Semaine européenne Athens de ParisTech 2014
AGROPT21 -- Neurones : des modèles à la conscience

WHY RED LOOKS RED RATHER THAN SOUNDING LIKE A BELL. A SENSORIMOTOR APPROACH TO THE PROBLEM OF « QUALIA »

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Arnold Schwarzenegger
as “Terminator”

At the end of the film the Terminator, Arnold Schwarzenegger playing the role of a very advanced robot, falls into a bath of boiling oil. Let's ask what Terminator feels at this point about the searing heat and the fact that his arm has been pulled out...

What does Terminator feel?

cognitive component

phenomenal component

I think there is a cognitive component and a phenomenal component to what he feels. The cognitive component concerns what Terminator knows. The phenomenal component concerns what Terminator *feels* -- this component is sometimes called "phenomenal consciousness".

What does Terminator feel?

cognitive component

organism poised to make use of sensory info

phenomenal component

In the cognitive component, one thing is clearly that T's brain circuits are poised to make use of the sensory stimulation. They are taking account of the fact that the oilbath is very hot and they're making him jump and hoist himself up with the chain..

but he's not just any old robot programmed to move and protect his body, he's a last generation device, and he actually knows that he, as a robot is doing these things and why he's doing this.

What does Terminator feel?

cognitive component

poised to cognitively make use of the fact that:
organism poised to make use of sensory info

phenomenal component

so we could say that he has a kind of higher order thought about what he's doing: he's poised to .
cognitively make use of the fact that: his organism is poised to make use of the incoming sensory information.

in fact we can say more: implicit in having this higher order thought is the fact that he knows he is a robot, and that it is he who is having these higher order thoughts... so we must postulate that

What does Terminator feel?

cognitive component

self is:

poised to cognitively make use of the fact that:

organism poised to make use of sensory info

phenomenal component

He has a self, and it is this self that is

poised to cognitively make use of the fact that: his organism is poised to make use of the incoming sensory information.

(and indeed must feel rather heroic like this, saving human lives while his arm gets chopped off and his circuits burnt by the oil.)

Notice that in the film there doesnt seem to be much doubt about the fact that all this is quite feasible, judging from the way Terminator is portrayed with his superior intelligence and even his moral judgments.

And I think that this reflects the fact that today scientists and philosophers believe that this kind of stuff is

What does Terminator feel?

cognitive component

self is:

poised to cognitively make use of the fact that:

organism poised to make use of sensory info

Amenable to Science
Easy part of Consciousness

phenomenal component

actually amenable to science, it's what the philosopher Ned Block calls access consciousness, it's the easier part of the problem of consciousness.

Even the fact that we assume Terminator has a notion of self and some kind of moral code is not too shocking. Following consciousness philosopher Dan Dennett for example, we can accept that the self is an abstraction like what he calls "a narrative center of gravity" that the robot uses to reason and communicate about itself to others and to itself. Social psychologists have evidence that the self is indeed such a social construction.

So although we may be decades away from such capacities in robots, it seems not to pose a *logical* problem and it may indeed be coming soon as an application

What does Terminator feel?

cognitive component

self is:

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Amenable to Science
Easy part of Consciousness
-- soon on iphone/android !!

phenomenal component

"Feel"

for your iphone or android device....

so that's the cognitive component of what's going on. But there's another question which concerns the phenomenal component: does T feel anything at all? The intuition many people have, and it seems to be portrayed in this way in the film, is that T doesnt actually feel anything at all. And i think this is consistent with the faith that many people have that robots could never have real feels like we do.

What does Terminator feel?

cognitive component

self is:

poised to cognitively make use of the fact that:

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Amenable to Science
Easy part of Consciousness
-- soon on iphone/android !!

phenomenal component

"Feel"

"Explanatory gap"

- 1. why feels differ?
  - red / green / ring like a bell?
- 2. why feels "feel like something" ?
  - oxygen, glucose *versus* seeing, hearing

And it's consistent with scientists' claim there is a so-called "explanatory gap" between the experienced quality of feels, and any physical mechanism that could generate them.

Suppose for example we had found some special brain mechanism, say for example a complex form of oscillation or reverberation, that generated conscious feel. Then how could we further explain how this mechanism generated DIFFERENT feels. So if had found for example that some particular oscillation generated the red feel, then what is it about this oscillation that makes the feel *red* rather than *green* or like the sound of a bell? If it was the frequency of oscillation, say, then we could always ask, why should one particular frequency give *red,* and another green, and another the sound of a bell?

And then there is a second, deeper question: why do some brain mechanisms give rise to feel, and feel like something, whereas most of what happens in the brain does not give rise to feel. Consider for example the sensory processes controlling oxygen or glucose in my blood. These are complicated sensory processes, yet I dont feel them. What's special about the neural circuitry involved in visual, auditory, tactile etc. sensations that makes them feel like something rather than feeling like nothing?

((If the secret lies in oscillations, then we have to explain what's special about *oscillations* that gives feel. If the secret lies in quantum gravity effects in neuron microtubules, you have to answer why quantum gravity effects should give feel. Whatever explanation is suggested, there is always the question WHY?? what is special about that mechanism.))

Proposed Mechanisms for generating Consciousness (catalogued by D. Chalmers, 1996)

40-hertz oscillations in the cerebral cortex (Crick and Koch 1990)
Quantum coherence in microtubules
Re-entrant loops in thalamocortical systems (Edelman 1989)
Nucleus reticularis (Taylor and Alavi 1995)
Extended reticular-thalamic activation system (Newman and Baars 1993)
Anterior cingulate system (Cotterill 1994)
Neural assemblies bound by NMDA (Flohr 1995)
Temporally-extended neural activity (Libet 1994)
Backprojections to lower cortical areas (Cauller and Kulics 1991)
Neurons in extrastriate visual cortex projecting to prefrontal areas (Crick and Koch 1995)
Neural activity in area V5/MT (Tootell et al 1995)
Certain neurons in the superior temporal sulcus (Logothetis and Schall 1989)
Neuronal gestalts in an epicenter (Greenfield 1995)
Outputs of a comparator system in the hippocampus (Gray 1995)
Global workspace (Baars 1988)
Activated semantic memories (Hardcastle 1995)
High-quality representations (Farah 1994)
Selector inputs to action systems (Shallice 1988)

No wonder so many different theories of consciousness have been proposed, each more obscure than another. This is a list compiled by philosopher David Chalmers. We have examples like 40 herz oscillations, “quantum coherence in microtubules” or re-entrant loops, among many others. But surely these do no more than add further mystery to what is already mysterious.

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Feel is not amenable to Science !!?
Hard part of Consciousness

There seems to be an infinite regress of questions one could always ask. Many philosophers and scientists think therefore that there is an explanatory gap, and that logically feel is not amenable to science. This is considered the "hard" problem of consciousness.

The explanatory gap

Psycho-analysis of the hard problem!

- **purposefully maintained confusion**
- **preserves last bastion of humanity: feel!**
- **avoids admitting we are only machines**
- **anthropocentrism, human chauvinism; anti-robot racism**

Now I would like to propose a psycho-analysis of the hard problem:

I suggest that the “hard problem” is a piece of purposefully maintained confusion. Scientists, philosophers and even workers in Artificial Intelligence are unconsciously happy about the confusion about consciousness and feel.

Maintaining this confusion is a tactic that preserves the last bastion of humanity, namely feel, from robots. People think: what a catastrophe it would be if our ability to feel, to have emotions, were usurped by robots.

When people remain convinced that there is something magical about feels that makes them unique to humans, this is a form of anthropocentrism or human chauvinism people employ to avoid facing up to the horrible fact that we are mere machines, and stupid ones at that. It is a form of anti-robot racism.

The explanatory gap

Psycho-analysis of the hard problem!

- **purposefully maintained confusion**
- **preserves last bastion of humanity**
- **avoids admitting we are only machines**
- **anthropocentrism, human chauvinism; anti-robot racism**

Error of reification

Analogy with vitalism

- **"vital spirit" to explain life in biological entities**

Today we know that life is *not the kind of thing that is generated*

"Category Error" (G. Ryle, 1949)

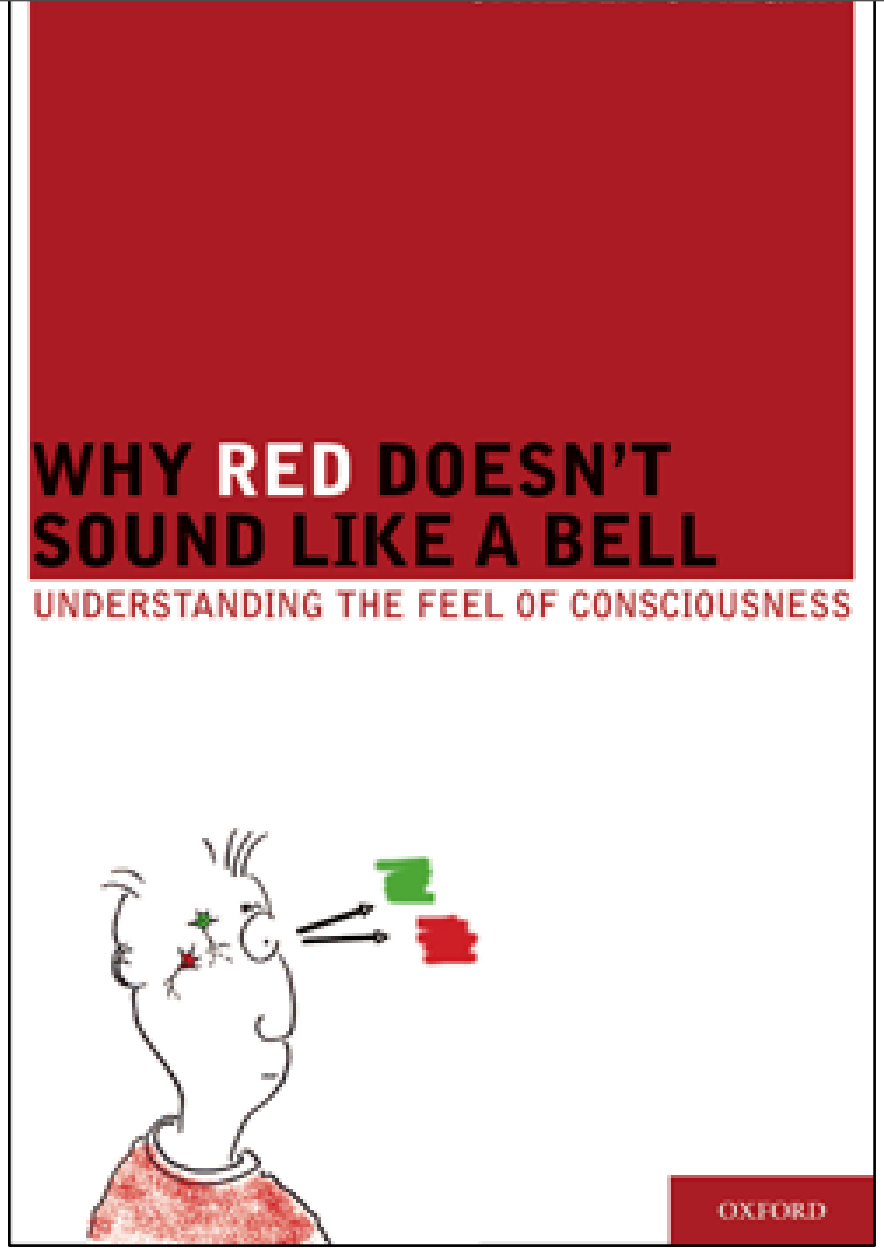
Feel and phenomenal consciousness are *not the kinds of things that*

i claim that the explanatory gap derives from thinking in a confused way about the nature of feel. It is the error of reification.

The problem of the explanatory gap is analogous to the problem of explaining the origin of life, as it was posed at the beginning of the 20th Century. Vitalists proposed the existence of an élan vital or vital spirit to explain why biological organisms were imbued with life.

But today we know that life is not the kind of thing that is generated by anything. It is a WORD that describes the way certain systems interact with their environment. Thinking that life was the kind of thing that could be generated was to make what gilbert Ryle called a category error. It was to commit the error of re-ification, that is to think that life was a thing, when in fact it is an abstraction. A way of interacting with the environment.

Many people are making the same error with respect to Feel. My view is that in fact we have to admit that Feel and phenomenal consciousness are precisely not the kind of thing that can be generated.



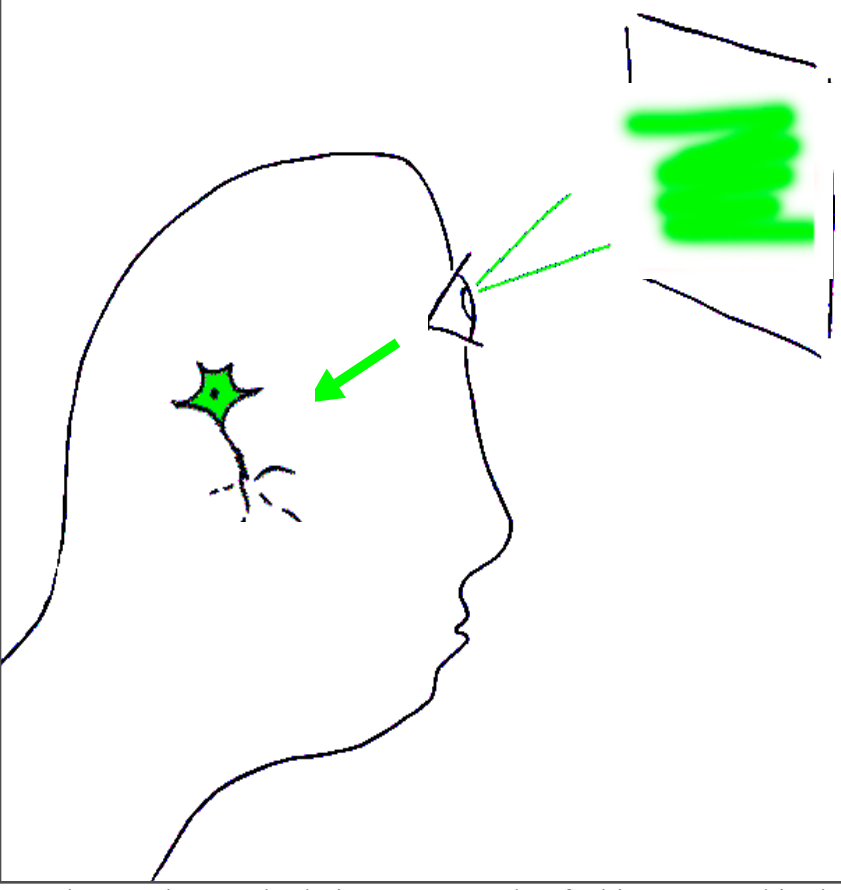
...published July 2011

http://www.kevin-oregan.net

Taking this view on feel is what I have done in my book, which has just been published with OUP.

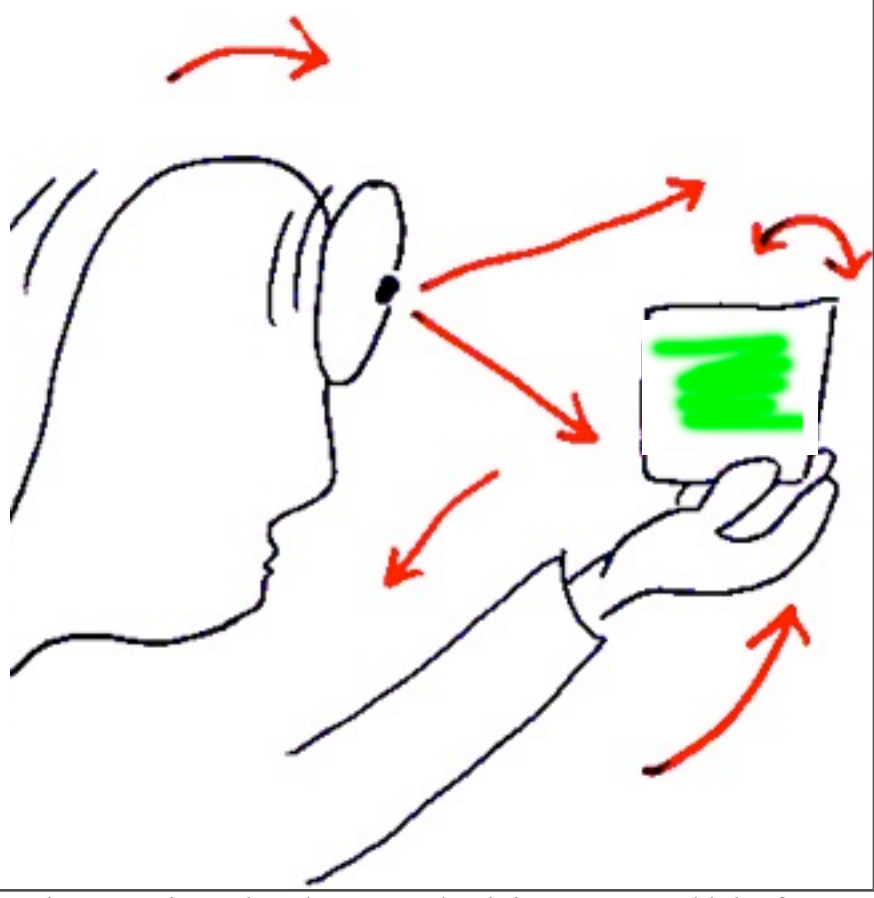
standard view

Brain creates feel



sensorimotor view

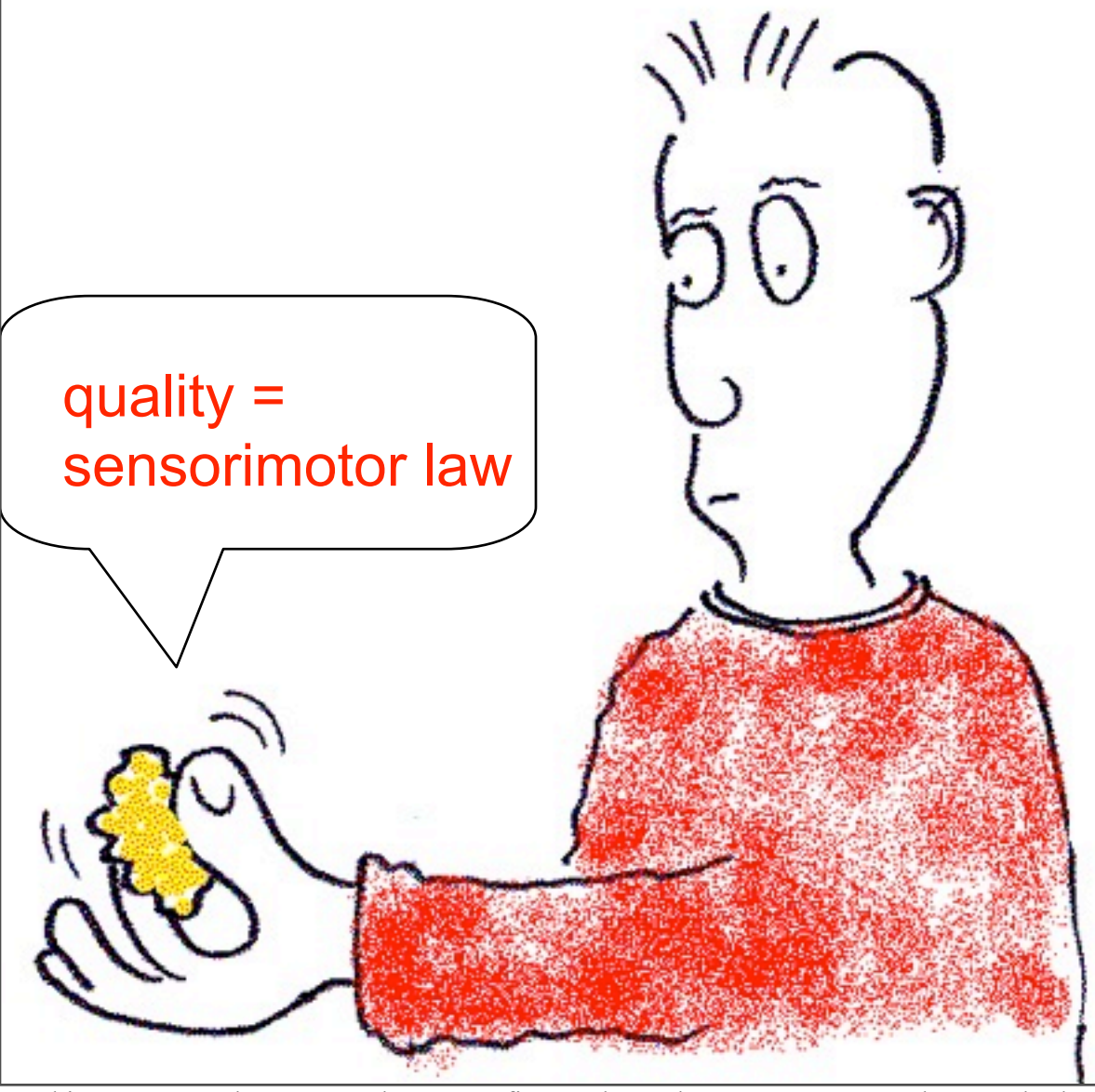
Feel is a way of interacting



Whereas the standard view assumes that feel is generated in the brain, The "sensorimotor" view takes the stance that it is an error to think of feels as being the kind of thing that is generated by some physical mechanism, and it is an error to look in the brain for something that might be generating feel.

