Duch, Włodzisław / Nowakowski, Przemysław / Wachowski, Witold

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What would the robots play?

Interviev with J. Kevin O'Regan

Włodzisław Duch, Przemysław Nowakowski, Witold Wachowski

Avant: What did you use to play as a child?

J. Kevin O'Regan: When I was about 10 years old I was obsessed with the idea of building a machine that could think. It was 1958 and computers only were starting to exist. I found a kit that allowed you to construct an electrical device that could play tic-tac-toe and solve various problems in boolean logic. I also fiddled around with electronics. I once made a microwave transmitter and left it overnight to see if it would cook a sausage. The sausage wasn't even slightly warm in the morning. I also had an artistic bent: an art gallery showed an exhibit with mobiles that I had constructed out of balsa wood and sheet metal.

What role does the imagination play in scientific work? Would there be any kind of special scientific imagination needed?

In my own work, it is less imagination, but *intuition* that played a role. What I mean is that when I think about things, I have a vague feeling that there is a relation between one thing and another, without being able at first to say precisely what the relation is. I enjoy making such relations. I expect what distinguishes scientific imagination from other forms is precisely that to be useful scientifically, the relation between things has to be more than merely arbitrary association. There has to be some kind of mechanistic link.

You have worked both with philosophers and scientists. To what extent did you have different opinions on the discussed problems?

Philosophers have helped me a lot in making my thoughts more precise. But they have also irritated me a lot, because they are not interested in explaining physical phenomena, but in *forms of argument*. So they can get waylaid in detours of thought which are interesting to them, but which don't help solve scientific problems. Surprisingly, scientists on the other hand are often also not interested in truth. Scientists are interested in pursuing a paradigm that other scientists have set out. They will just tend to grind out more experiments in the same direction as their colleagues. They like talking about their results and fiddling with their apparatus, but often they don't care if the concepts that they use in their paradigms really make sense. Examples in cognitive science are the concepts of "representation", "attention", "mirror neuron".

"The world as an outside memory" – how could it be elementarily and clearly explained to the greatest skeptics (in regard to, for example, the change blindness)?

All of us have the impression of seeing everything laid out before us in infinite detail. But, logically, this impression of detail does not require the detail to be represented inside the brain. It suffices for the detail to be immediately available on demand, whenever we (even unconsciously) ask ourselves about it. It is like the light in the refrigerator: we get the impression that it is continually turned on, because whenever we open the refrigerator to look, the light is on.

It could therefore be that in visual perception the outside world acts in a way that is similar to the refrigerator light: it is immediately available on demand. Thus, the outside world acts like an immediately accessible memory. Whenever you need information, it is available by the slightest flick of the eye or of attention.

It is an empirical question whether the human brain operates in this way. Change blindness supports the idea, although it does not prove it conclusively.

Do you agree, at least to some point, that "what you see is what you need" (the title of the article by J. Triesch, D. Ballard, M. Hayhoe, and B. Sullivan[2])?

Yes absolutely. The idea is very similar to the idea of the "world as an outside memory". Ballard, Hayhoe and their collaborators have in several articles illustrated the idea in real-life tasks like stacking bricks. Change blindness illustrates the idea in a different kind of task, namely one of visual detection. In both cases the idea is that at any moment in our visual activity, we are only making use of a very small amount of information from the visual field. It may nevertheless be the case that information that has not been

[2] J. Triesch, D. Ballard, M. Hayhoe, and B. Sullivan. 2003. What you see is what you need. *Journal of Vision*, 3/2003: 86-94.

attended is stored in the brain, and may unconsciously influence future behavior. But if we mean by "what you see" "what you are aware of seeing", then indeed you essentially only see what you need in the task you are doing.

Speaking of engaged and manipulative character of visual perception, does the visual consciousness itself posses the features of manipulation?

If what you mean by "visual consciousness" is the experience of visually perceiving, then I think the answer is yes. I think all perceptual experiences consist in particular modes of interaction with the environment. In these interactions, we use our sensory systems as tools to explore and examine the environment in a potentially active way. What is usually meant by saying one is "visually conscious" of something, is the fact that at a given moment, one is in the process of using one's visual apparatus to gain information about the world. Thus visual experience is by definition a manipulative process.

Researches on sensorimotor account usually focus on touch and vision. Are there studies on other modalities like smell or audition in the field of interest here? How there can be a problem of multisensory integration treated in sensorimotor account?

The sensorimotor approach has not yet been extensively applied to these other sensory modalities, unfortunately, but it would be very interesting to do so. I think the fact that action plays a progressively less determining role in hearing, taste, and smell, explains why these sense modalities have a more "interior" quality than vision and touch. As concerns multisensory integration, the sensorimotor account takes this to necessarily be at the basis of all senses. Take for example the feeling of touch on your arm. How do you know it is on your arm, not on your foot? The sensorimotor account explains this in terms of the fact that if you move your arm, but not your foot, there will be a change in the stimulation. If you look at your arm, but not if you look at your foot, there will be a temporal correlation between the incoming visual and tactile stimulation. If you are feeling a touch on your arm, you may hear a correlated sound in the direction of your arm, but not in the direction of your foot. So *what is meant* by the location of a touch is by definition a set of multisensory correlations. Under the sensorimotor account, the notion of multisensory *integration* make no sense, because sensation is by essence multisensory to begin with.

Does sensorimotor account offer – or perhaps may offer in the future – a frame for the relation between gestures and language?

I must say I have no thoughts on this. For me, the sensorimotor account is about the very basic nature of sensory experience: the redness of red, the sound of a tone, the

hurt of a pain. It does not address questions of semantic content as transmitted by gestures and language.

It is known that you have been interested in rubber hand illusion. Have you consider sensorimotor based account for other kinds of passive tactile illusions, like *tactile rabbit* or illusions caused by muscles' vibrations?

