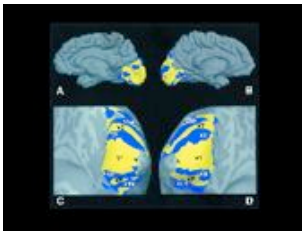


It shows 4 sprinters at the Olympic games. They are running, so one of their legs is hidden. We see this because we know this.

There is no way of knowing this by just looking at this picture. To a naïve eye, these men have one long and one short leg. But the reading of images isn't only a problem for aliens.



Some people with autism for instance, have difficulty imagining the invisible body of the horse that sticks its head through the stable door. So we see what we know. We project our own concepts, our own prototypes, onto the visual information that reaches our eyes. What is seeing anyway? It has something to do with light, the eyes and the brain.



The visual system of the brain happens to be one of the best-known brain areas.



In the visual cortex in the back of the brain, area V1 is actually a direct projection of the image that reaches our eyes. This image is extremely shaky and fragmentary as our eyes move all the time. The other areas surrounding area V1 are modules that independently process specific aspects of vision like colour, form, motion, distance, angles and so on. Here you see how movement is processed separately from a more detailed analysis of the objects in the visual field.

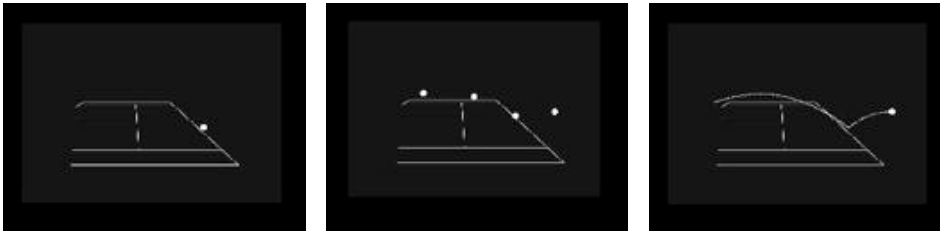
So it is assumed that somewhere a composite image is constructed out of this fragmented information. A lot of visual interpretation takes place before we even see anything. Purely visually speaking, we both see more than we think we see and less than we think. An example of seeing more than we think is the phenomenon of blindsight.



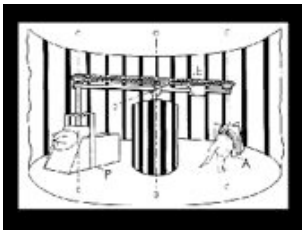
This man is blind after a stroke destroyed part of his visual cortex. He doesn't consciously see anything, but he can manage to walk and avoid obstacles. So he is seeing but doesn't know that he is seeing. This man sees more than he thinks he sees, as we all probably do.

But we also see less than we know. A simple example is tennis. We think we can clearly see whether a tennis ball is in or out. But it is actually impossible to see this as the time interval of touching the ground is much too short for us to perceive. But we clearly see the ball touching the ground at a specific location. So

what we think we see is only a construction based on a calculation of the ball's trajectory.



But seeing is not only the processing of visual information, it is also understanding what we see. This is something we have to learn as a child and when we miss that crucial opportunity, we can never properly understand visual information. This has to do with our bodies. It's a very much-underestimated fact that everything we perceive, think, do, is essentially embodied. Everything that happens in our heads also happens in a body that actively moves through the world. The fantasy that intelligence, cognition and all of the higher mental functions could also be achieved in an isolated brain has to be radically abandoned.

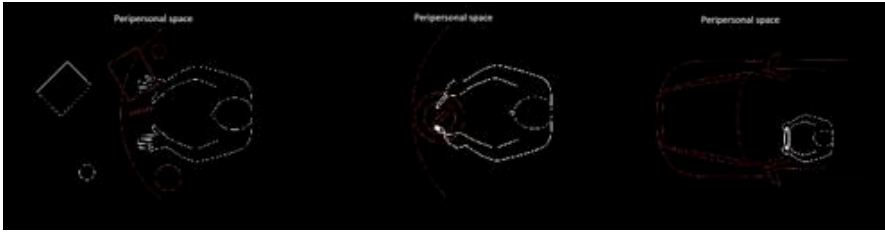


In a cruel and classic experiment from the 60s, two kittens were attached to a carousel, and one kitten could actively move while the other one only passively. They both received the same information about the outside world, but the passive kitten did not develop a normal visual system. It had never learned to connect its own movements with movements in the visual field.

But animals and people don't just move through the world, they do so with an intention, always. We are seekers and predators, all the time. Unconsciously, when objects enter our visual field, we conceptualize what we could do with them.