Instead, the sensorimotor view suggests that we should think of feel in a way similar to how we think of life, namely as a *way of interacting* with the world.

Sensorimotor view

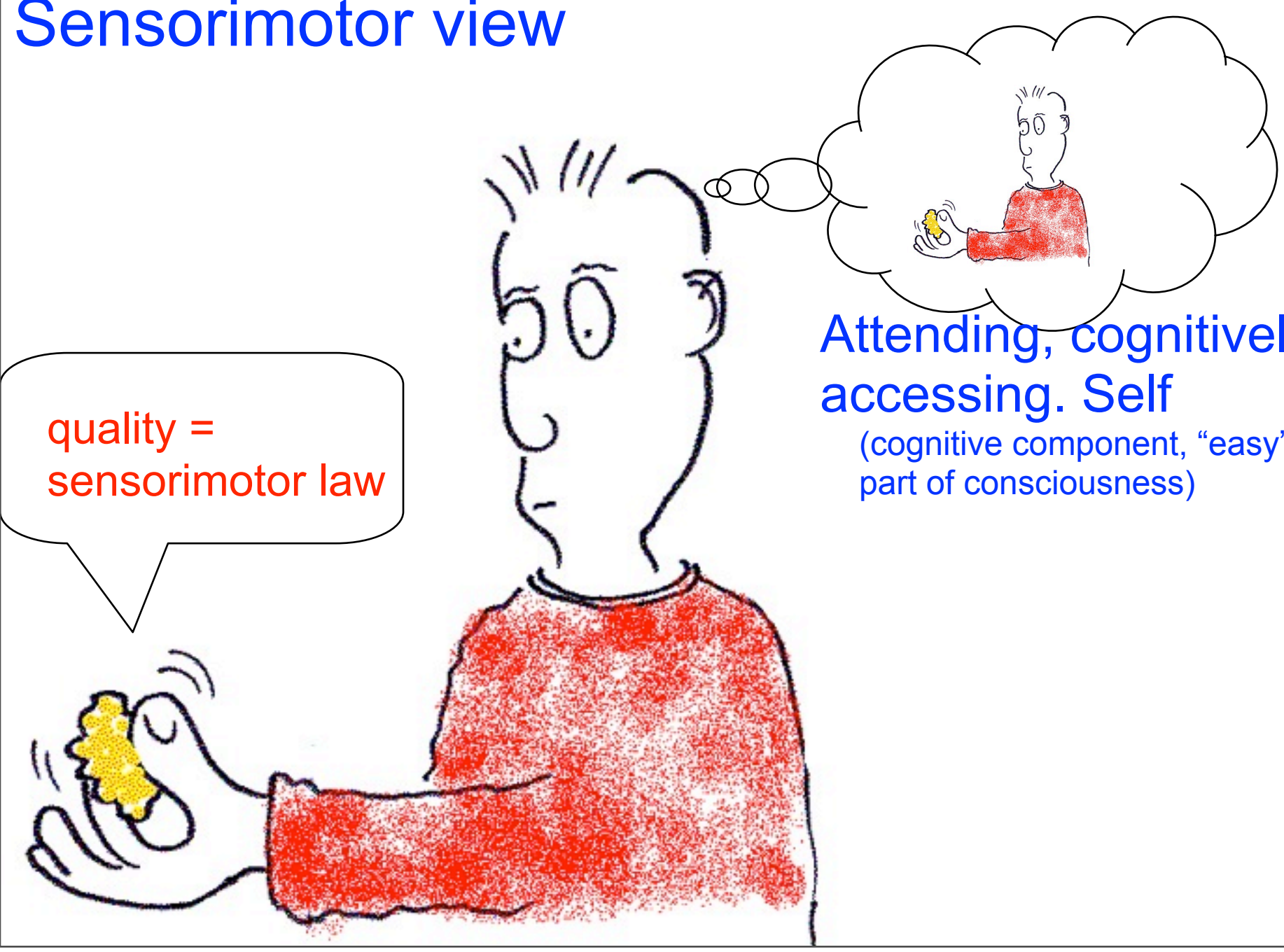


This may not make very much sense at first, so let's take a concrete example, namely the example of softness.

How or where in the brain is the softness of a sponge generated? Surely the softness of the sponge is not the kind of thing that is generated anywhere! Rather, the softness of the sponge is a quality of the way we interact with sponges. When you press on the sponge, it cedes under our pressure. What we mean by softness is the fact that a particular sensorimotor law is currently in effect.

Now the sensorimotor view takes the stance that more generally, the quality of all feels is constituted by the law of sensorimotor interaction that is being obeyed as we interact with the environment.

Sensorimotor view



Attending, cognitively accessing. Self

(cognitive component, “easy” part of consciousness)

But note that something more is needed. It is not sufficient to just be engaged in a sensorimotor interaction with the world for one to be experiencing a feel. We need additionally to be attending, cognitively accessing the fact that we are engaged in this way. But as noted at the beginning when i was talking about the robot Terminator, this is the cognitive component of feel, and should pose no problem for science.

What does Terminator feel?

cognitive component

self is:

poised to cognitively make use of the fact that:

organism poised to make use of sensory info

Amenable to Science
Easy part of Consciousness
-- soon on iphone/android !!

phenomenal component

"Feel"

"Explanatory gap"

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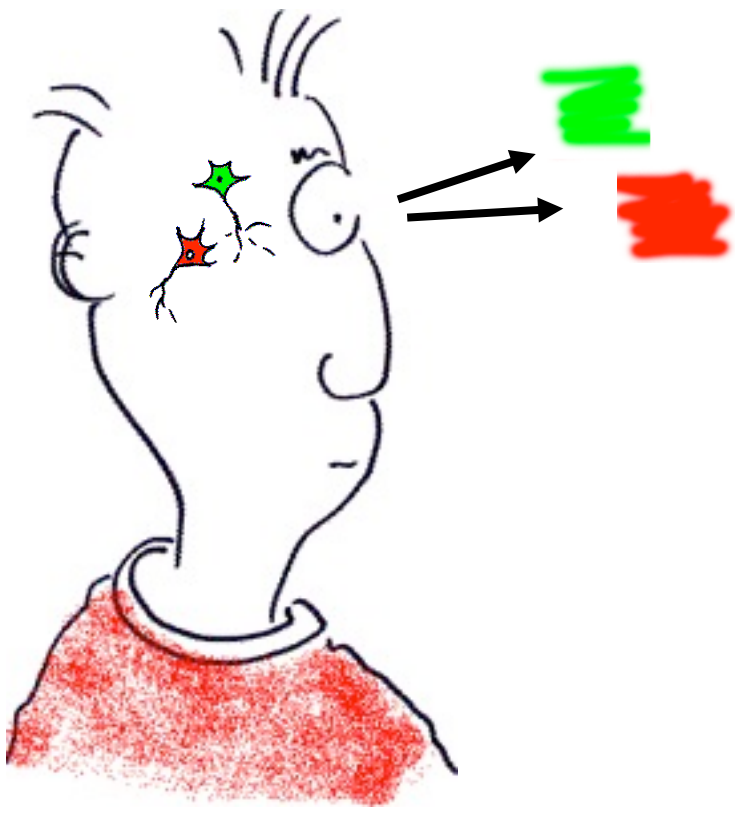
Not amenable to Science !!?
Hard part of Consciousness

So remember the explanatory gap problem of accounting for why there's something it's like and why feels differ.
Let's see how the sensorimotor approach removes the problem.

The explanatory gap: 1. Why feels differ

Why do we HEAR sounds and SEE sights?



Why does red look RED and not GREEN?

Why does RED not ring like a bell?

let's first look at how in the sensorimotor theory we can explain why sensory feels differ the way they do.

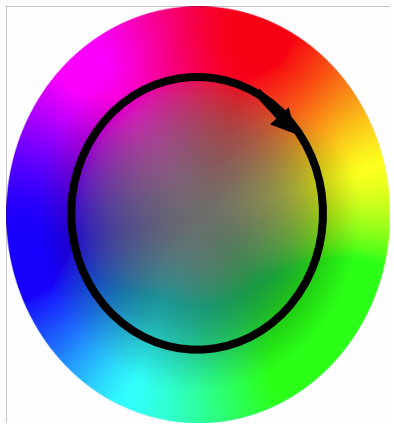
Why do we hear sounds and see sights? Why does red look red and not green? These are the kind of questions that motivated the title of my book: why does red not ring like a bell?

Structure of sensory qualities

sometimes not comparable: e.g. vision and hearing

sometimes comparable: e.g. colors; sounds…

dimensions: linear, circular; more complex…



color

A second aspect is structure. Even if feels are ineffable and we can't exactly pin them down, at least there are *some* things we can say about them, namely that

Sometimes they cannot be compared

Sometimes they can

When they can they can be organised along dimensions.

- Sometimes the dimensions are linear
- Sometimes circular
- Sometimes it is difficult to organise the dimensions at all (smell)

Why is all this a problem?

It's a problem because it's not clear how we can hope to explain these facts scientifically?

The explanatory gap: 1. Why feels differ

Why do we HEAR sounds and SEE sights?

Why does RED not ring like a bell?

I'll start with why we hear sounds and see sights?

Why do we HEAR sounds and SEE sights?

	SEEING	HEARING
blink:	big change	no change
move forward:	expanding flow	increasing amplitude
turn sideways:	shifting flow	asynchrony
cover ears:	nothing	big change
cover eyes:	big change	nothing

Under the sensorimotor approach, though obviously we admit that the brain plays a role in determining sensation, ultimately the explanation for why things feel the way they do must reside in the mode of interaction with the world that is involved.

So to explain why we HEAR sound and SEE sights, we must look at the sensorimotor laws involved in seeing and hearing. There are a very large number of laws that show why seeing and hearing cannot really be compared.

When you blink, for example, and you are SEEING, there is a very big change in the input coming into your sensory systems. But if you blink and you are HEARING, there is no change.

When you move forward and you are SEEING, there is a certain very specific law that governs the sensory change, namely an EXPANDING flowfield. But when you are HEARING and you move forward, the law is quite different: it involves an increase in the amplitude of the signal.

These are just a few examples of a large number of laws that describe the difference in seeing and hearing. It is the set of all these laws that CONSTITUTE the difference in perceived qualities between hearing and seeing.

Why do we HEAR sounds and SEE sights?

Because they INVOLVE DIFFERENT LAWS

	SEEING	HEARING
blink:	big change	no change
move forward:	expanding flow	increasing amplitude
turn sideways:	shifting flow	asynchrony
cover ears:	nothing	big change
cover eyes:	big change	nothing

So the answer to the question of why we HEAR sounds and SEE sights is that what we MEAN by hearing and seeing is determined by the sensorimotor laws that constitute hearing and seeing. So hearing and seeing are different precisely insofar as those laws are different.

But now note that this very simple philosophical idea predicts something interesting. If it were possible to simulate the laws of seeing by using some other sense modality instead of vision, then I would predict that it should be possible to see through this other sense modality, PROVIDED the correct sensorimotor laws were maintained,

1. Qualities have structure: Sensory Substitution

Tactile Visual
Sensory Substitution

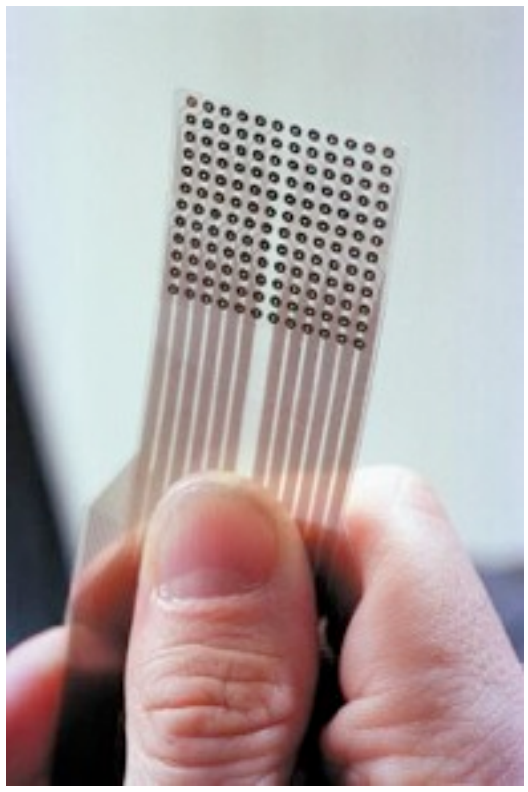
Bach y Rita (1972; 1984)

This is the idea of Sensory Substitution. Paul Bach y Rita in the 1970's had already equipped blind people with a video camera worn on their spectacles, connected through some electronics to an array of vibrators that the blind person wore on their stomach or back. He had found that immediately on moving with the device, observers were able to navigate around the room, and had the impression the sensation as coming from the outside world, rather than from vibrations on the skin. With a bit more practice they were able to identify simple objects in the room. There are reports of blind people referring to the experience as "seeing".

With modern electronics, sensory substitution is becoming easier to arrange and a variety of devices are being experimented with.

1. Qualities have structure: Sensory Substitution

Tongue display unit



Sampaio, E., S. Maris., and P. Bach-y-Rita. 2001
Brain plasticity: 'Visual' acuity of blind persons via the tongue. *Brain Research* 908(July 13):204.

Bach y Rita and his collaborators have developed a tongue stimulation device. Because of its low resolution however it is not so useful for substituting vision, but is mainly useful in substituting vestibular information, that is, information about balance.

1. Qualities have structure: Sensory Substitution

P. Meijer's
"The vOICe"

(Malika Auvray)
Video: http://www.malika-auvray.org

Peter Meijer, an engineer from Eindhoven in Holland has made a device called "the VOICe" that converts vision into audition. Information from a webcam is translated into a kind of auditory "soundscape" that can be used to navigate and identify objects. A student of mine, Malika Auvray did her thesis on this device, and on the web you can see a video of how an observer learns to see using it.

1. Qualities have structure: Sensory Substitution

Visual-to-auditory sensory substitution

(on Nokia phones by Peter Meijer)

There is even an application written in collaboration with Peter Meijer who invented this particular vision-to-sound system that works on some Nokia phones.

Substitution sensorielle avec « The vOICe » de P. Meijers
(Malika Auvray)

The explanatory gap: 1. Why feels differ

Why do we HEAR sounds and SEE sights?

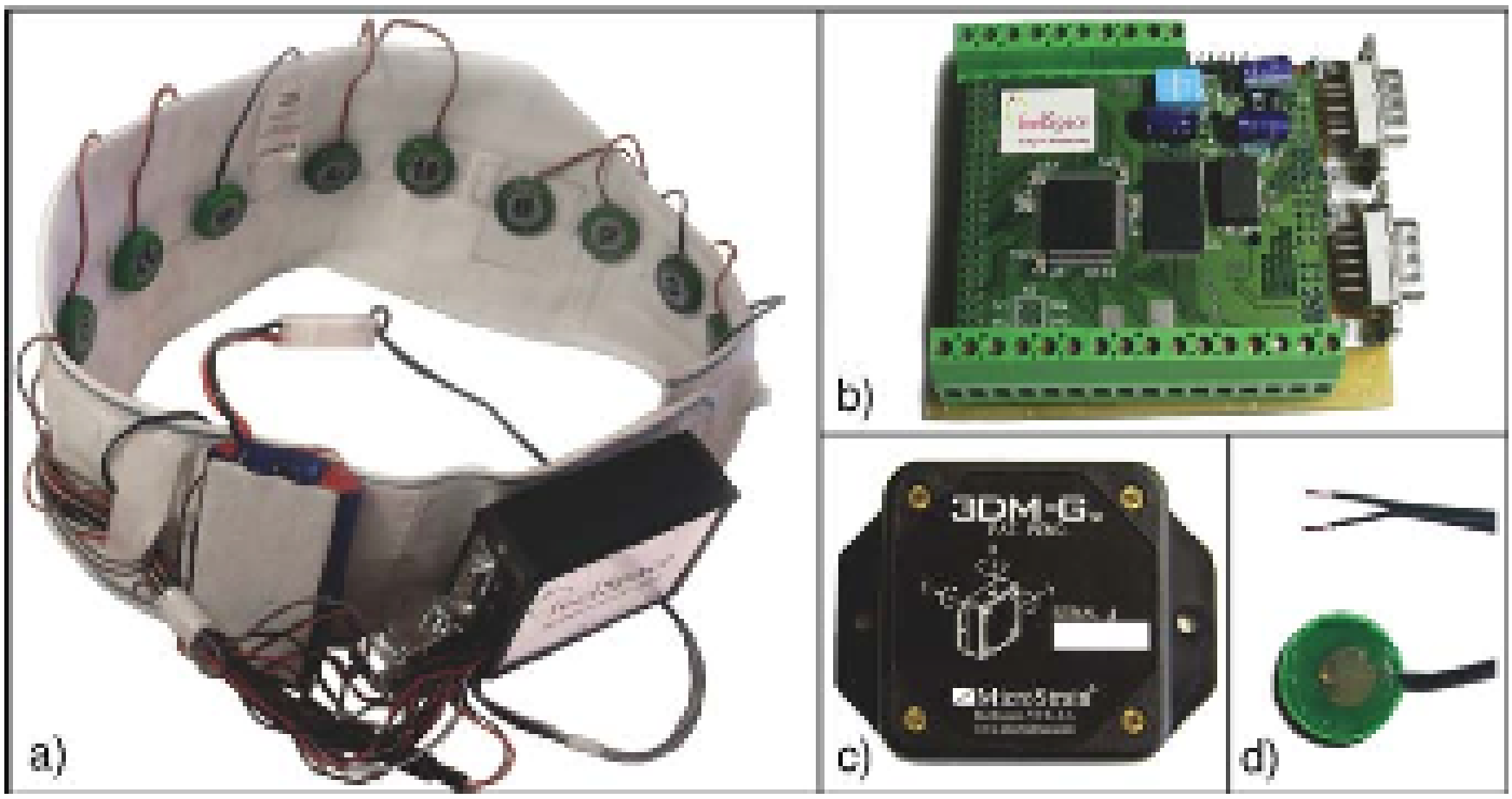
Because they INVOLVE DIFFERENT LAWS

predicts: Sensory Substitution

I hope to have convinced you up to now that taking the sensorimotor approach can explain why feels differ in the way they do.

Modalities like seeing and hearing have the different feels that they have because they involve different laws of interaction with the environment. I've also shown how taking the sm view makes predictions about the feasibility of sensory substitution between modalities, providing visual, or vestibular sensations from tactile input, or input from the tongue, or auditory input.