The rubber hand illusion is a phenomenon to be expected from the sensorimotor account, because as explained above, according to this account, touch sensation is inherently multisensory and correlational, and so should be affected by systematic correlations introduced in the rubber hand illusion. On the other hand, the effect of muscle vibration is a low-level physiological phenomenon operating by physically affecting the responses of stretch receptors. Explaining the accompanying illusions of limb extension does not require appeal to the sensorimotor account. The cutaneous rabbit is an interesting phenomenon that can presumably be explained by the fact that the brain has prior expectations for tactile stimulations displace relatively slowly over the skin. Again, I don't think the sensorimotor approach adds anything to such an explanation.

One of the commonly observed consequence of sensory deprivation is generation of stimuli in the frame of hallucinations. How can this phenomenon be explained by sensorimotor account?

How do you know that at this moment you are really seeing something? You know you are seeing, when you know that if you move your eyes, blink, or move your hands in front of your eyes, this will immediately cause correlated changes in your visual input. More generally, you can distinguish real perceptions from hallucinations by the fact that your voluntary *actions* have a systematic effect. In sensory deprivation, your actions no longer have an effect on sensory input. Changes in sensory input deriving from outside reality can no longer be distinguished from random variations in brain activity, and you continually hallucinate.

What do you think about the last book by Schwitzgebel, "Perplexities of consciousness"[3]? Do you share the author's view about a difficulty in describing one's own internal experience?

Absolutely. I think Schwitzgebel's book is brilliant. Just as my own work shows that we think we see better than we do, Schwitzgebel goes even further and says we think we think better than we do!

[3] E. Schwitzgebel. 2011. *Perplexities of consciousness (Life and Mind: Philosophical Issues in Biology and Psychology).* MIT Press.

In short: can brain-like computing lead to conscious systems? What kind of artificial systems could claim to be conscious and to experience qualia?

In my book coming out with OUP (*Why red doesn't sound like a bell*)[4] I suggest that consciousness is not an all-or-none thing. Like "Life", it is just a word that can be applied to describe the way certain systems interact with their environment. Like "Life", consciousness is not some kind of vital essence generated by brains. It is just a way of talking about certain abilities we have. As such, newborn babies have less of them than adults, dogs have less of them than newborn babies (perhaps), and flies have even less than dogs. But there is nothing special that has to be built into robots or artificial agents in order to be conscious. Once we get artificial agents that can think about their own states, interact with their environments and have social interactions, then we will start saying (and they will start saying!) that they are conscious.

Can studying aesthetic experience contribute in any significant way to our knowledge of cognition and consciousness?

Because aesthetic experience is somewhat mysterious, some people think that understanding it might help in understanding something else that seems mysterious, namely consciousness. But under my view neither consciousness nor aesthetic experience, nor for that matter creativity, empathy, morality, compassion, etc. are unique to humans. Humans are just too stupidly egoistic and racist about other agents, robots in particular, to conceive that beings other than themselves might share these supposedly sophisticated capacities. I think humans in the next fifty years should prepare for a severe lesson in humility. Soon there will be artificial beings with higher intelligence, higher sensibility, higher moral standards, higher creativity, than humans have! But to answer your question: no, I don't think that studying one mysterious thing is necessarily going to help in understanding another mysterious thing, just because the two are both mysterious!

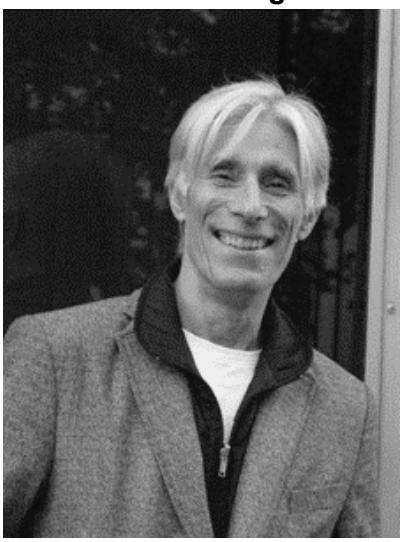
How do you feel about your scientific path from your famous article "A sensorimotor account of vision..."[5] up to now? How do you see your book in this context?

The article was about vision and visual consciousness, and at the time we wrote it with Alva Noë, I had not yet realized that the same approach used in the article could also help understand the more general problem of phenomenal consciousness. In the years

[4] J. K. O'Regan. 2011. *Why Red Doesn't Sound Like a Bell: Understanding the feel of consciousness*. Oxford University Press.

[5] J. K. O'Regan and A. Noë. 2001. A sensorimotor account of vision and visual consciousness. *Behavioral and Brain Sciences*, 24: 939-1031.

J. Kevin O'Regan



(J.K.O'R. archives)

following the article I gradually realized this. So in the 15 years it took me to write my book, it progressively oriented more and more away from vision and towards consciousness. To do this I refined the approach in several ways: I better distinguished between perception in general and the most basic or "raw" forms of feel. I better explained the role of action in the theory, which was overemphasized in the BBS[6] paper. I developed much further the concepts of richness, grabbiness, bodiliness and insubordinateness in order to explain why sensory experiences feel like something rather than feeling like nothing, that is, why they have sensory "presence". Finally I thought a lot about access consciousness and cognitive access, and how these extend the theory so as to explain conscious experience in general. All these points are what distinguish my current work from Alva Noë's. What I want to do now is get some brilliant collaborators to develop the theory. In particular, we need to find a link to neurophysiology, which I have totally neglected up to now. And there are lots of avenues of empirical research that are open: in color vision, in pain research, in robotic sensor calibration, in sensory substitution.

How would the robots play?

Lovingly!

[6] *Behavioral And Brain Sciences*.