This kind of scene, where objects in the visual field are tagged as interesting or dangerous have become a cliché in science fiction movies and video games. In reality, our way of perceiving the world is not very different from this. The one big difference is: nobody is watching the tags and digits on the screen; this would be illogical. We have different body maps in our brains, some indicating our own body parts, some indicating our immediate perimeter. This means for instance that, when we sit down at a table, just like the Terminator, we immediately spot the objects that are within the reach of our hands like this glass of water. We do not only see it, we have an idea of how it would feel, of how our fingers should bend to take it, we even make a guess of its weight. This peripersonal space is normally defined by what is an arm's length away, but it can be extended.



When we eat with knife and fork, we have almost tactile contact with the food through these

metallic extensions. And when we drive our own car, our peripersonal space is extended to great precision to the body of the car.



But of course we do not only see static things, we also see moving objects and we have a very sharp eye for the difference between objects that move actively, like animals, people, birds, cars, and objects that move passively, like a tennis ball, like leaves in the wind, like water flowing. In other words, we easily spot the difference between entities that have a brain and entities that don't. Indeed, plants don't move actively, and for

this reason they don't need a brain. Actually, this difference between moving actively and passively is the difference between animate and inanimate, between having a soul and not having a soul.

Anyway, when we see a moving entity, we try to calculate its motion if it's inanimate, or we try to predict its behaviour, if it's animate, in other words, we try to guess its intentions.



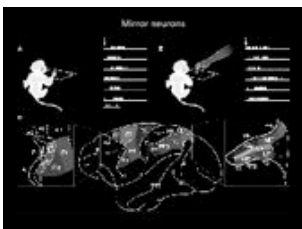
Only very rarely, the distinction between passive and voluntary movement, between animate and inanimate is not so clear, and this is usually very puzzling. It can give rise to fascination and the wildest of speculations, as in this scene from "American Beauty".

Of course, this scene is meant to be poetic and emotional, but it can also be read as an attempt to empathise with a plastic bag. Empathising, interpreting intentions: this is where the mirror neurons come in.



The existence of mirror neurons is a fabulous, thought-provoking discovery, with far-reaching implications. They were discovered by chance in 1992 by Giacomo Rizzolatti, in monkeys.

The Italian researcher was measuring brain activity in a monkey to see what brain areas were active when the monkey was grasping something.



But while the monkey was still wired up, an assistant came in and grabbed something. A specific area of the monkey brain reacted in the same way as when the monkey would have

grabbed the object itself. This is shocking, and very probably these mirror neurons exist in humans as well. It means that some areas of the brain are active when we do something and when we observe someone else doing the same thing. And it is not just about the action itself, it is also about the intention of the action. So when I move an apple from here to there, a zone is activated in my brain, but as you see me doing it, it will activate that same zone in your brain at this very moment. And when I move it to my mouth, another activation takes place in your brain as you guess my intention. Mirror neurons do not only mirror action in the brain of the observer, but also tactile feeling. When we see someone being touched on her arm, a zone is activated that is activated when we are touched in the same place ourselves. When I explained this to one of the artists here, he immediately associated this with the effect of watching pornography. Of course I had never thought about that. But this empathic touching goes even further than that: we would be persuaded that our own arm is touched if our arm didn't tell us that it wasn't touched, like in people who don't feel anything in their arm. So, to summarize, unconsciously, our brain mimics the actions, intentions and feelings of living, moving beings around us.



This is mind-boggling and as I said, the implications are enormous. Mirror neurons in humans are still a bit mysterious for the simple reason that it is unethical to wire up a person as they do with monkeys. But in the mean time, mirror neurons have speculatively been implied in empathy, in language, in the development of human culture and civilization. This is because the mirror neuron system is not only assumed to help us *understand* the actions, intentions and feelings of others, but also to *imitate* them. So mirror neurons probably play an important role in learning, allowing humans to acquire skills much faster than for instance evolution would produce. So we could continue talking and hypothesizing about mirror neurons for a long time, but in my story about vision, they are just one of the elements that define the way we see the world. So when we look around, we are not only unconsciously defining our peripersonal space, tagging objects of interest, identifying moving beings, but you could say that we are impersonating these beings in a little theatre in our heads.

But it goes even further. A few minutes ago, I used the word guessing a few times. In fact, what we see is not so much what there is to see, but what we expect to see. Or more precisely, what we don't expect to see. The brain can be viewed in many ways, but it can among others be viewed as a prediction machine. It uses all of its knowledge, experience, and sensory input to predict what is going to happen next and to already prepare the way we are going to react. And it is especially the things that we don't expect that catch our attention. Unexpected events or objects receive the quality of meaningfulness. This is called salience, meaning what catches the eye, and it is a very delicate tool. It needs to be fine-tuned: when it's tuned too low, you are indifferent to everything; when it's tuned too high, everything becomes meaningful. The world becomes a place where everything has a meaning, an intention. This can end up in

psychosis, but also in a work of art, or even in a mystic experience where you feel there is an intention in the universe and that the soul and the universe are deeply connected.