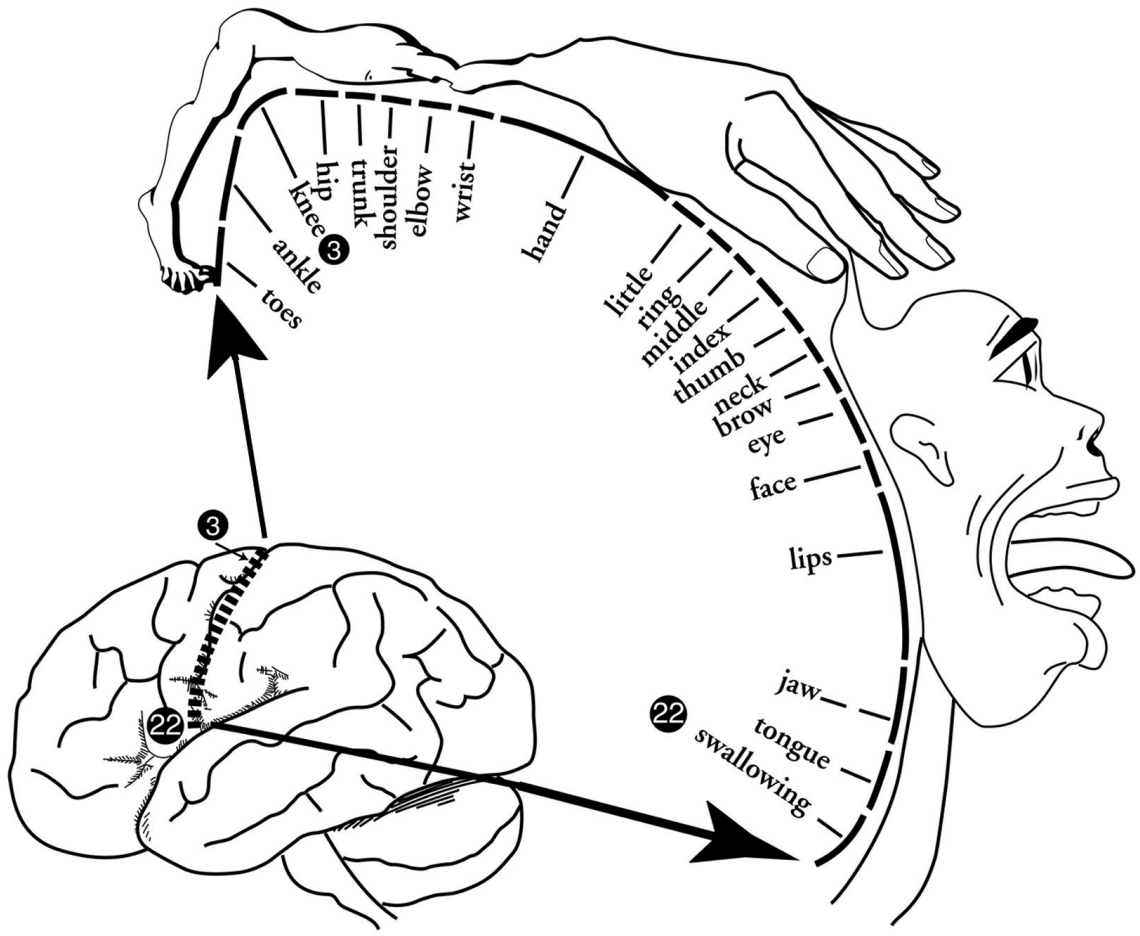
Magnetic sense



Beyond sensory substitution: learning the sixth sense. Nagel, Carl, Kringe, Märtin & König, J. Neural Eng., 2005

There are even more interesting applications. Peter König and his group at Osnabrück have been experimenting with a belt that provides tactile vibrations corresponding to the direction of north. The device, when worn for several weeks, becomes a kind of 6th sense, facilitating navigation behaviour and making people feel they somehow know better where they are. They're notion of space apparently becomes more "present".

Why do we feel touch where we are touched?



Somatosensory map in parietal cortex

"Penfield Homunculus"

And here is another application of the sensorimotor approach, applied to the question of why we feel touch where we are touched.

Have you ever wondered why, when i touch you on your ARM, you feel the sensation on your ARM and not, say, on your FOOT?

The natural impulse is to think the answer lies in the brain.

And in fact many people have heard of the famous Penfield homunculus. This is an area in the parietal cortex where there is something like a map of all the different parts of the body. If a surgeon stimulates the finger area of the map with an electrode, the patient feels a sensation on their finger. If the surgeon stimulates the lip area, the patient feels a sensation on their lip. The different areas have different sizes, with highly sensitive areas like the fingers and the face and mouth occupying larger areas on the map.

So the idea would be that when I touch you on your ARM, the ARM neurons in the Penfield map get stimulated, and so you feel things on the ARM and not on the foot. But why??? What is it about the ARM neurons in the map that give that ARM feeling? Is it some special neural connectivity, chemical or oscillation in those neurons? If it is, why does this connectivity, or chemical, or oscillation give the ARM feeling rather than the FOOT feeling? We are back to the infinite regress of questions and the explanatory gap.

Sensorimotor Approach to touch

Touch on arm

- if you move your ARM, big change
- if you move your FOOT, no change
- if you LOOK at your ARM, temporally correlated changes in sensory input / Not if you look at your foot
- sounds coming from your ARM are also temporally correlate / but not from your foot.

Feeling the tires against the curb when you park

Feeling the paper at the tip of the pen

To provide a satisfactory explanation of why touch on your arm feels the way it does, under the sensorimotor approach we have to consider what the sensorimotor laws are that underlie a touch on the arm. What we mean by a touch on your arm is, among other things, facts like those listed here.

You feel touch on your ARM when,

- If you move your ARM, there is a big change in sensory input
- But if you move your FOOT, there is no change
- If you LOOK at your arm, there are temporally correlated changes in sensory input. This is not the case if you look at your foot.
- Sounds coming from your ARM are also temporally correlate / but not from your foot.

And then this gives rise to an interesting consideration.

Have you ever noticed that when you drive a car, you essentially extend the boundaries of your body to the boundaries of the car. You can feel the tires against the curb when you park, for example. And yet the information you get about your tires comes very indirectly from the contact you have with the seat where you're sitting, or your fingers on the steering wheel. How can this come about? The sensorimotor theory provides an obvious explanation: the sensorimotor laws that describe the tactile input from the seat of the car and from your fingers is best described in terms of tires against the curb.

Another example is the roughness or smoothness of the paper at the tip of your pen as you write. The information from the pen comes in a distributed way across the palm of your hand and on your fingers. How does the brain project this very complex information to the tip of the pen, independently of how you hold the pen? Under the sensorimotor approach this is easy to understand. The job of the brain is to abstract sensorimotor laws from input and output, and the best way of characterizing the input/output relation that

The Rubber Hand Illusion

(Botvinick & Cohen, 1998)

real hand

fake rubber hand

An interesting application of these ideas concerns what's called the RHI, studied recently by Botvinick & Cohen and many other researchers.

In the RHI a person looks at a false, rubber hand placed in front of them on the table. Their own hand is hidden from view under a box. An experimenter comes and strokes the rubber hand and at the same time, simultaneously strokes the real hand. Since people see the rubber hand being stroked, and feel the stroking at the same time on their real hand, they very quickly get the very peculiar illusion that the rubber hand is their own hand.

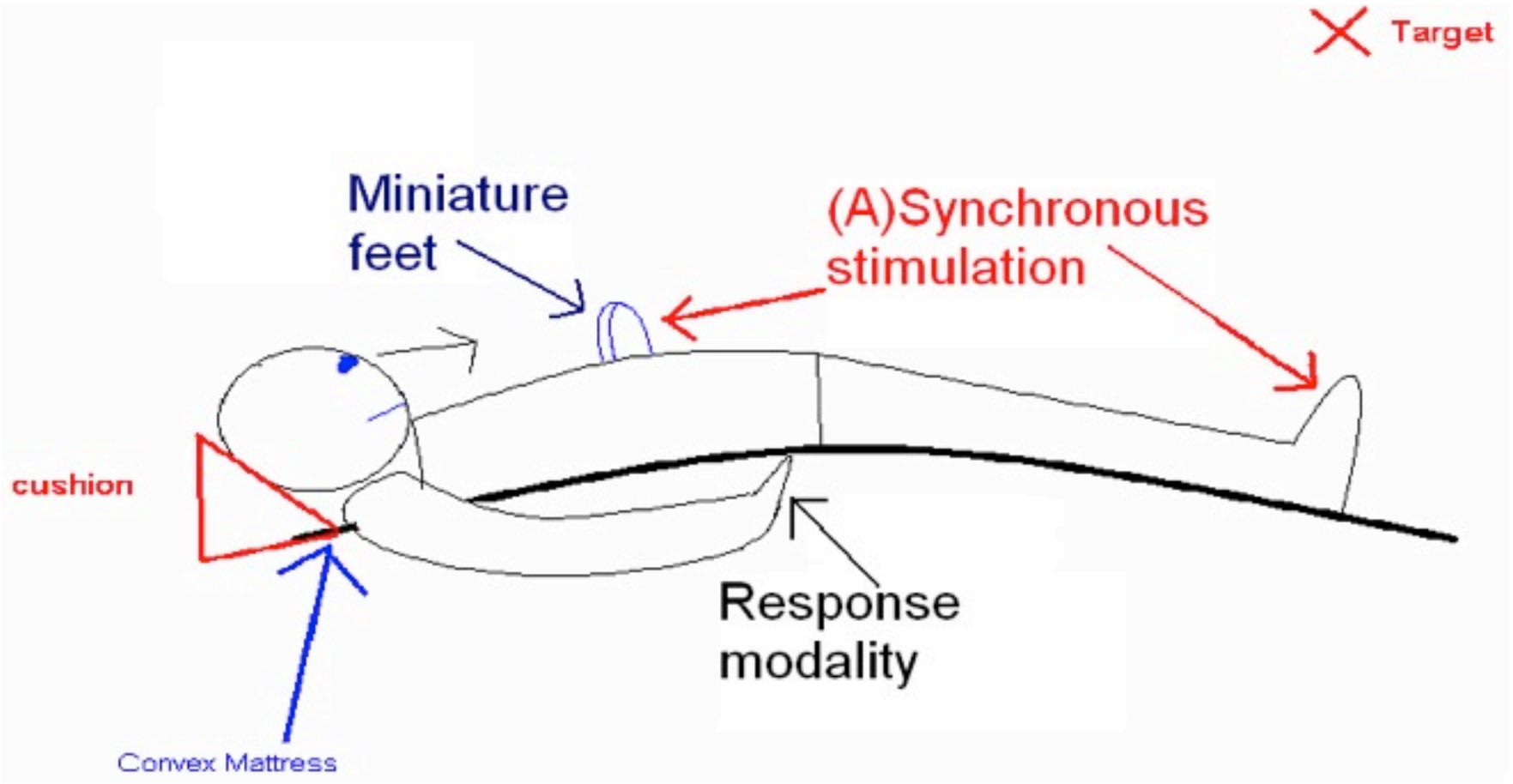
It's also possible to use different size rubber hands, as here, and give people the impression that their real hands are bigger or smaller than they really are. In fact you can repeat the experiment yourself by taking rubber dishwashing gloves and filling them with rice, for example. You make a cardboard box like the one shown here. Note that you have to stroke the rubber hand and the real hand SIMULTANEOUSLY and in the same way. It is this correlation which the brain uses to deduce that the rubber hand is yours.

The Rubber Hand Illusion

2. Qualities have structure: body sensation

Cooke & O'Regan, en prep

2. Qualities have structure: body sensation



Stimuli: the little feet

The explanatory gap: 1. Why feels differ

Why do we HEAR sounds and
SEE sights?

Because they INVOLVE DIFFERENT LAWS

Sensory Substitution

Why we feel touch where we do

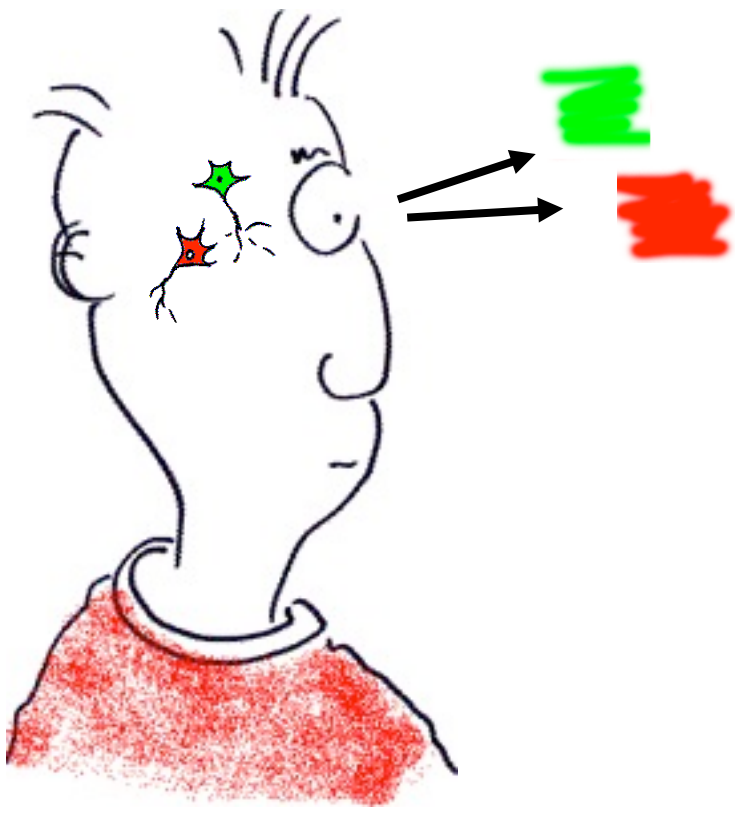
Rubber Hand Illusion

“Explanatory gap”
(J. Levine, 1983)

I hope to have convinced you up to now that taking the sm approach can explain why different sensory modalities like seeing and hearing have the different feels that they have. I’ve also shown how taking the sm view makes predictions about the feasibility of sensory substition between modalities, why we feel touch where we do, and explains phenomena like the Rubber Hand Illusion.

The explanatory gap: 1. Why feels differ

Why do we HEAR sounds and SEE sights?



Why does red look RED and not GREEN?

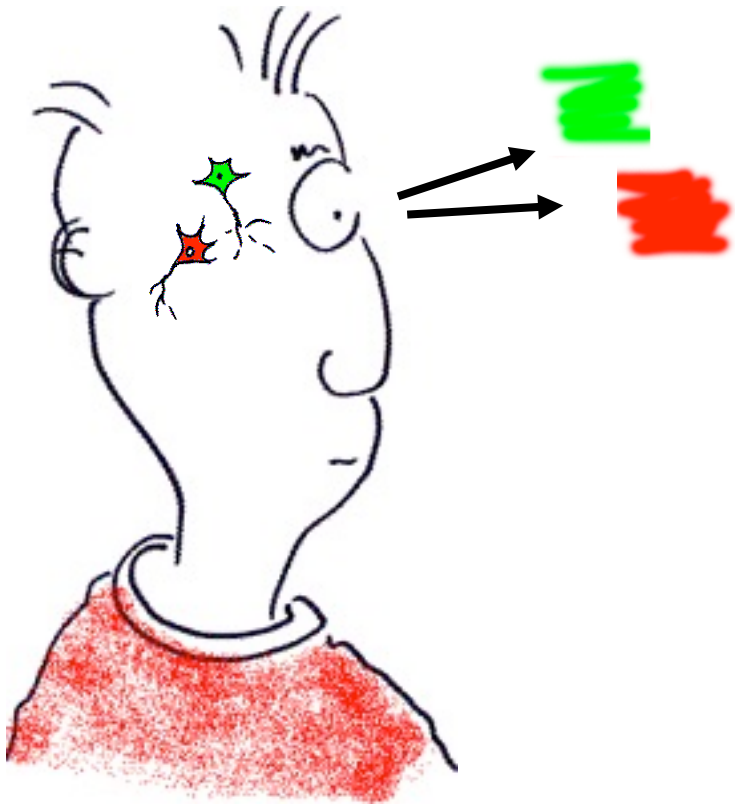
“Explanatory gap”

(J. Levine, 1983)

Another aspect of how feels differ is understanding the differences of feel *within* a given modality, for example *within* the visual modality.

Why do colors seem to be colored the way they are. Why does red look red and not green for example?

The explanatory gap: 1. Why feels differ

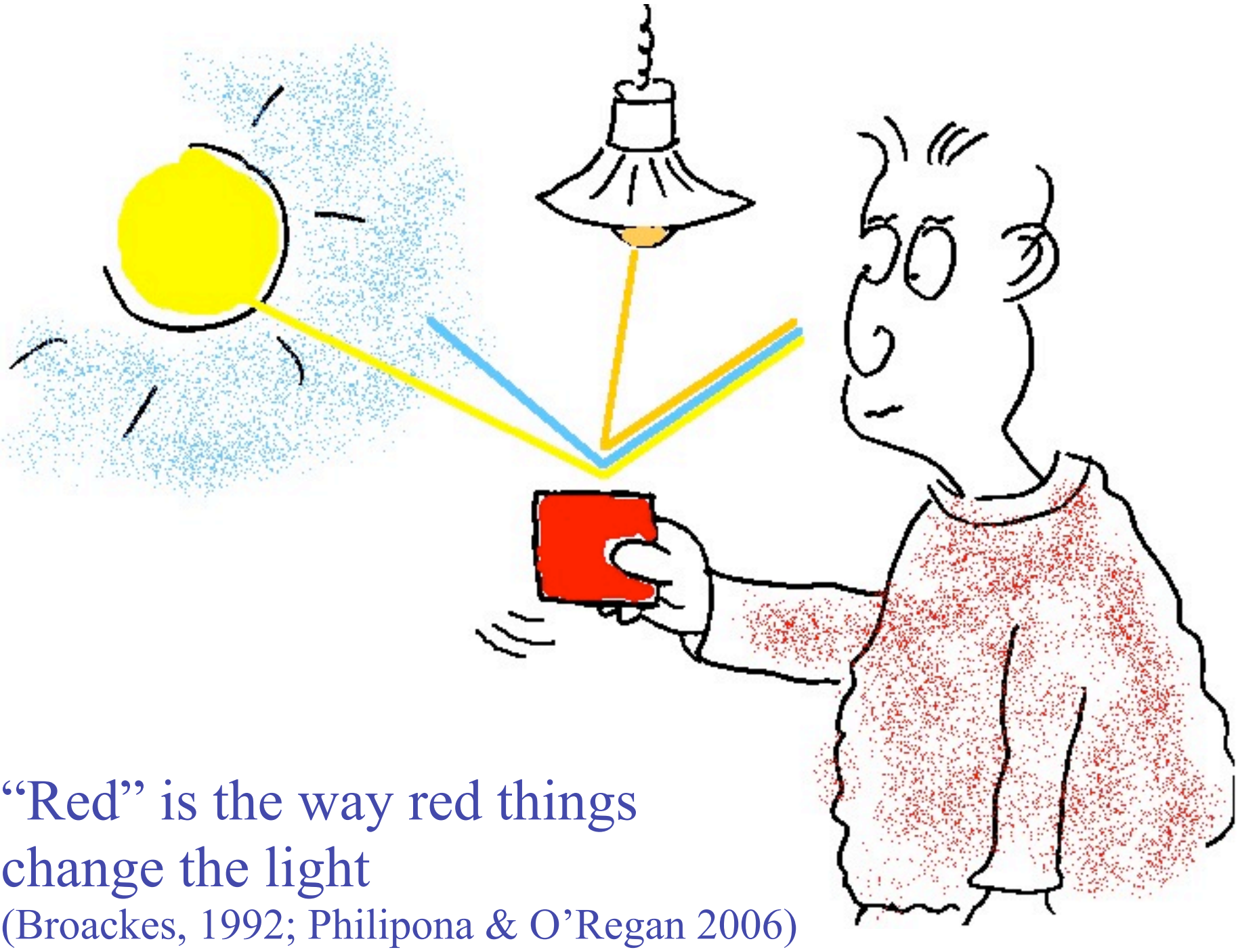


Why does red look RED and not GREEN?

“Explanatory gap”

(J. Levine, 1983)

To give an explanation for why red looks red from the point of view of the sensorimotor approach, we need to look at the laws that govern our interaction with the world when we are experiencing the sensation of red. At first it seems very counterintuitive to think of color as being anything to do with sensorimotor laws. After all, we can see color without moving at all. But because of the advantage, as concerns bridging the explanatory gap, of conceiving color in terms of actions we can perform, we tried to nevertheless make a theory.



"Red" is the way red things change the light

(Broackes, 1992; Philipona & O'Regan 2006)

With my doctoral student David Philipona we realized that this could be done by considering not colored *lights,* but colored surfaces. Color scientists know that when you take a red surface, say, and you move it around under different lights, the light coming into your eyes can change dramatically.

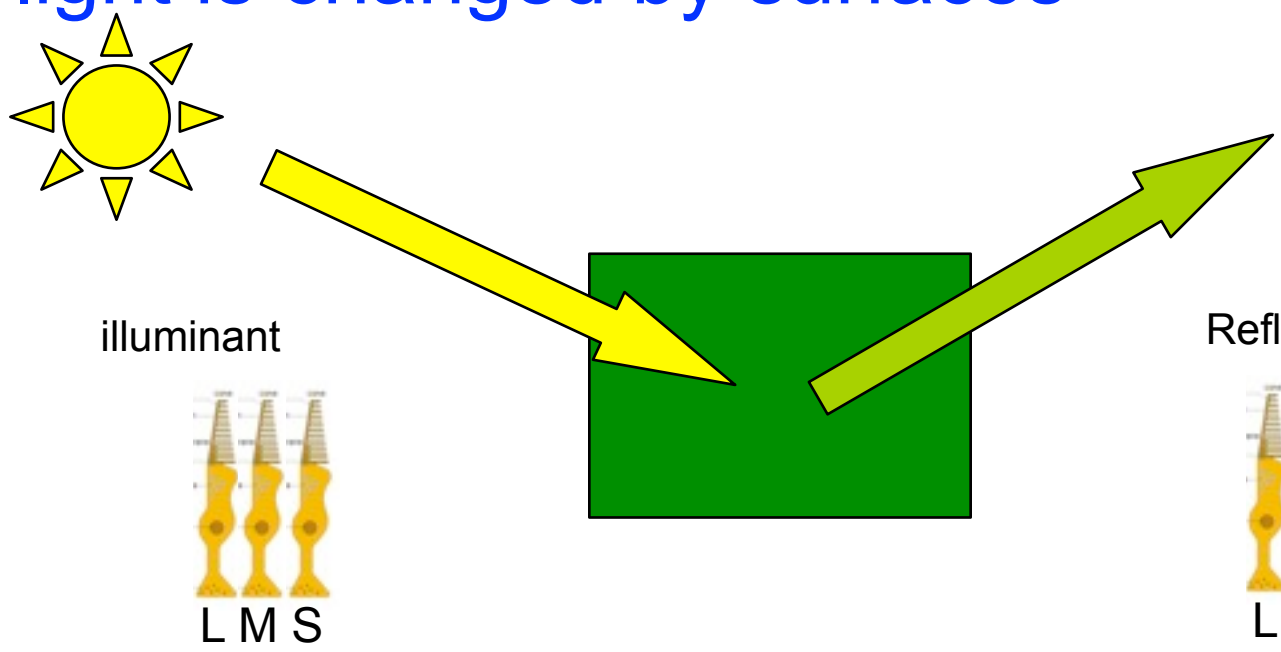
For example in an environment composed only of blue light, the reflected light coming off a red surface can only be blue. There is NO red light coming off the surface, and yet you still see it as red.

The explanation for this surprising fact is well known to color scientists, but not so well known to lay people, who often incorrectly believe that color has something to do with the wavelength of light coming into the eyes.

What *really* determines perceived color of a surface is the *law* that links incoming light to outgoing light. Redness is the particular law that governs the way red things change incoming light. In general, seeing color involves the brain *figuring out this kind of law.*

For a given colored surface, the way to do this is to move the surface around under different illuminations, and by sampling the relationship between incoming and outgoing illumination, to deduce what the law linking the two is.

How light is changed by surfaces



This is illustrated in this figure. The incoming light is sampled by the three types of photoreceptors in the eye, the L, M and S cones. Their response can be represented as a vector in a three dimensional space. When the incoming light bounces off the surface, the surface absorbs part of it, and reflects the rest. This rest can then be sampled again by the eye's three photoreceptor cone types, giving rise to another three-vector.

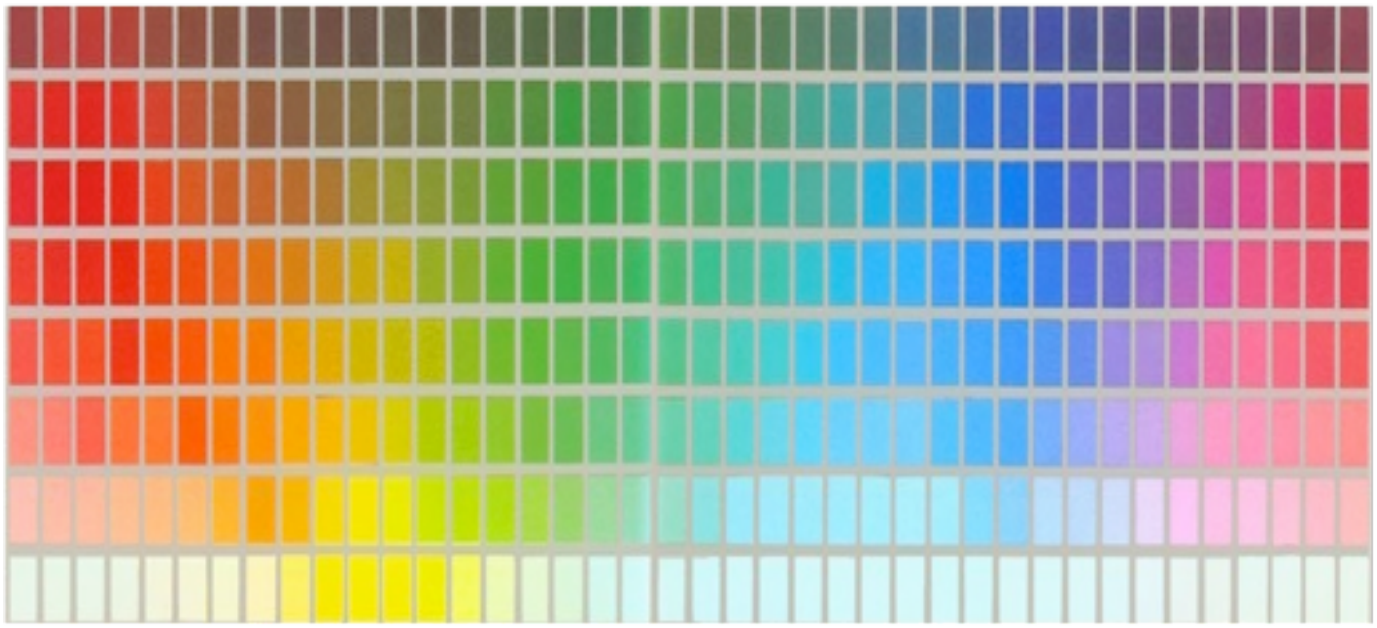
It turns out that the transformation of the incoming three vector to the outgoing three vector can be very accurately described by a 3 x 3 matrix. This matrix is a property of the surface, and is the same for all light sources. It constitutes the *law* that we are looking for, namely the law that describes how incoming light is transformed by this surface.

It is very easy to calculate what the 3 x 3 matrices are for different surfaces. My mathematician David Philipona did this simply by going onto the web and finding databases of measurements of surface reflectivity, databases of light spectra (like sun light, lamp light, neon light, etc.) and figuring out what the matrices were.

Of course human observers, when they judge that a surface is red don’t do things this way. One way they could do it is to experiment around a little bit, moving the surface around under different lights, and ascertaining what the law is by comparing inputs to outputs. So in that respect the law can be seen as being a sensorimotor law. In many cases however humans don’t need to move the surface around to establish the law: this is probably because they know more or less already what the incoming illumination is. But in case of doubt, like when you're in a shop under peculiar lighting, it's sometimes necessary to go out of the shop with a clothing article to really know what color it is.

1. Qualities have structure: Color

Munsell chips

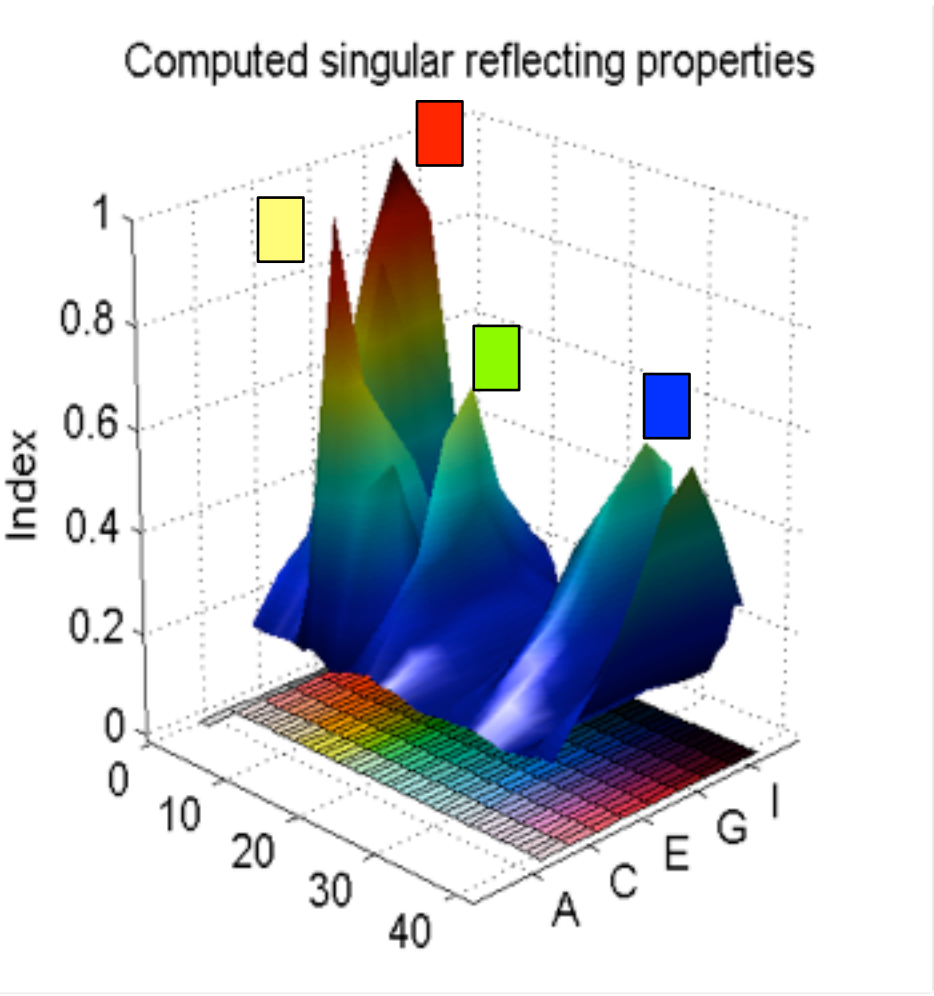


Philipona & O'Regan, Vis. Neurosci, 2006

Using this idea we have managed to make an exciting discovery.

Here are a set of colored chips called Munsell chips which are often used in color experiments. Each such chip has a different reflectance spectrum that has been measured and tabulated by physicists. We can use these reflectance spectra to calculate for each chip what we called its "singularity". This is a measure of how simple the law is that links any incoming light to the resulting outgoing light for that chip.

Singularity index



Here is a graph showing the calculated singularity of the laws corresponding to each of the different Munsell chips.

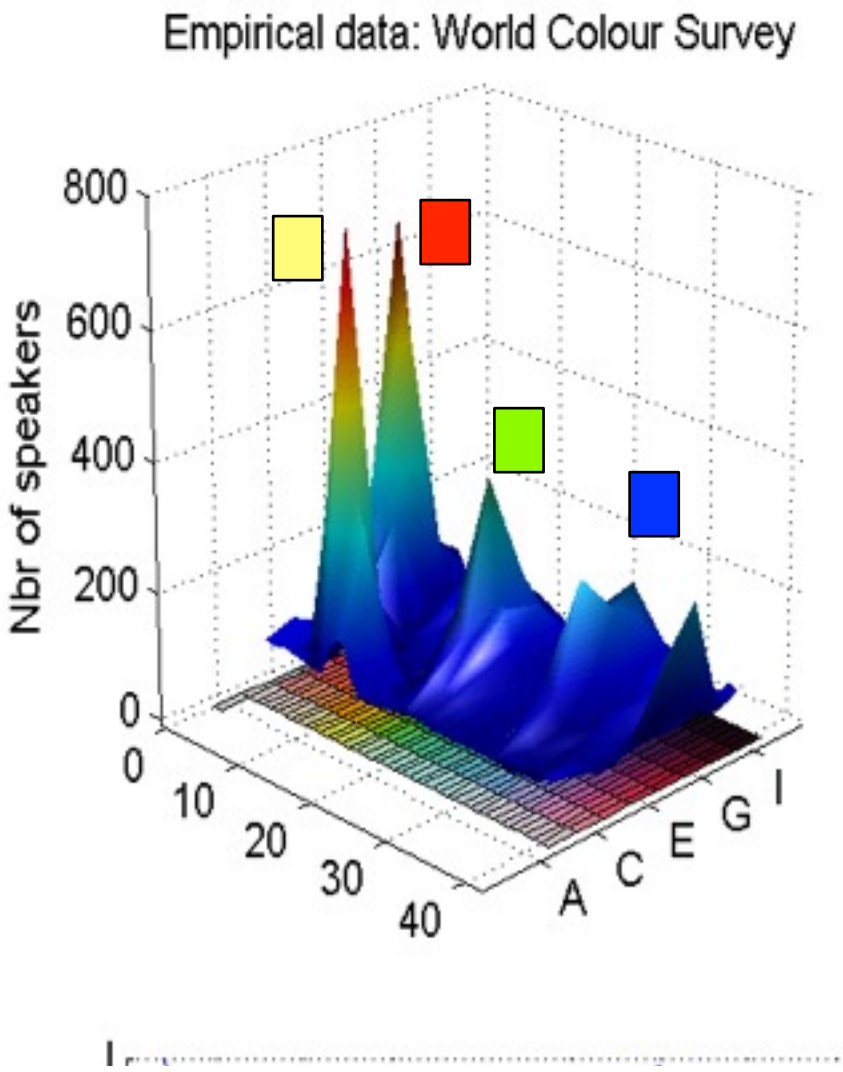
You see that there are essentially four peaks to the graph, and they correspond to four very particular chips, namely those with colors that look like primary red, yellow green and blue.

What this means is that these four colored chips have the property that the laws of sensorimotor dependency that they correspond to are *simpler* than the laws for all other colored surfaces.

And this reminds us of something.

World Color Survey: "Focal colors"

Berlin & Kay (1969); Kay & Regier (2003)



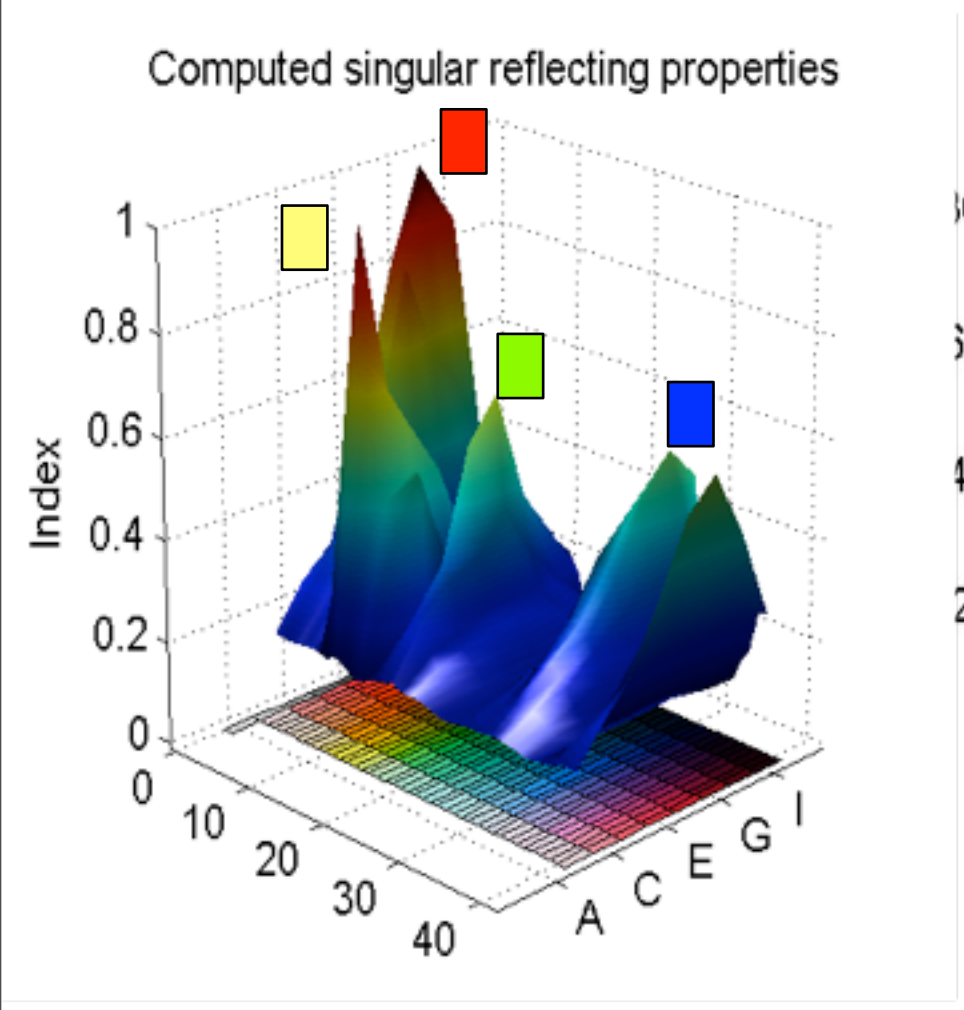
In the 1970's, two anthropologists at Berkeley, Brent Berlin and Paul Kay, went around the world with the same Munsell chips, asking people which chips they had names for.

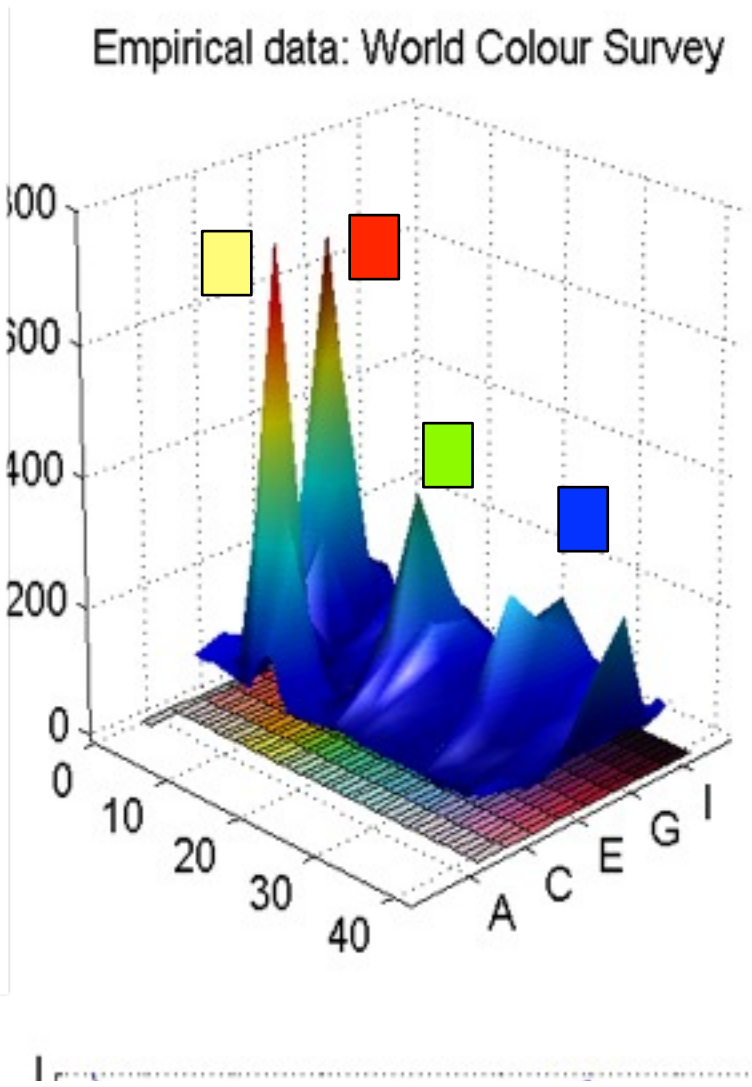
This graph shows the number of different people that had a name for each chip in the Munsell collection. You can see that there are certain chips that most people had a name for: and these chips are EXACTLY THE SAME CHIPS as those that have a high singularity index.