So to summarize, what we see is a very illusory virtual reconstruction consisting of tagged objects of interest, projected concepts, extrapolations, interpretations of intentions and predictions, only loosely related to an outside reality that we can never know.



In the fascinating movie “The Man with the X-Ray Eyes”, a doctor has experimented with his own eyes, so that he sees through everything. At first, he only sees through clothes, which he finds nice and funny.



But later on, he also sees through skin and bones, an ability he exploits in some shadowy medical consultations and it gets more depressing.

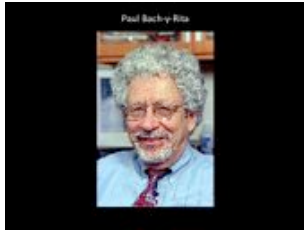
But you may not agree with this grim view on vision. You may say: when I see the colour blue, this is a visual experience that is conscious, subjective, sharp. Seeing the colour blue has a specific quality that can't be substituted or fully explained by some brain mechanisms, it is something that happens in the mind, something that exceeds the brain, something that is transcendent.



There is this philosophical fairy tale about Mary the Colour Scientist. Mary is a scientist who knows everything about colours, from light to optics to the eyes and the visual system in the brain. But she lives in a world where there is no colour. So the question is: what would Mary the colour scientist experience when she saw a colour? Would she see something very familiar or would she experience a quality that is of a completely different category than all her knowledge about colours? It is tempting to say: yes, seeing a colour is very different from knowing everything about it. Seeing a colour is a subjective experience by a person that is very different than the analysis of wavelengths of light.

This makes sense, but on the other hand... It could be argued that what we call seeing is not even something visual. We think it is visual, that it has to do with light reflections on objects that we can perceive. But maybe what we experience as a visual experience is not strictly visual or even optical. As the man with blind sight demonstrated, you can have a visual perception without consciously having a visual experience. And the

opposite is true as well: you can have a visual experience without seeing. We do it all the time when we dream. But it goes even further.



The late American neuroscientist Paul Bach-y-Rita invented a way to see with the skin.



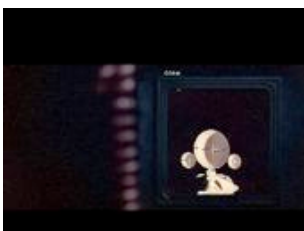
It works like this: a camera is attached to your head and the image is transformed into tactile signals that you can sense on your skin as a little push. So you attach the array with tiny vibrators that the man is holding in his left hand to your belly or your back or even your finger or your tongue, and this is the kind of image you get on your skin.

Now, although the skin is strictly a two-dimensional sensory organ, although XXX, within hours, blindfolded people who try this, have a visual experience. They are even able to walk around, pick up objects and catch a ball. So it seems that a visual experience has less to do with light than with the recognition of shapes in a three-dimensional space. So seeing is not what we think it is.

So there is no light in the brain, everything we experience is a 3-d construction. We have no direct contact at all with the world, we get only vague and volatile impressions and lots of self-devised shadows. We live in complete darkness.



We are like the prisoners in Plato's allegory of the cave. Plato thought that the material world we live in is just a shadow of the world of Ideas. We could re-actualise this idea by stating that what we experience is only a shadow of the material world. This shadow is projected like a movie in our minds, like the shadows on the wall of the cave, that bear much resemblance to a movie projection. And the world of ideas could be seen as the concepts we have in our minds to understand what we perceive. But we live in complete darkness.



We are fallen astronauts, lost in space.

But at least we have ourselves, don't we? We don't. We are as much an illusion to ourselves as the world is an illusion to us. The experience to be someone, to feel like an autonomous individual actively exploring the world, subjectively perceiving things, making decisions, being conscious, is very much a construction as well.

A few examples. The sense of being ourselves, of being in our own body, is very volatile. Maybe you will not believe this, but people can easily be fooled to be in another body.

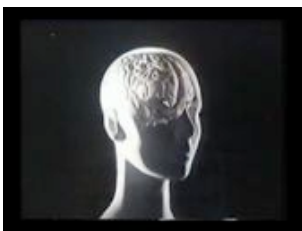


This woman wears glasses connected to a camera that films her from the back. So she sees her own back in front of her. Her back is then stroked, which she sees in front of her. After only one minute of stroking, she will have the impression that her back and her whole body are not where she stands, but in front of her. In the same way, people can be made to believe completely illogical things like shaking hands with oneself.