Singularity index

World Color Survey: "Focal colors"

Berlin & Kay (1969); Kay & Regier (2003)





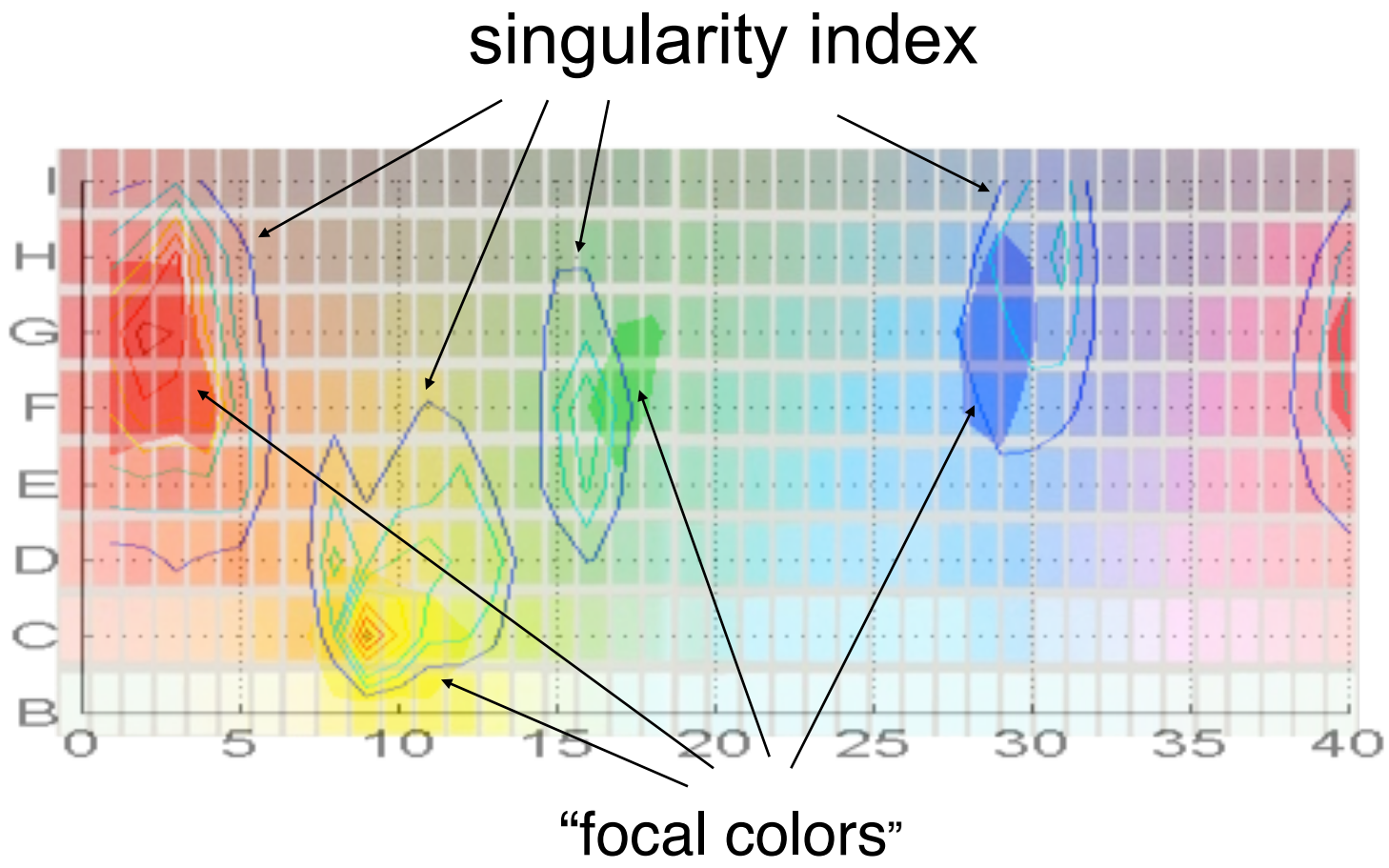
You can see this by comparing the naming data with the graph of singularity values.

It does indeed seem reasonable that names should most frequently be given to colors that are *simple* in the sense that when you move them around under different illuminations, their reflections remain particularly stable compared to other colors.

The coincidence between singularity of the laws of sensorimotor dependency for color and anthropological naming data is a great victory for the sensorimotor approach. From a simple philosophical idea, namely that feel is not neural activation but a sensorimotor law, we have been able to make an accurate empirical prediction.

And for years, color scientists have been trying to explain this data from neurophysiology without success.

2. Qualities have structure: Color



Philipona & O’Regan, Vis. Neurosci, 2006

Here I have superimposed contour plots of the two previous graphs. You see that the peaks of the black contour plots of the singularity data correspond to within one chip of the anthropological data, shown as flat colored areas.

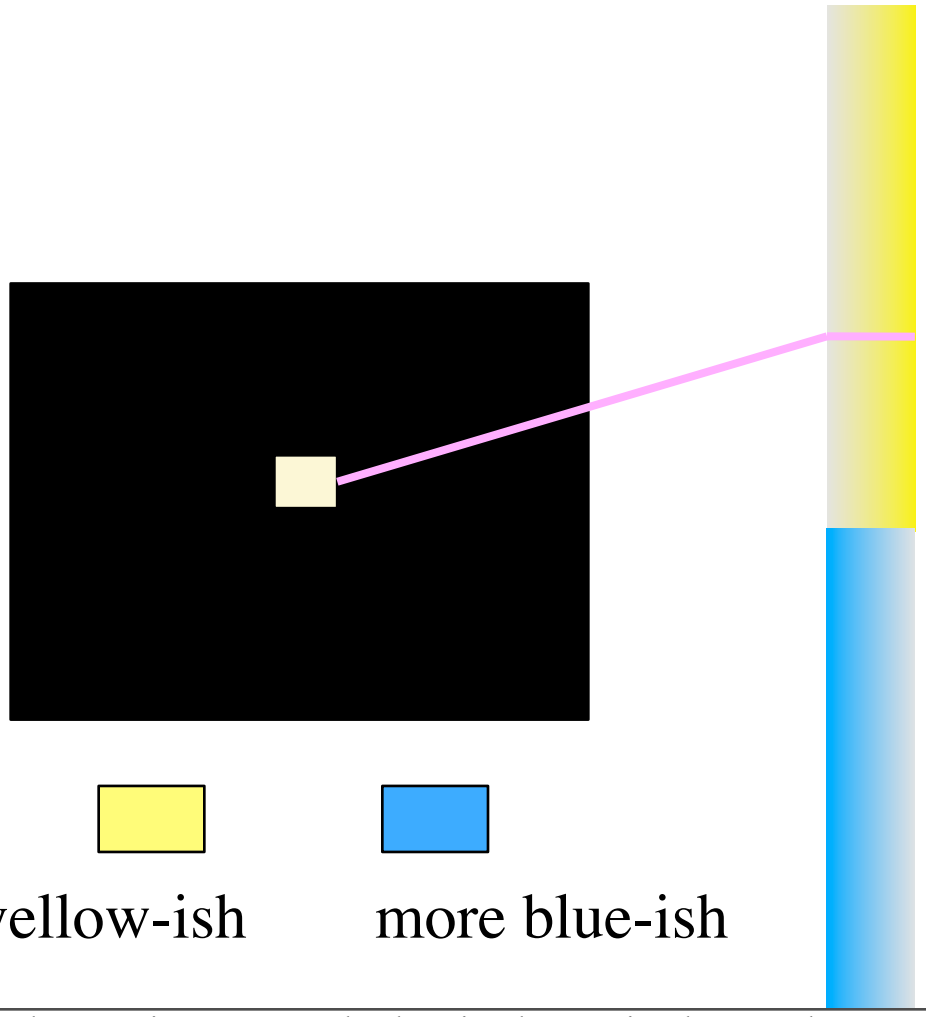
As though those colors which tend to be given names, are precisely those *simple* colors that project incoming light into smaller dimensional subspace of the three dimensional space of possible lights.

It's worth mentioning that Berlin and Kay, and more recently Kay and Regier have been seeking explanations of their anthropological findings. Though there are some current explanations based on a combination of cultural and perceptual effects, which do a good job of explaining the *boundaries* between different color names, no one up to now has been able to explain the particular pattern of peaks of naming probabibility, as we have here. And in particular, the red/green and blue/yellow opponent channels proposed on the basis of Hering's findings do not provide an explanation.

On the other hand it does seem reasonable that names should most frequently be given to colors that are *simple* in the sense that when you move them around under different illuminations, their reflections remain particularly stable compared to other colors.

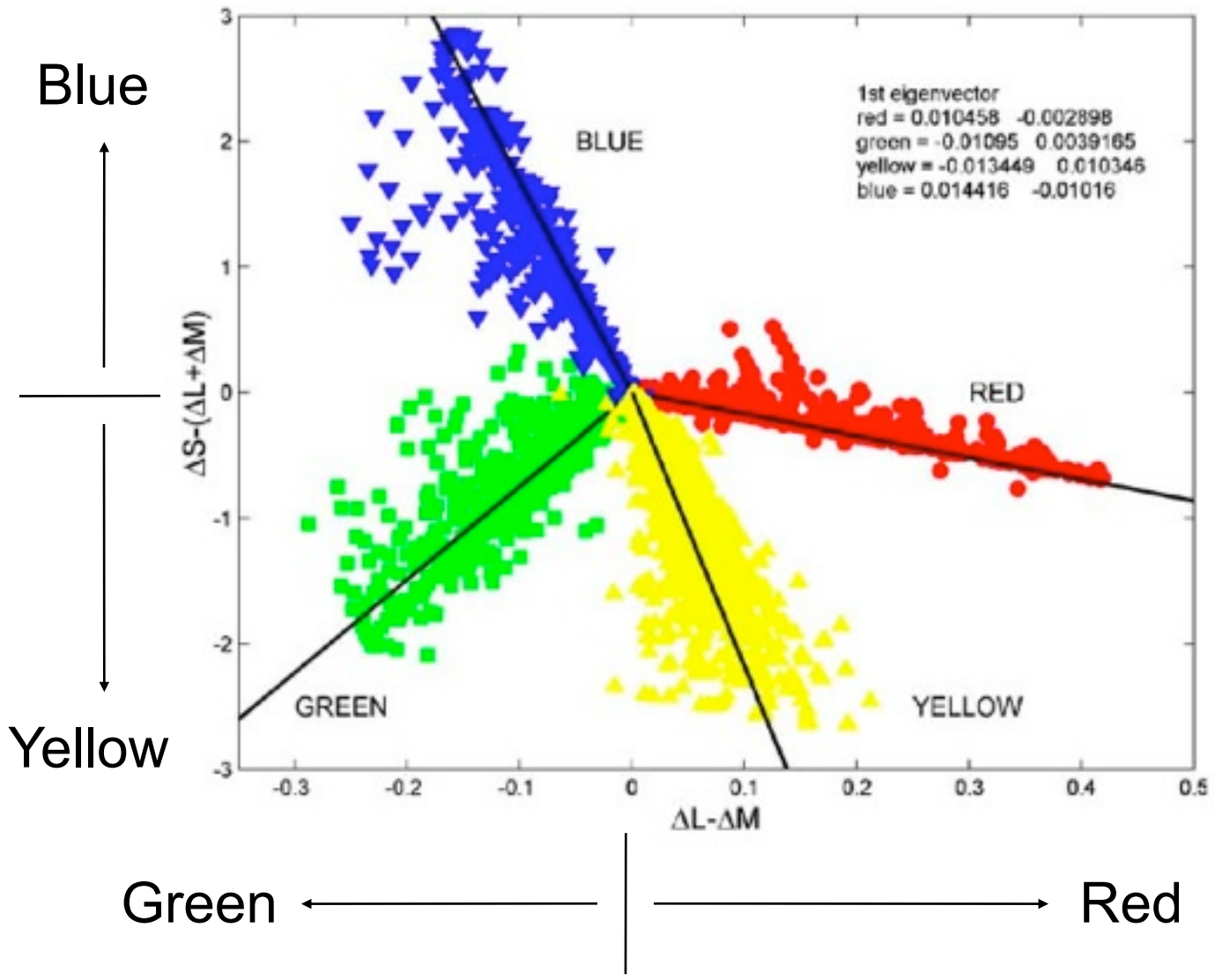
So in my opinion the finding that we are able to so accurately predict color naming from first principles, using only the idea of the sensorimotor approach, is a great victory for this approach.

Bompas & O'Regan, Perception, 2005, 2006



I don't have time to describe some other results about color that confirm the sensorimotor approach. These involve wearing these trendy psychedelic colored spectacles, that have the property of creating a new sensorimotor dependency between eye movement and color sensation, and thereby changing color quality.

Channel activations for unique hues



Wuerger 2005 (18 observers)

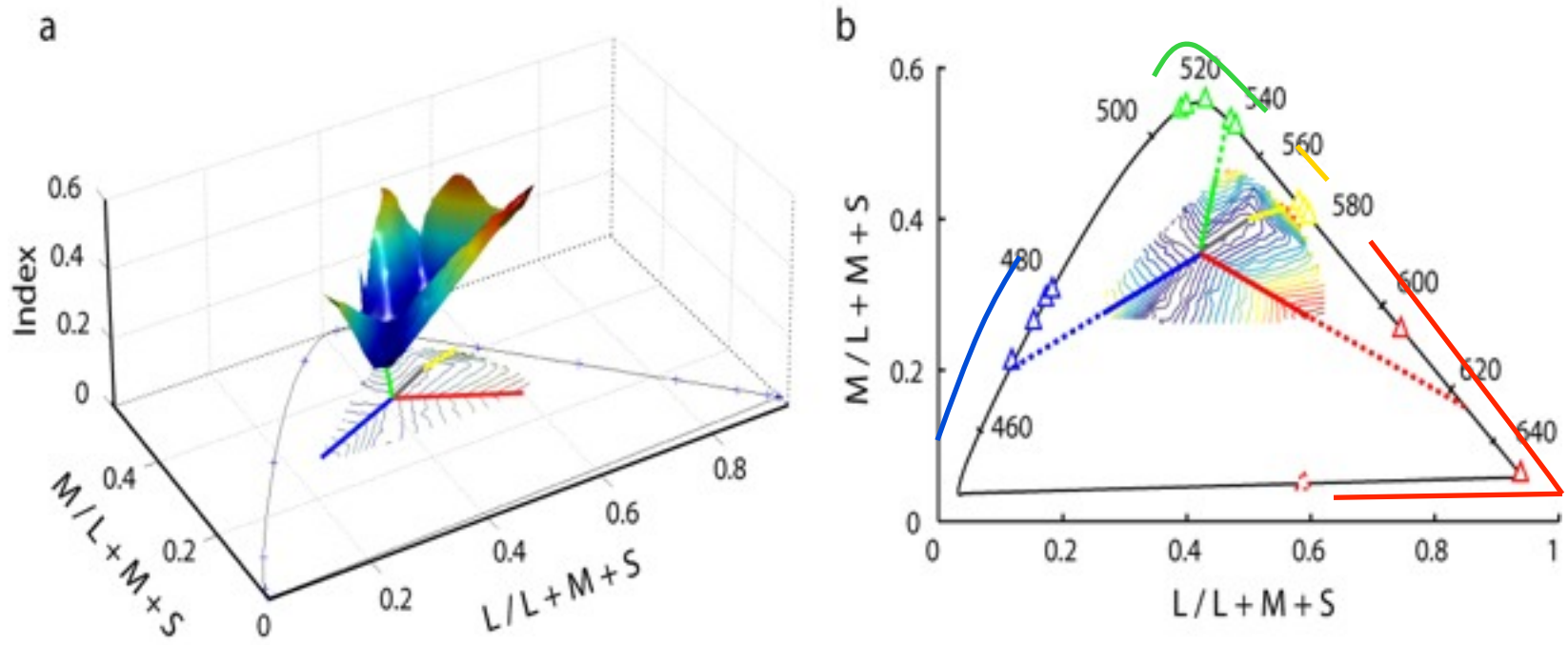
(also: deValois, Mollon & Jordan, 1997; Miyahara & al, 1998; Webster & al, 2000 ; Valberg, 2001; Kuehni, 2003)

There is another quite independent victory of the sensorimotor approach to color that concerns what are called *unique hues*. These are colors that are judged by people to be *pure*, in the sense that they contain no other colors. There is pure red, green, yellow and blue, and people have measured the wavelengths of monochromatic light which provide such pure sensations.

Unfortunately, the data are curiously variable, and seem to have been changing gradually over the last 50 years. Furthermore, the data have not been explained from neurophysiological red/green and yellow/blue opponent channels.

The dots in this graph show empirical data on channel activations observed to obtain unique red, yellow, green and blue. Instead of crossing at right angles, the data are somewhat skewed.

Unique hues predicted from singularity of surfaces



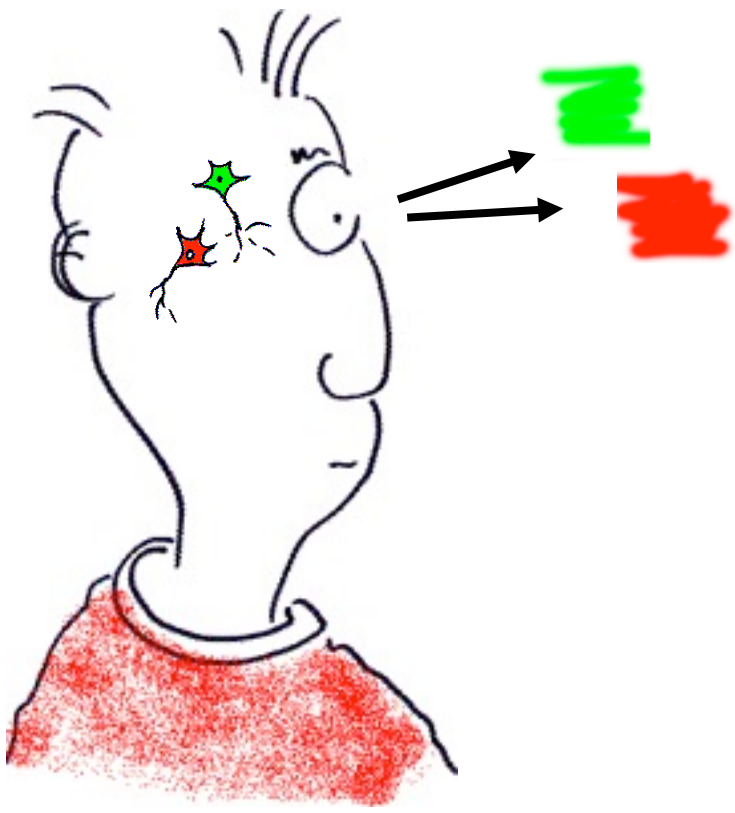
Philipona & O'Regan, Vis Neurosci. 2006

Another fact about unique hues is their variability. The small colored triangles on the edge of the diagram here on the right shows the wavelengths measured in a dozen or so different studies to correspond to unique red, yellow, blue and green. You see the data are quite variable. The colored lines are the predictions of variability proposed by the sensorimotor approach. Again, the agreement is striking.

Incidentally we can also account for the fact that the data on unique hues has been changing over recent years. We attribute this to the idea that in order to make the passage from surfaces to lights, people must have an idea of what they call natural white light. And this may have been changing because of the transition from incandescent lighting to neon lighting used more often today.

The explanatory gap: 1. Why feels differ

Why do we HEAR sounds and SEE sights?



Why does red look RED and not GREEN?

I’ve been talking about why feels differ the way they do. How they compare across sensory modalities, like between hearing and seeing, and how they compare within a given modality, as for color. The sensorimotor approach provides not only an appealing way to deal with these questions but generates empirical predictions that can be confirmed.

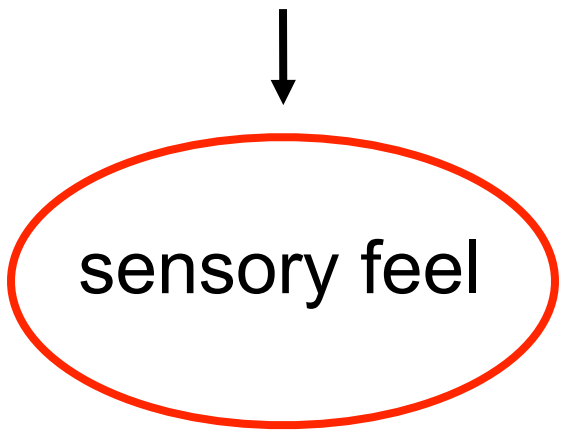
The explanatory gap: 2. Something it's like to feel?

But there is the second question related to the explanatory gap which we have not yet talked about, namely the question of why there's something it's like at all to have a sensory feel.

The explanatory gap: 2. Something it's like to feel?

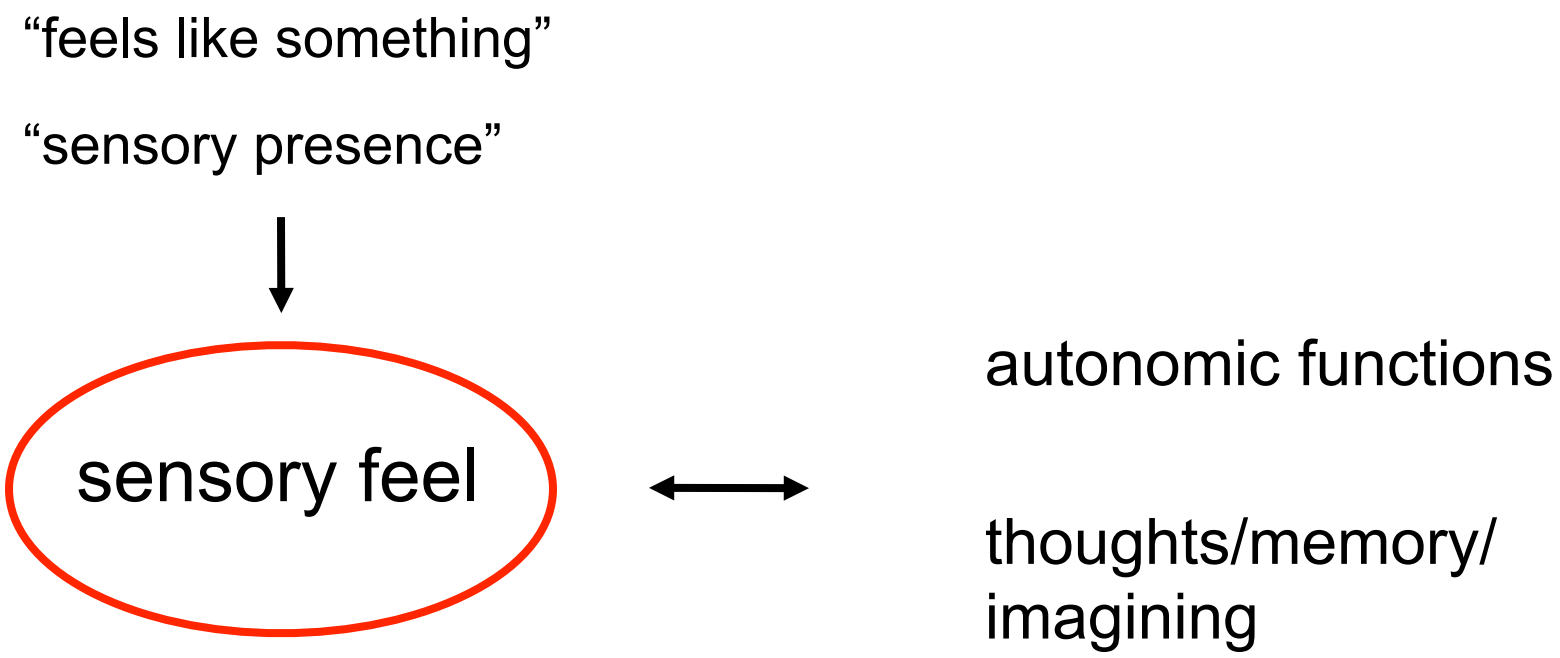
"feels like something"

"sensory presence"



Intuitively it seems that there really is something special about feels. The philosophers say that feels feel like something rather than feeling like nothing.

The explanatory gap: 2. Something it's like to feel?



To understand what I mean, we can compare sensory feels like the feel of red or the sound of a trumpet or the pain of a pin prick, with other brain processes, like autonomic functions and thoughts and imaginings.

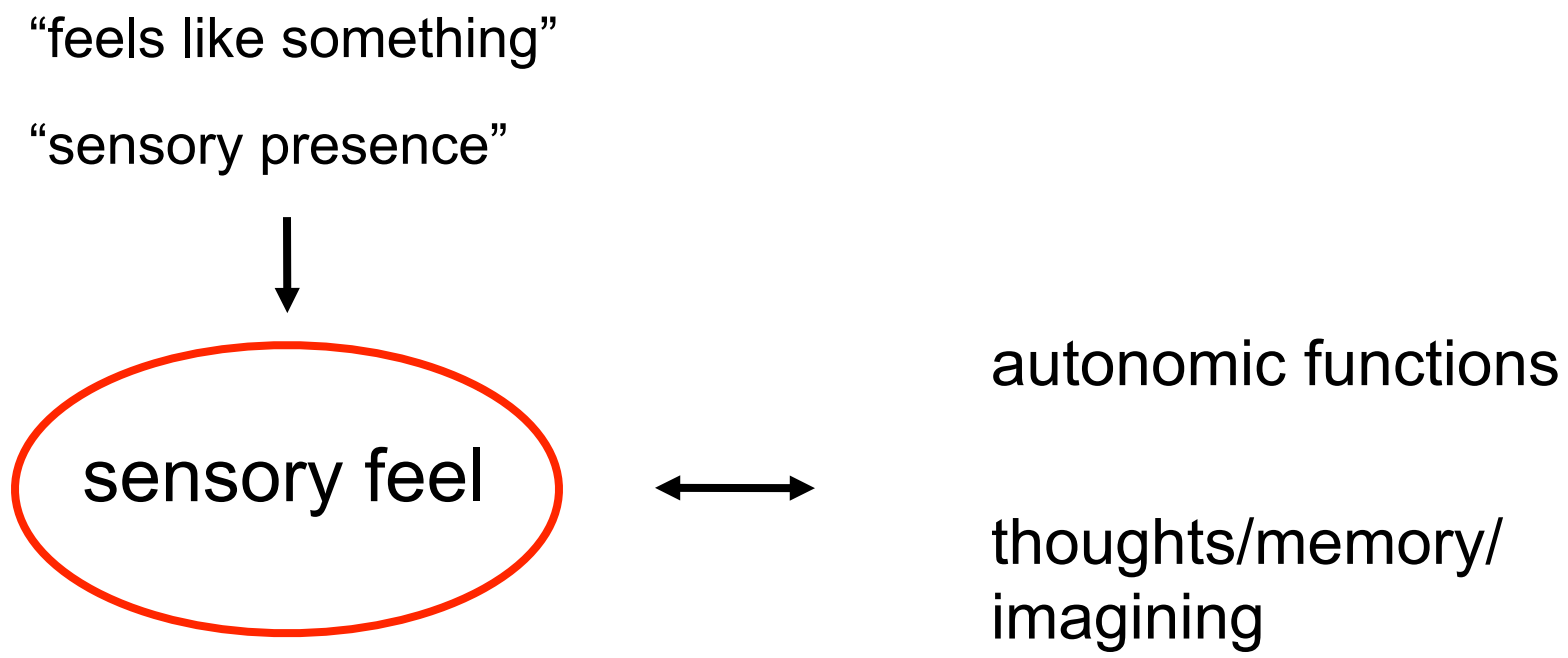
When I feel the prick of the pin, or hear the trumpet, it feels like something. But when autonomic systems in my body detect the concentration of glucose or oxygen in my blood, or some chemical equilibria in my liver, for example, these are also sensory systems. Why do I not feel them? There seems to be something special about the five "classic" sensory modalities of hearing, seeing, smelling, tasting and touching, which gives them a special "sensory presence" that other sensory systems in my body do not possess.

And take the case of thoughts, memory and imagining. These involve complex cognitive processes, but they do not provide us with the same sensory quality as the classic sense modalities. When you think about a pain, you are not in pain. When you remember or imagine redness, you do not have the same sensory presence as when you actually see redness.

Why is this? Again, if we were to try to find an explanation in terms of brain mechanisms, we would be faced with the same problem of infinite regress as I described earlier concerning the particular qualities of sensory feels. Imagine we had discovered that sensory feels all involved a special kind of synchrony between cortical and thalamic processes which was not displayed by autonomic sensory processes, and not possessed by thoughts, memory and imaginings.

We could then ask, what is it about cortico-thalamic synchronization that provides sensory presence? Why should such synchrony give us feels that feel like something?

The explanatory gap: 2. Something it's like to feel?

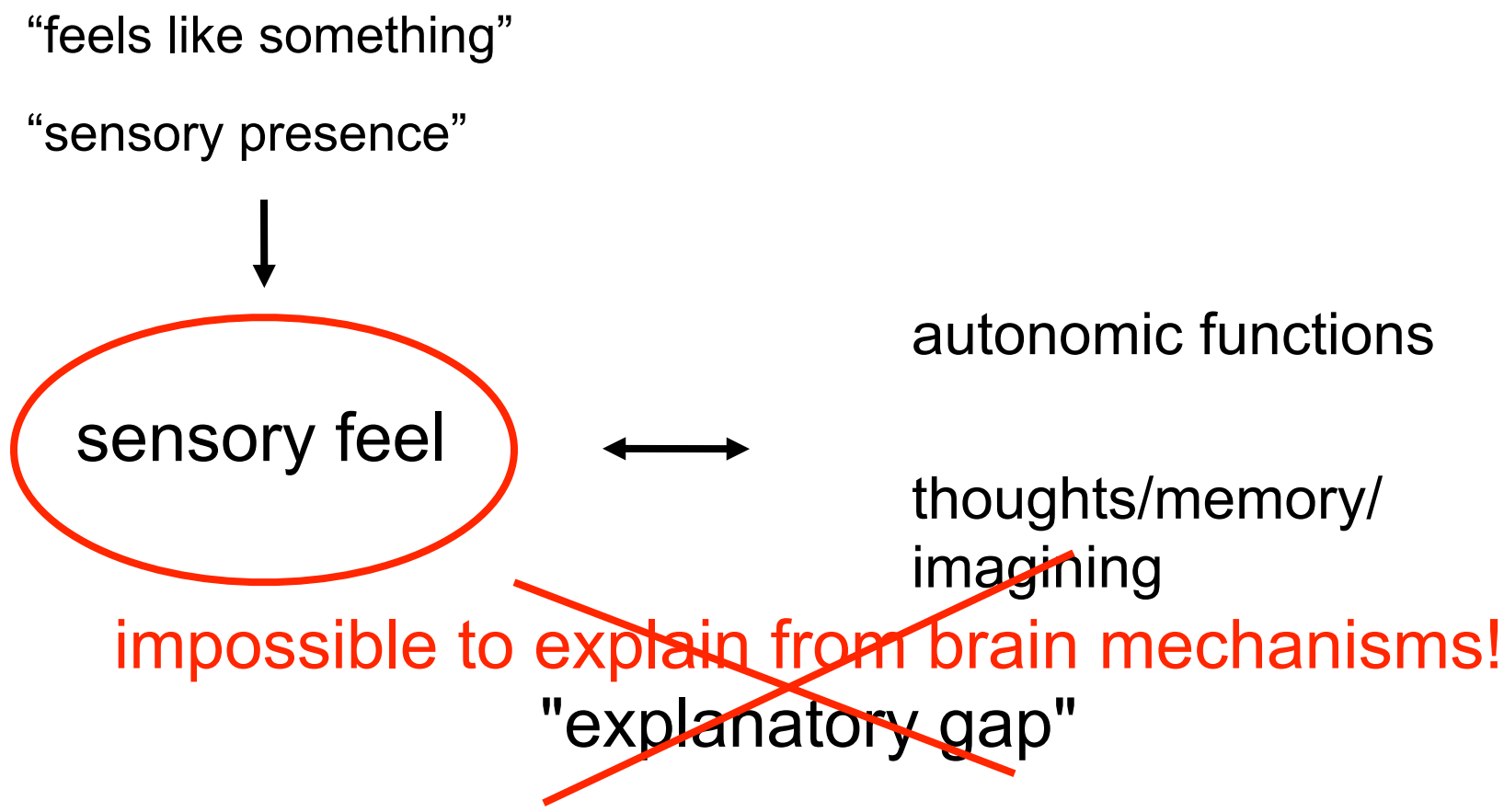


impossible to explain from brain mechanisms!

"explanatory gap"

The quesiton of why there is something it's like to feel seems to be logically impossible to explain from brain mechanisms. We are back to the explanatory gap.

The explanatory gap: 2. Something it's like to feel?



examine differences in sensorimotor laws!

To solve this problem under the sensorimotor view, we don't look *in the brain* for a way to explain this difference. We look in differences in the laws that govern our interactions with the environment when we engage in sensory feel, as compared to engaging in autonomic functions or thoughts/imaginings.

If you ask yourself, let's say in the case of feeling the softness of a sponge why there's something it's like to do this, I think you come to the conclusion that the reason there's something it's like is pretty obvious: you really **are** doing something, not just thinking about it or letting your brain deal with it automatically.

The explanatory gap: 2. Something it's like to feel?

Really doing something!

How do you know when you are really doing something?

- Bodiliness
- Insubordinateness
- Grabbiness

But then what is it about a real interaction with the world that allows you to know that it you really are having such a real interaction? How do you know, when you're squishing a sponge, that you REALLY ARE squishing it, and not just thinking about it, hallucinating or dreaming about it?

The answer I think lies with at least three aspects of real-world interactions which determine their sensory presence: bodiliness, insubordinateness and grabbiness.

The explanatory gap: 2. Something it's like to feel?

Bodiliness

if voluntary motions systematically affect input

e.g. visual, auditory, tactile, (taste, smell)

not: autonomic sensory pathways/thoughts

Bodiliness is the fact that voluntary motions of your body systematically affect sensory input. This is an aspect of sensory interactions which distinguishes them from autonomic processes in the nervous system and from thoughts.

Sensory input deriving from visceral autonomic pathways is not generally affected by your voluntary actions. Your digestion, your heartbeat, the glucose in your blood, although they do depend somewhat on your movements, are not as intimately linked to them as your sensory input from your visual, auditory and tactile senses. If you are looking at a red patch and you move your eyes, etc., then the sensory input changes dramatically. If you are listening to a sound, any small movement of your head immediately changes the sensory input to your ears in a systematic and lawful way. If you're thinking about a red patch of color or about listening to a sound, then moving your eyes, your head, your body, does not alter the thought.

The explanatory gap: 2. Something it's like to feel?

Insubordinateness

Bodiliness is not complete: the world escapes our control

But note that in real world interactions, bodiliness is not actually *complete*. This is because what characterises sensations coming from the world is the fact that precisely they are **not** completely determined by our body motions. The world has a life of its own, and things may happen: mice may move, bells may ring, **without us doing anything to cause this.** I call this insubordinateness. The effect of the world on our sensors partially escapes our control, because not all sensory changes are caused by our movements. Some come from the world.

The explanatory gap: 2. Something it's like to feel?

Grabbiness

capacity to peremptorily interfere with cognitive processing

Hard-wired transient detectors in vision, audition, touch, smell, taste

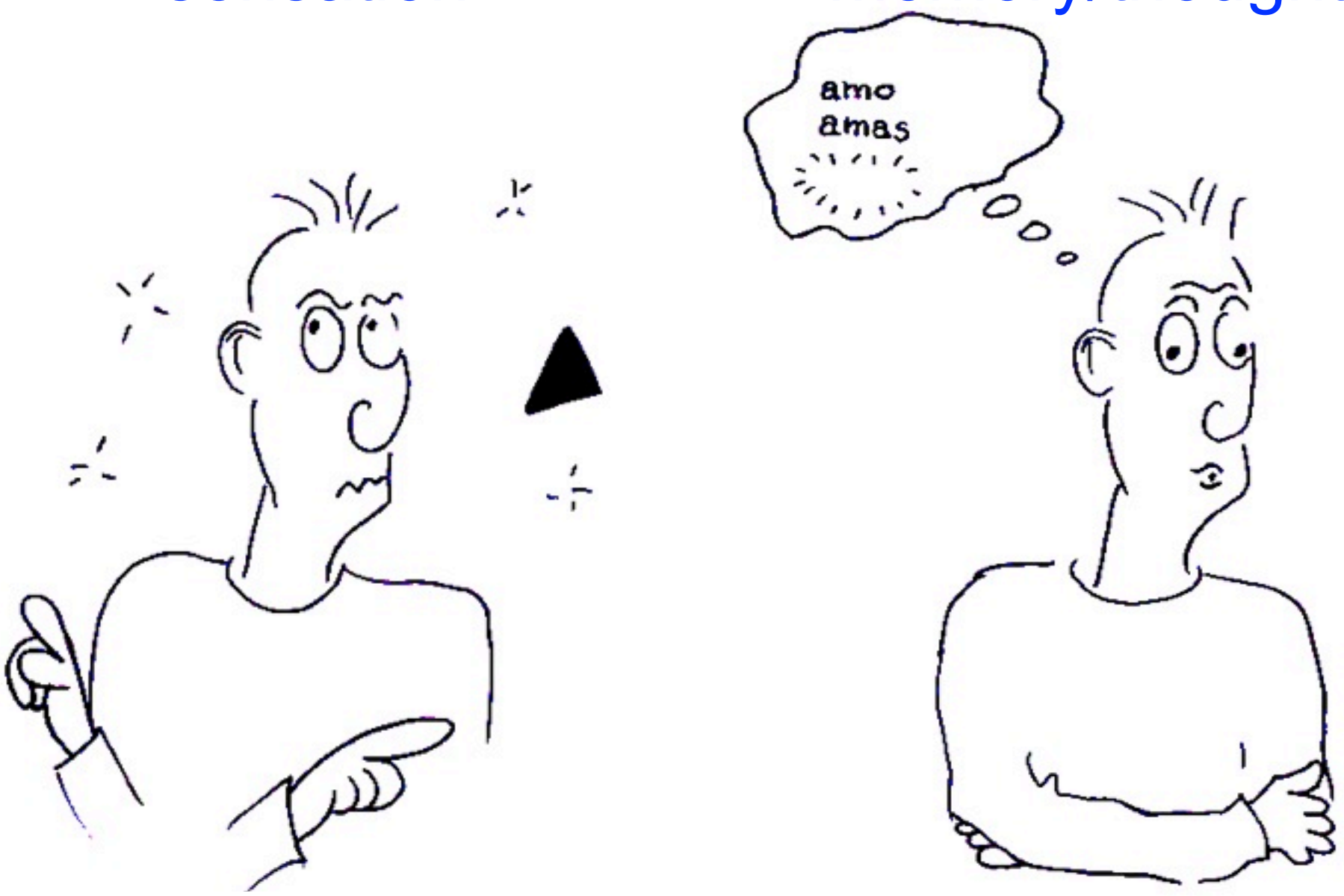
not: vestibular, proprioceptive, autonomic sensory pathways; not: thoughts, imaginings

And then there is grabbiness. This is the fact that sensory systems in humans and animals are hard-wired in such a way as to peremptorily interfere with cognitive processing. What I mean is that when there is a sudden flash or loud noise, we react, automatically by orienting our attention towards the source of interruption. This fact is an objective fact about the way some of our sensors -- namely precisely those that we say we **feel**, are wired up. Visual, auditory, tactile olfactory and gustatory systems are able to interrupt my ongoing cognitive activities and cause an automatic orienting response. On the other hand a sudden change in my blood sugar or in other autonomic pathways like a sudden vestibular or proprioceptive change, will not cause exogenous orienting. ((Of course such changes may make me fall over, or become weak, for example, but they do not directly prevent my cognitive processing from going on more or less as normal -- although there may be indirect effects of course through the fact that I fall over or become weak.))

My idea is that what we call our real sense modalities are precisely those that are genetically hard wired so as to be able, in cases of sudden change, to interrupt our normal cognitive functioning and cause us to cognitively orient towards the change. Those other, visceral, autonomic sensing pathways, are not wired up this way. It is as though normal sense modalities can cause something like a cognitive "interrupt", whereas other sensing in the nervous system cannot.

sensation

memory/thought



grabbiness

no grabbiness

Note that grabbiness allows us also to understand why thoughts are not perceived as real sensations. If you are seeing or hearing something, any change in the environment immediately creates a signal in the transient detectors and alerts you that something has happened. But imagine that overnight neurons die in your brain that code the third person of the latin verb "amo". Nothing wakes you up to tell you this has happened. To know it, you have to actually think about whether you still remember the third person of amo. In general, except in the case of obsessions, thoughts and memory do not by themselves interrupt your cognitive processing in the way that loud noises and sudden flashes or pungent smells cause automatic orienting.

Why is there “something it’s like” to SEE???

Compared to automomous processes and thoughts, Vision has:

Bodiliness

depends on body movements: unlike thoughts, imaginings, autonomous processes (e.g. glucose, oxygen...)

Insubordinateness

not completely determined by body motions: unlike proprioception

Grabbiness...

An example of the application of the notions of, bodiliness, insubordinateness and grabbiness is in explaining the presence of vision.

When we see a visual scene, we have the impression of seeing everything, simultaneously, continuously, and in all its splendor. Why do we have this impression of reality?, bodiliness, insubordinateness and grabbiness provide an explanation.

The visual world iIt has bodiliness because whenever we move our eyes or body, the input to our eyes changes drastically. And it is insubordinate because our own movements are not the only thing that can cause changes in input: all sorts of external changes can also happen.

But there is also grabbiness.

Sensation of seeing requires grabbiness

Change Blindness (using flicker)
(from J. Kevin O'Regan -- http://nivea.psycho.univ-paris5.fr)

Usually, if something suddenly changes in the visual scene, because hard-wired transient detectors in the visual system automatically register it and orient your attention to it, you see the change, as in this example.

Simons, Franconeri & Reimer, 2000; Auvray & O’Regan, 2003

But if you make the change so slow that the transient detectors don’t work, then an enormous change can happen in a scene without your attention being drawn to it, like in this movie:

http://nivea.psycho.univ-paris5.fr/sol_Mil_cinepack.avi

Where almost a third of the picture changes without you noticing it.

22m

CB during Mudsplashes (O'Regan, Rensink & Clark, 1999)

There's another way of preventing grabbiness from functioning in the normal way, which is to drown out the transients that would normally attract your attention by putting additional transients all over the visual scene. This is what I've done with these mudsplashes. Even though there's a big change here which is perfectly visible, because it occurs simultaneously with the extraneous, attention-grabbing mudsplashes, you don't see the change.