Conscious decision-making is also something very illusory. It can be shown that many decisions we think we make are for instance made before we make them, or even not made at all.

In one experiment, you are told to bet on two card decks. But one card deck turns out to be bad, let's say the red card deck. If you bet on these cards, you lose money. It takes a while for you to realise that these cards are bad. But quite some time before you consciously realise that the red cards are bad, your body starts to show signs of nervousity, and you are already avoiding to bet on the bad cards. So you have unconsciously noticed this and you have unconsciously made a decision before you get the illusion of making a decision.



Another example is people with a split brain. The two halves of their brain are split because they were born that way or because they had an accident or an operation. This implies that they can't consciously see and explain what they see with their left eye, as the visual information goes to their right hemisphere, that is disconnected from the left hemisphere, which they need to speak. So if you blindfold the right eye of such a person and show him an instruction on a piece of paper, like "pick up the glass", he will pick up the glass. But actually he doesn't know he has read the instruction, so he doesn't know why he is doing this. This is already a very strange situation. But it gets even stranger. If you ask why he is picking up the glass, he will make up a reason, he will tell you for instance that he was thirsty. In the same way, we think that we stop before a

red traffic light because we have to due to traffic regulations, but the decision to stop is automatic and has been made long before we think we make it.

What does this mean? That many things happen in our brains unconsciously and automatically. This is nothing new of course. But the conscious part of our brain just seems to be an illusory instance that makes up stories about why we do things. Some narrative that explains what we're doing, that provides some coherence to what we do, or say, or feel. The feeling of "self" is a construction, an illusion that the German philosopher Thomas Metzinger calls the "Ego Tunnel".

So the part of the proverbial iceberg that sticks out of the water is actually in the water as well, it only thinks it is different.

So we don't have any direct contact with the world and we don't have any direct contact with ourselves. We are dark, deaf and blind automatons that are lost in space without a clue. And every morning, when I wake up, this illusion, this reality machine boots up, giving me the impression that there is an outside world, that is a whole, and that there is me, that is also a whole and that is apart from the world.



In this clip from Robocop, we witness the awakening of the Robocop, the man-machine. There is a discussion about his arm, whether they're going to amputate it or keep it. It is eventually replaced by a robotic arm, which is at first separate from his body, but it works nevertheless. Is the arm part of Robocop's body or is it part of the world? This has nothing to do with the disconnection of the arm, but with the illusion that Robocop will generate that the arm is part of his body and apart from the world. Actually, two things happen when Robocop wakes up: the world appears and it appears to Robocop. So these two things are intimately connected: the illusion of a world and the illusion of a self, apart from the world. This appears to be the best hypothesis the brain can make up to explain whatever happens in the brain.



You may find this a very depressing, pessimistic, dark, nihilistic, grim view of the world and ourselves and it is. When you see the world this way you may end up like the Man with the X-Ray Eyes in this last part of the movie. The fallen doctor has further developed his visual skills and he can now see through everything, up to the centre of the universe.

But you could also look at these scientific facts in another way. I have been arguing that we are much less connected with the world than we think we are, as we are imprisoned in some kind of virtual reality. But at the same time, we are much more connected with the world than we think. As I explained, we are full of unconscious, automatic tools that help us perceive the world and especially each other, as humans are profoundly social. When we observe the inanimate world, we unconsciously conceptualise its structure and mechanics. When we watch each other, we unconsciously empathise; we are

influenced and inspired by each other, even if we dislike each other. We impersonate and we imitate each other. We mirror the world and each other in our minds, making our mind a theatre with actors and props and a scenario. In my theatre piece, for some reason I am the principal actor, but it could as well be someone else. The distinction between myself and the world is indeed an illusion as well. But for some practical reasons I prefer to keep the impression that I am separate from the world. Everything I am saying and doing is in reality a collection of imitations of other people but I perceive it as mine.

All this means that our minds are much bigger than our brains. I know this may sound trivial and esoteric, but it isn't. I guess we could even use the word soul here, as this word indicates something that is separate from the material body. Our souls contain a whole universe, they constantly feed on everything and everyone they encounter. There is only a thin line between the outside and the inside, between what other people think, feel and do and what we think, feel and do ourselves. For a large part, this soul is something collective. So when we wake up in the morning, we are immediately part of something much bigger, that is only artificially separated from ourselves.

This means that the message from the Voyager space probes is not so much a message to the aliens, as a message to ourselves. Somehow, the images and sounds from the Golden Record represent the collective soul of all the people that were alive in 1977.

I will end as I started, with music. I made a collage of the 31 sound recordings and the 116 images on the Golden Record to make the connection with the soul through space.

Erik Thys