CB during Mudsplashes (O'Regan, Rensink & Clark, 1999)

D. Simons & D. Levin

D. Simons & D. Levin

D. Simons & D. Levin

Change Blindness

Flicker

Rensink, O'Regan & Clark,1997; 1999

Eye saccades

Currie, McConkie, Carlson-Radvansky & Irwin, 1995; McConkie & Currie, 1996

Blinks

O'Regan, Deubel, Clark, Rensink, 1999

Film cuts, real life

Levin & Simons, 1997

"Mudsplashes"

O'Regan, Rensink & Clark (Nature, 1999)

These 'slow change' and mudsplash demonstrations are part of a whole literature on "change blindness". Change blindness can also occur if the interruption between scenes that causes the transients to be drowned out is caused by flicker in the image, or by eye saccades, blinks, or film cuts, or even by real life interruptions.

Presence of Vision

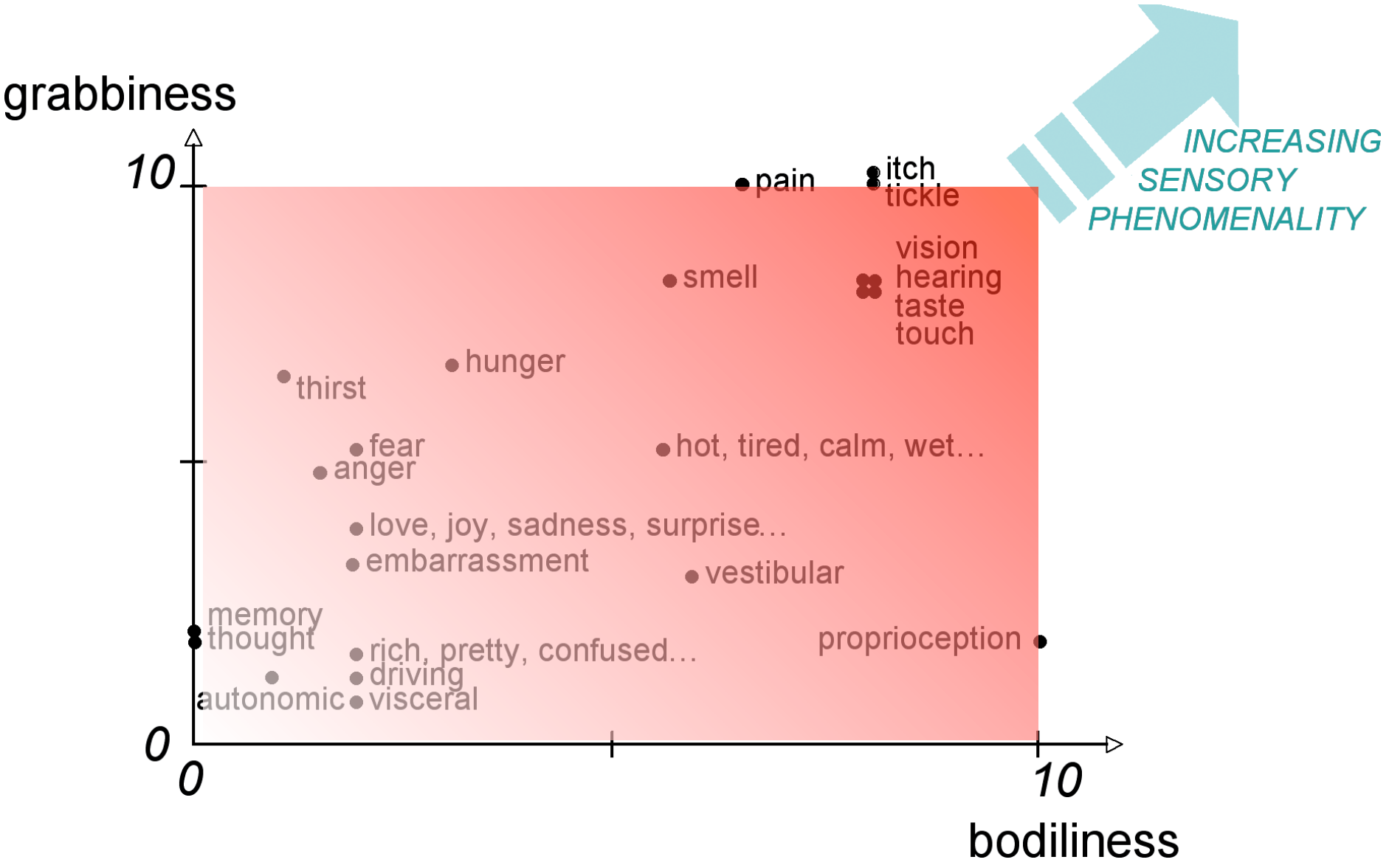
Bodiliness

Insubordinateness

Grabbiness

In summary then, change blindness illustrates how -- along with richness, bodiliness, insubordinateness -- grabbiness is important in determining the feeling of presence we have of our visual world. When we artificially remove grabbiness by using different change blindness paradigms, we no longer have the impression of seeing things.

The “phenomenality plot”



Exactly the same ideas concerning experienced quality of vision can be applied to other sensory experiences, and in fact to all experiences. Looking at the sm laws for such experiences provides a way of comparing and contrasting them, and determining furthermore the extent to which they will possess the mysterious “what it’s like”.

here just plot grabbiness and bodiliness, will consider insubordinateness if we need to.

first: classic senses are on top of diagonal.
memory, thought and autonomic are on bottom of diagonal. Now look at other experiences.

smell: less bodiliness means less “outside of us”, more internal.

proprioception and vestibular sense are interesting. Sensory signals just like the classic sense modalities of seeing, hearing, taste, touche and smell, but we dont feel them consciously.

No good saying that they’re not wired up to conscious brain areas!

seek objective aspects of sm interaction which explain this. Check bodiliness: actually have a high degree, proprioception even higher than other senses.
Check insubordinateness: little but
check grabbiness: little.
so we can explain.

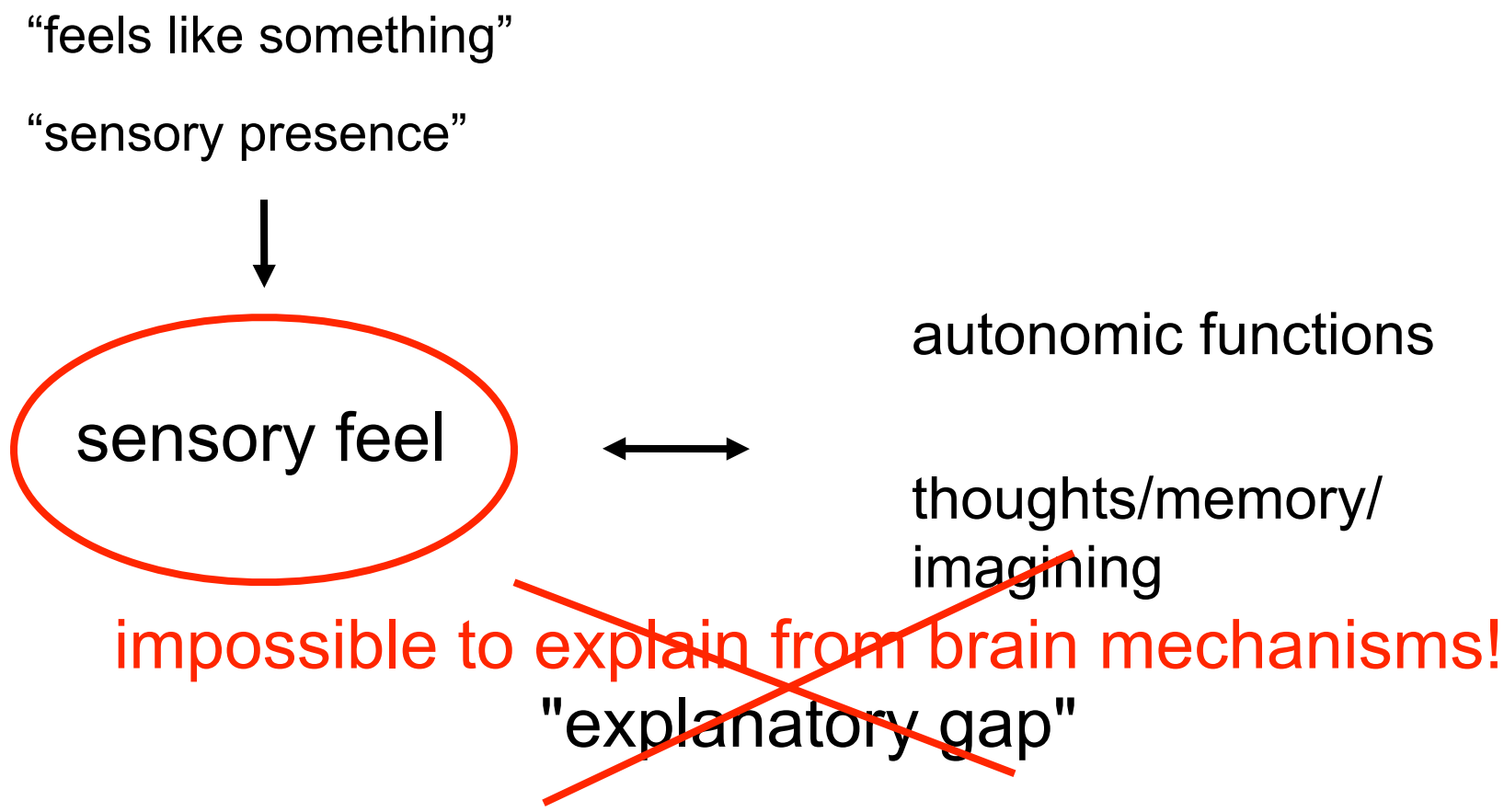
notice visceral sensations.

pain is an interesting case: not so much bodiliness as other sensations, but v high grabbiness. but itches and tickles also have this. Why does pain hurt?

again, a mistake to appeal to special pain circuits in the brain, since we would have to explain what’s special about these circuits. useless to appeal to Need an objective fact about pain interactions. An idea I had is automaticity. but that exists also for itches and tickles. Ultimately I have the impression the hurt of pain is a social construction. Negative social evaluation. Perhaps this explains why pain can be fairly easily controlled through hypnosis.

Take for example autonomic processes, or internal visceral sensory stimulations...

The explanatory gap: 2. Something it's like to feel?



More generally, I consider we have now solved the problem of why feels feel like something, whereas other mental processes do not have anything they're like. Instead of looking at brain mechanisms, we look at the different sensorimotor laws that are involved when we have a sensory feel. These laws are characterised by the fact that they have , bodiliness, insubordinateness and grabbiness. These properties correspond naturally with what we mean when we say feels feel like something.

What does Terminator feel?

cognitive component

self is:

poised to cognitively make use of the fact that:

organism poised to make use of sensory info

Amenable to Science
Easy part of Consciousness
-- soon on iphone/android !!

phenomenal component

"Feel"

"Explanatory gap"

- 1. why feels differ?
  - red / green / ring like a bell?
- 2. why feels "feel like something" ?
  - oxygen, glucose *versus* seeing, hearing

Feel is not amenable to Science !!?
Hard part of Consciousness

At the beginning of the talk i said that there were two components to what Terminator feels a cognitive component and a phenomenal component.

What does Terminator feel?

cognitive component

self is:

poised to cognitively make use of the fact that:

organism poised to make use of sensory info

Amenable to Science
Easy part of Consciousness
-- soon on iphone/android !!

phenomenal component

"Feel"

"Explanatory gap"

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  - oxygen, glucose *versus* seeing, hearing

Feel is not amenable to Science !!?
Hard part of Consciousness

The hard problem was dealing with the phenomenal component, namely the problem of FEEL.

What I have shown you up to now are a few samples of how the sensorimotor approach deals with this problem, and bridges the explanatory gap.

What does Terminator feel?

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poised to cognitively make use of the fact that:

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Amenable to Science
Easy part of Consciousness
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phenomenal component

"Feel"

~~"Explanatory gap"~~

different sensorimotor laws

- 1. why feels differ?
  - red / green / ring like a bell?
- 2. why feels "feel like something" ?
  - oxygen, glucose *versus* seeing, hearing

bodiliness, insubordinateness grabbiness

~~Feel is not amenable to Science !!?~~
~~Hard part of Consciousness~~

It turns out that if we remove the confusion about what feel is, and consider it to be a way of interacting with the environment, then we can get rid of the explanatory gap, and answer the two important questions: namely why feels differ in the way they do, and why feels feel like something at all, rather than feeling like nothing.

The first question is answered by the realization that different feels are different in the way they are because of the different sensorimotor laws that are involved.

The second question is answered by realizing that what we MEAN by there being something it's like to have a feel boils down to 3 objective facts about sensorimotor laws that govern real sensory interactions with the world: namely bodiliness, insubordinateness and grabbiness.

What does Terminator feel?

cognitive component

self is:

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PREDICTIONS:

Sensory Substitution

Color Naming

Rubber Hand Illusion

Change Blindness

phenomenal component

"Feel"

~~"Explanatory gap"~~

different sensorimotor laws

- 1. why feels differ?
  - red / green / ring like a bell?
- 2. why feels "feel like something" ?
  - oxygen, glucose *versus* seeing, hearing

bodiliness, insubordinateness grabbiness

~~Feel is not amenable to Science !!?~~
~~Hard part of Consciousness~~

And these are not just philosophical ideas, they actually give rise to scientific predictions, like the work I told you about concerning sensory substitution, Color Naming, the rubber hand illusion, and Change Blindness.

What does Terminator feel?

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self is:

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~~Hard part of Consciousness~~

But now let's go back to look at what Terminator feels. We've seen that the phenomenal component of what he feels no longer poses a problem if we get rid of the confusion about the explanatory gap, and adopt the sensorimotor approach to deal with feel.

What does Terminator feel?

cognitive component

self is:

poised to cognitively make use of the fact that:

organism poised to make use of sensory info

Amenable to Science
Easy part of Consciousness
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phenomenal component

"Feel"

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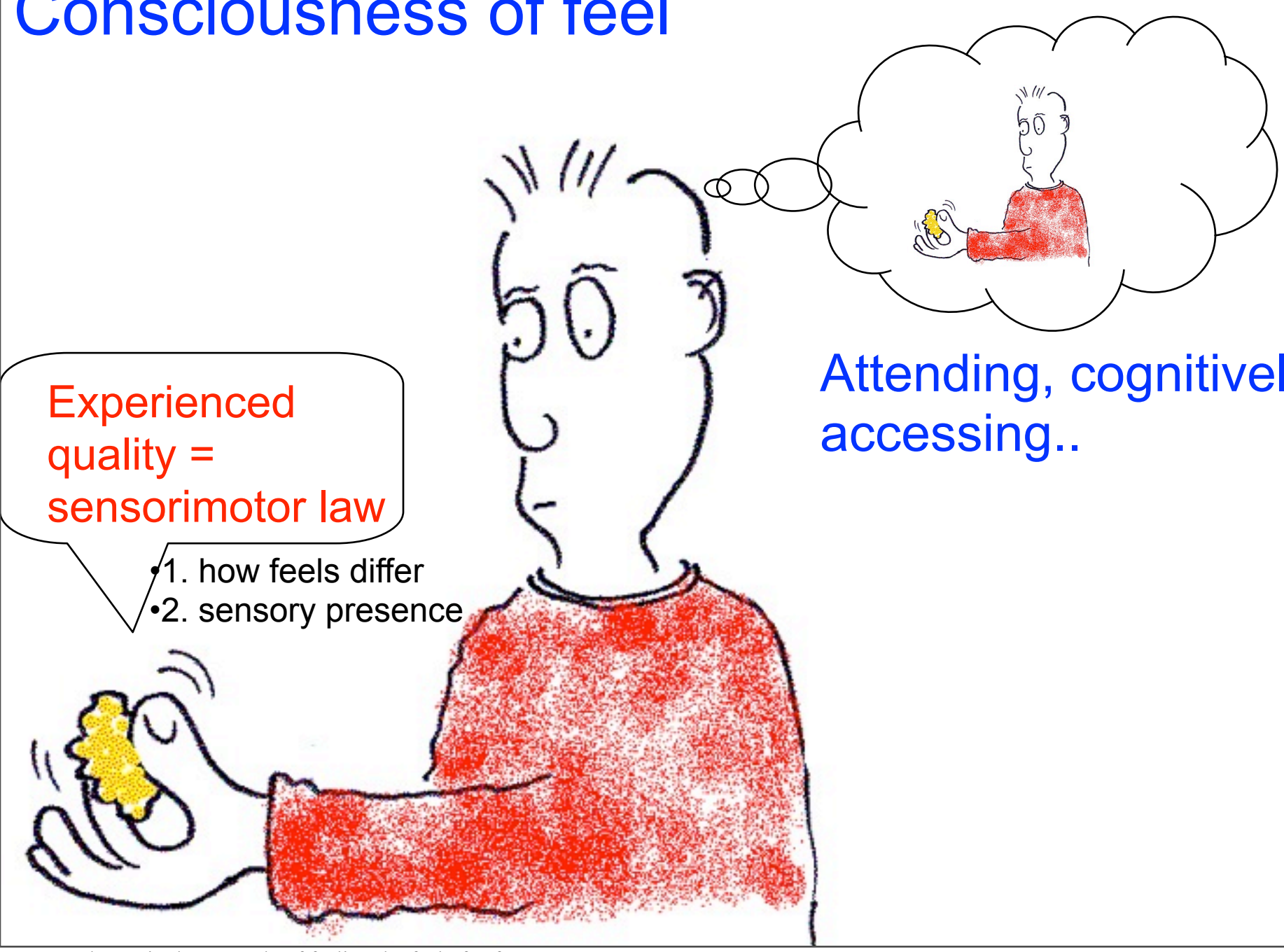
Amenable to Science

The phenomenal component of feel is now amenable to science just like the cognitive component.

Let me now look in more detail at the relation between the two components.

Consciousness of feel



Let's take again the example of feeling the feel of softness.

Under the sensorimotor approach, the experienced quality of the softness lies in the ....

We can explain the two a priori mysterious things ...

But notice that this is just an abstract law that describes the quality of the interaction.

You could have a mechanical squishing machine...

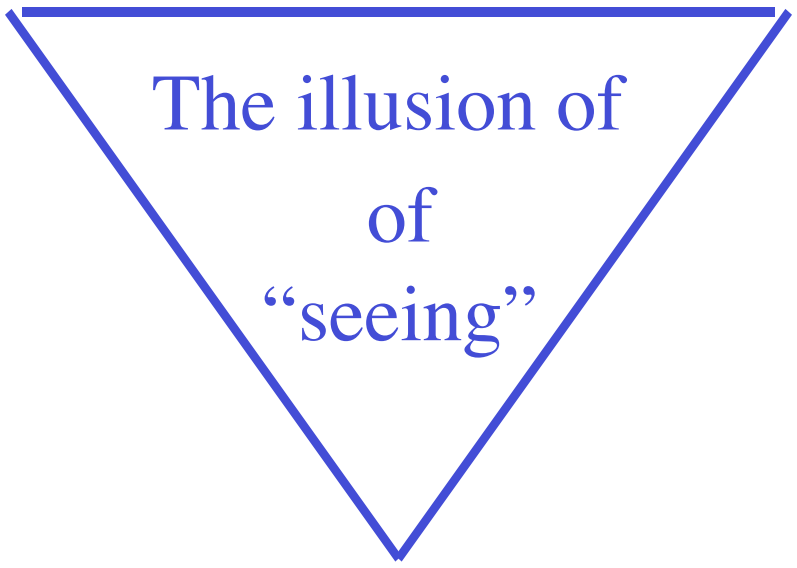
For the person to be really experiencing the feel, the person must be attending, cognitively accessing...

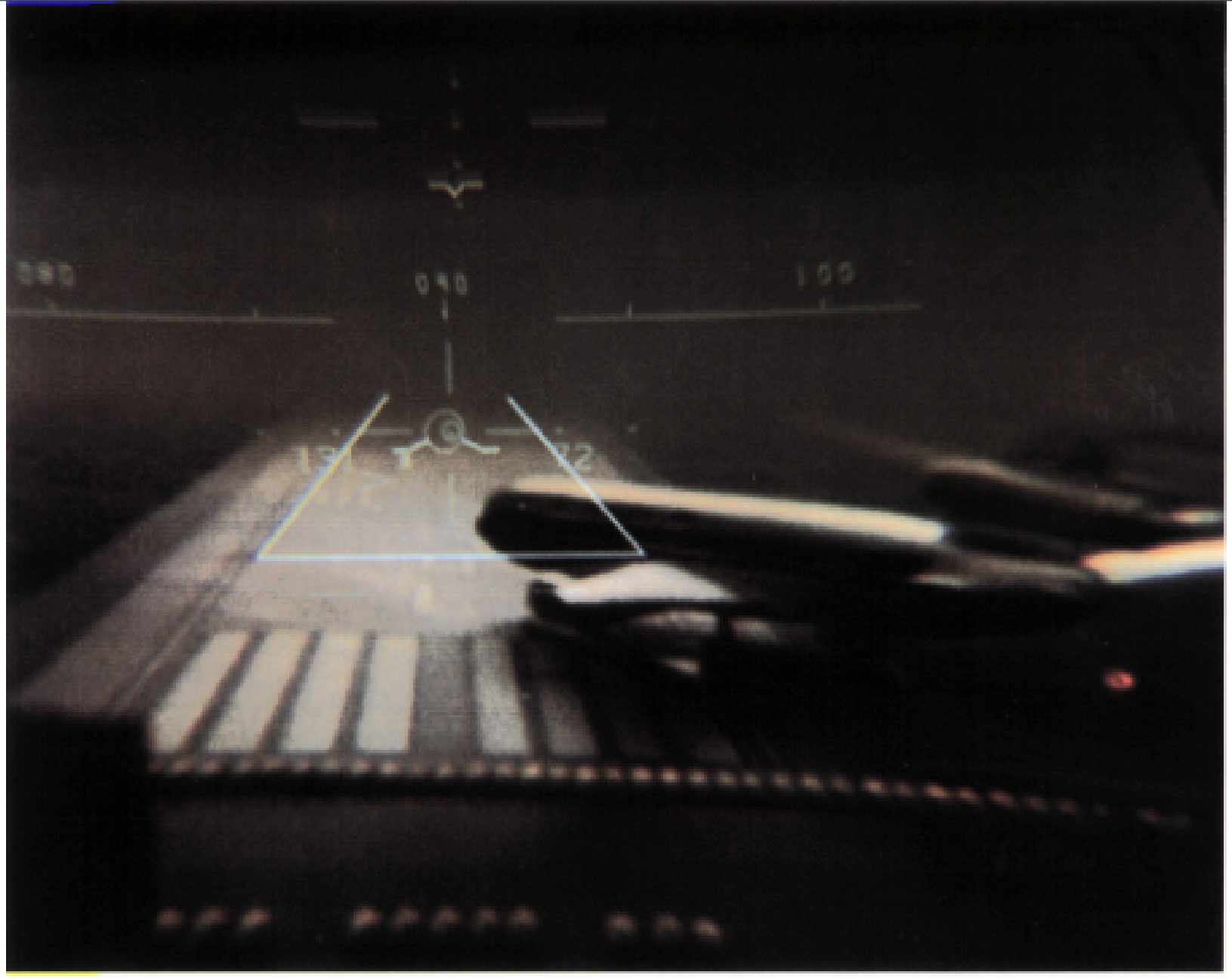
But I think this poses no theoretical problem. I would like to claim that what we mean by consciously experiencing a feel is: cognitively accessing the quality of the sensorimotor interaction we are currently engaged in.

As an example, take the opposite case:

Take driving down the highway as you daydream thinking of something else. When you do this you would not say you are in the process of experiencing the driving feeling, the stoplights you stop at or the cars you pass. or at least only in a "background" manner.

For you to actually experience something you have to be concentrating your attention on it, you have to be cognitively engaging in the fact that you are exercising the particular sensorimotor interaction involved.


The illusion of
of
“seeing”



Haines, 1991. Ames Res. Center, NASA

As seen in Table 17-1, two pilots never saw the obstructing airplane in front of them at all. Both of these runs were with HUD first; i.e., they were the pilots' first exposure to the obstruction with the HUD present. Pilot D was a First Officer with about 2000 hr in the 727; his performance with both head-down instruments and the HUD was considered good. He

flew 21 data runs prior to the first obstacle encounter. The obstruction became increasingly visible about 4 sec after breakout from the fog and cloud layer, yet the pilot gave no indication of seeing it. He was pleased with his approach "setup," as indicated by his comments (altitude given in parentheses):

oh, it looks good (110 ft altitude). . . the HUD looks good (90 ft) . . ." The experimenter terminated the run at an altitude of about 67 ft* when he said, "Oh, wait a minute! It looked good, the flare bars were coming up. . . then the picture disappeared." The subsequent conversation between the First Officer and the Captain was, "I saw an airplane. Did you see it?" "No." "You didn't see it?" "No, sir."

Pilot F was a high-flight-time Captain who demonstrated exceptionally good performance both with and without HUD. The runway obstruction run was his seventh data run. He indicated his "Decision (140 ft) . . to land (110 ft)," and proceeded to do so. The experimenter terminated the run at an altitude of 50 ft. * The pilot was surprised. Captain:

"Didn't get to flare on this one." First Officer "No you didn't . . . I was just looking up as it (the picture) disappeared, and I thought I saw something on the runway. Did you see anything?" Captain: "No, I did not." The experimenters suggested that an equipment failure was probably to blame. Both of these pilots saw the obstruction during the second exposure without HUD (13 runs and 21 runs later, respectively) and executed missed approaches. Later, when he was shown the videotape of this run, Pilot D said, "If I didn't see it (the tape), I wouldn't believe it. I honestly didn't see anything on that runway."

LBFTS
"Looked But
FailedTo See"

Mother and son killed in collision with morning train

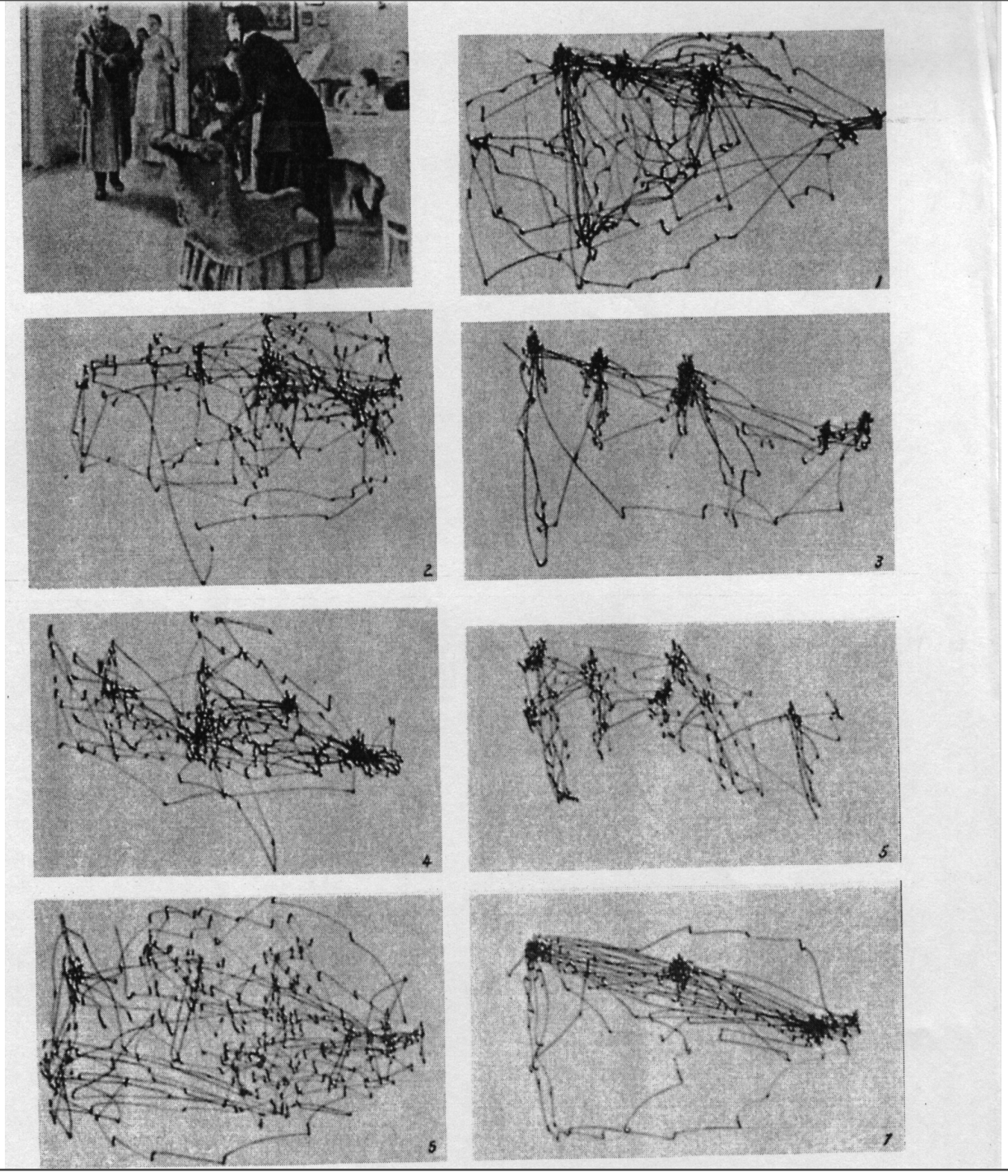
OTA, Gunma -- A woman and her son died after she drove her car through the closed gate of a railway crossing here and hit an oncoming train early Thursday morning, police said.

The woman was rushing to a nearby station so that her son could catch his regular train, according to investigators.

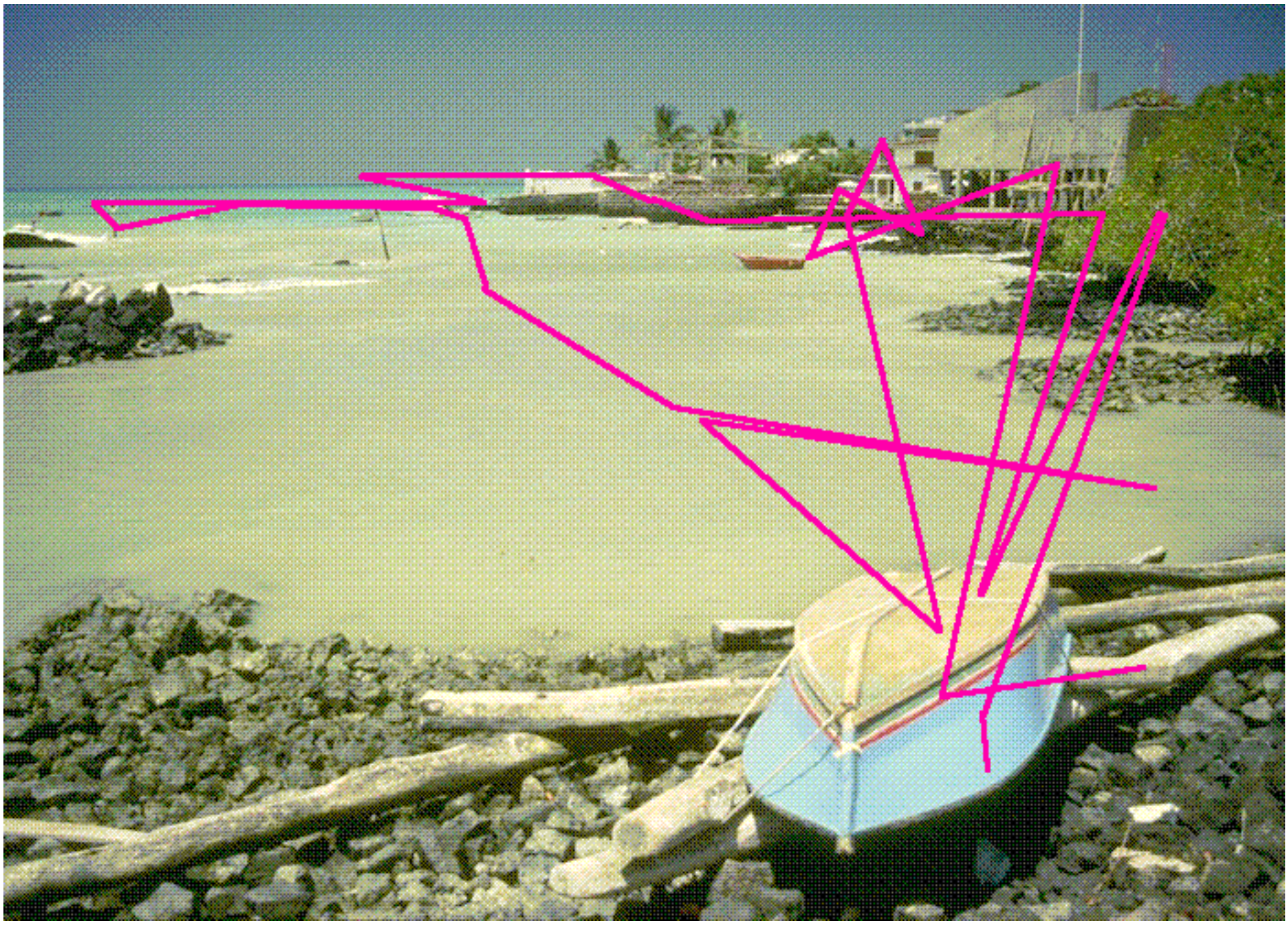
Mainichi Shimbun

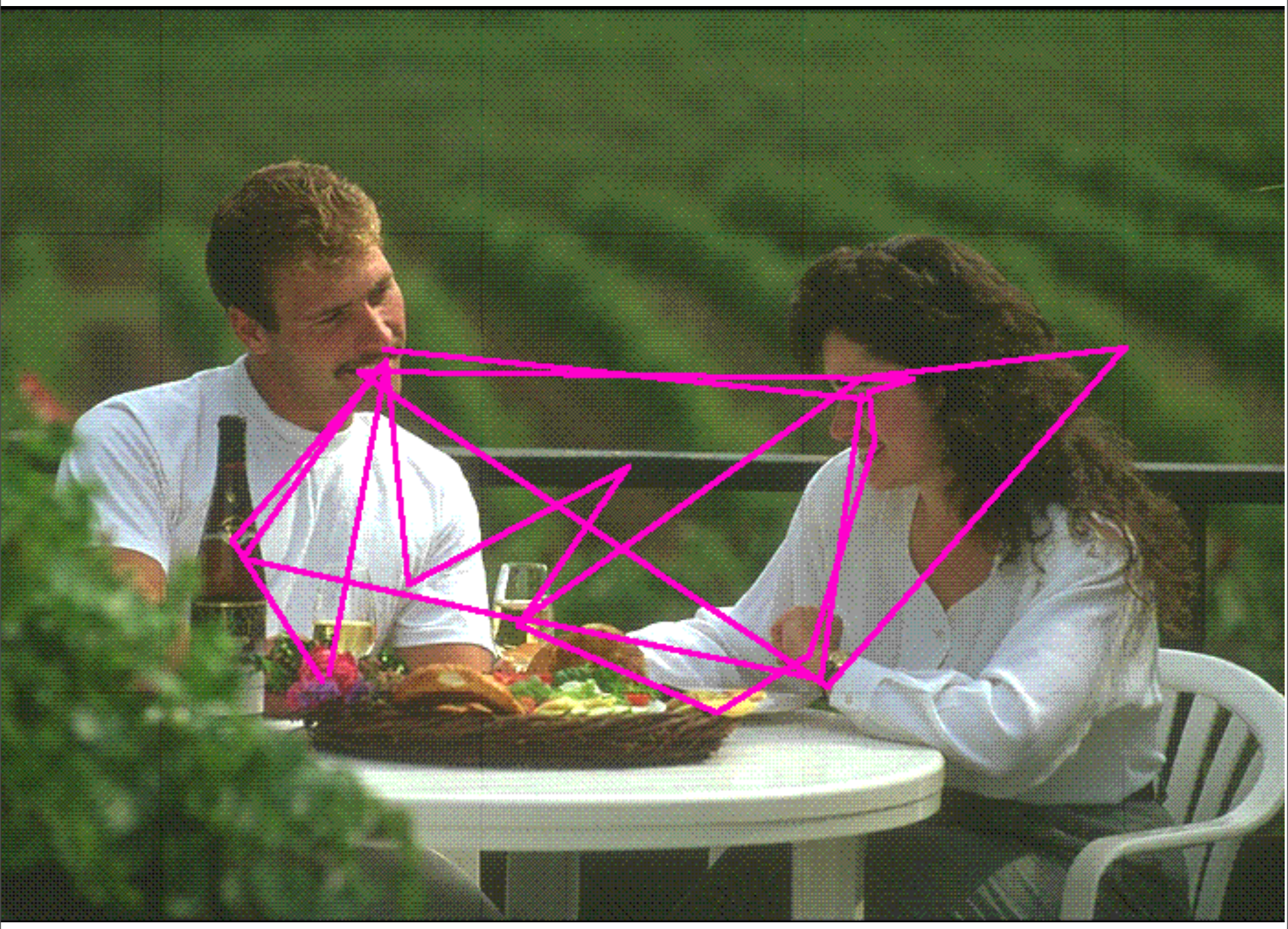
A wrecked car lies near a train that hit it on a crossing in Ota, Gunma Prefecture, Thursday morning.

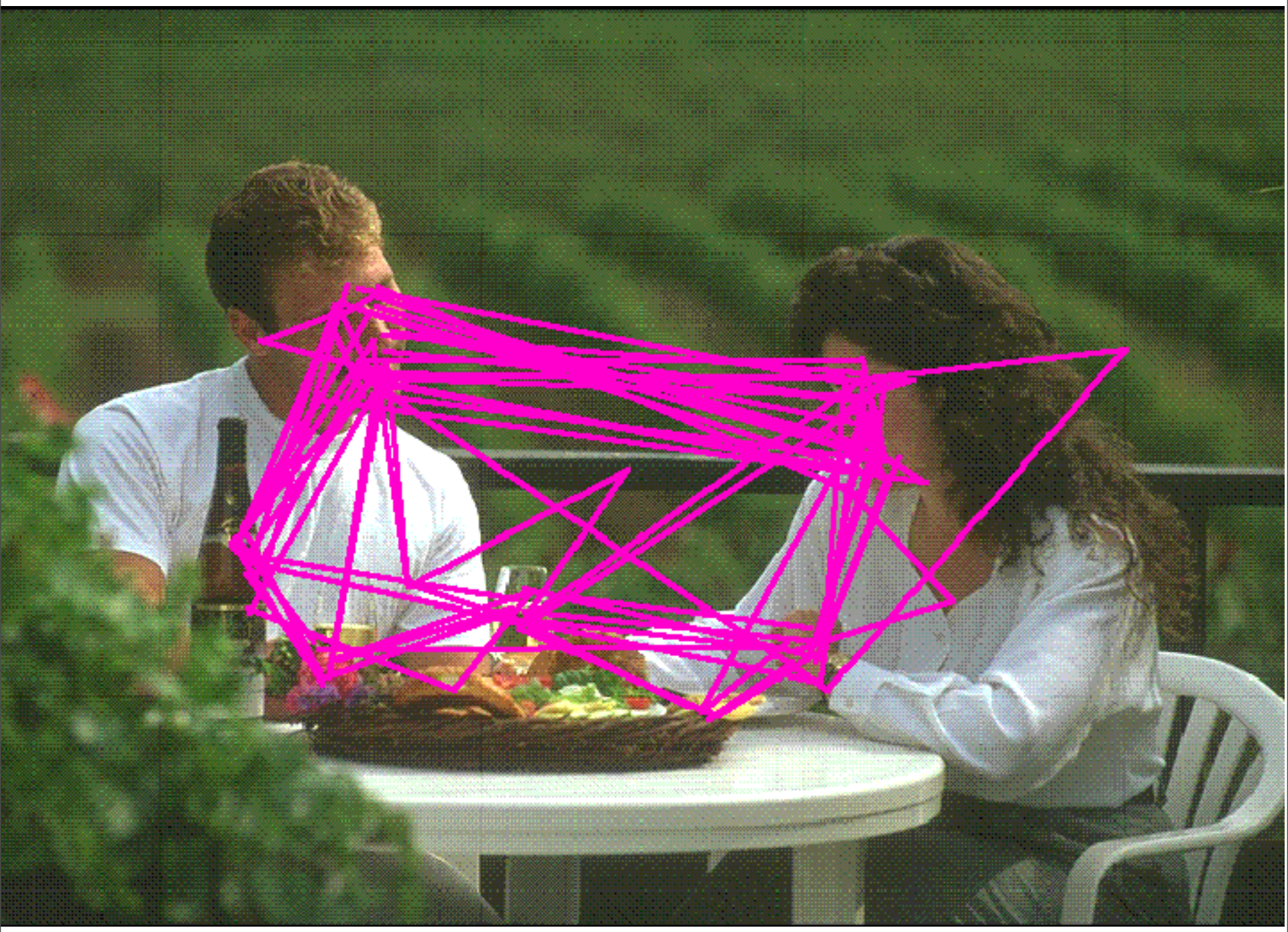
At around 5:20 a.m., the car driven by Yoko Kobayashi, 46, an office worker from Isesaki, Gunma Prefecture, drove through the gate of a crossing on the Tobu Isesaki Line near Nirakawa Station, police said. It hit a semi express train bound for Tokyo's Asakusa from Ota and was sent flying more than 10 meters.



Yarbus,
1978







Seeing continuously

Auvray & O'Regan

Psychologists are of course very interested in attention, and do interesting experiments to test your ability to put your attention on something when all sorts of other things are going on in the visual field.

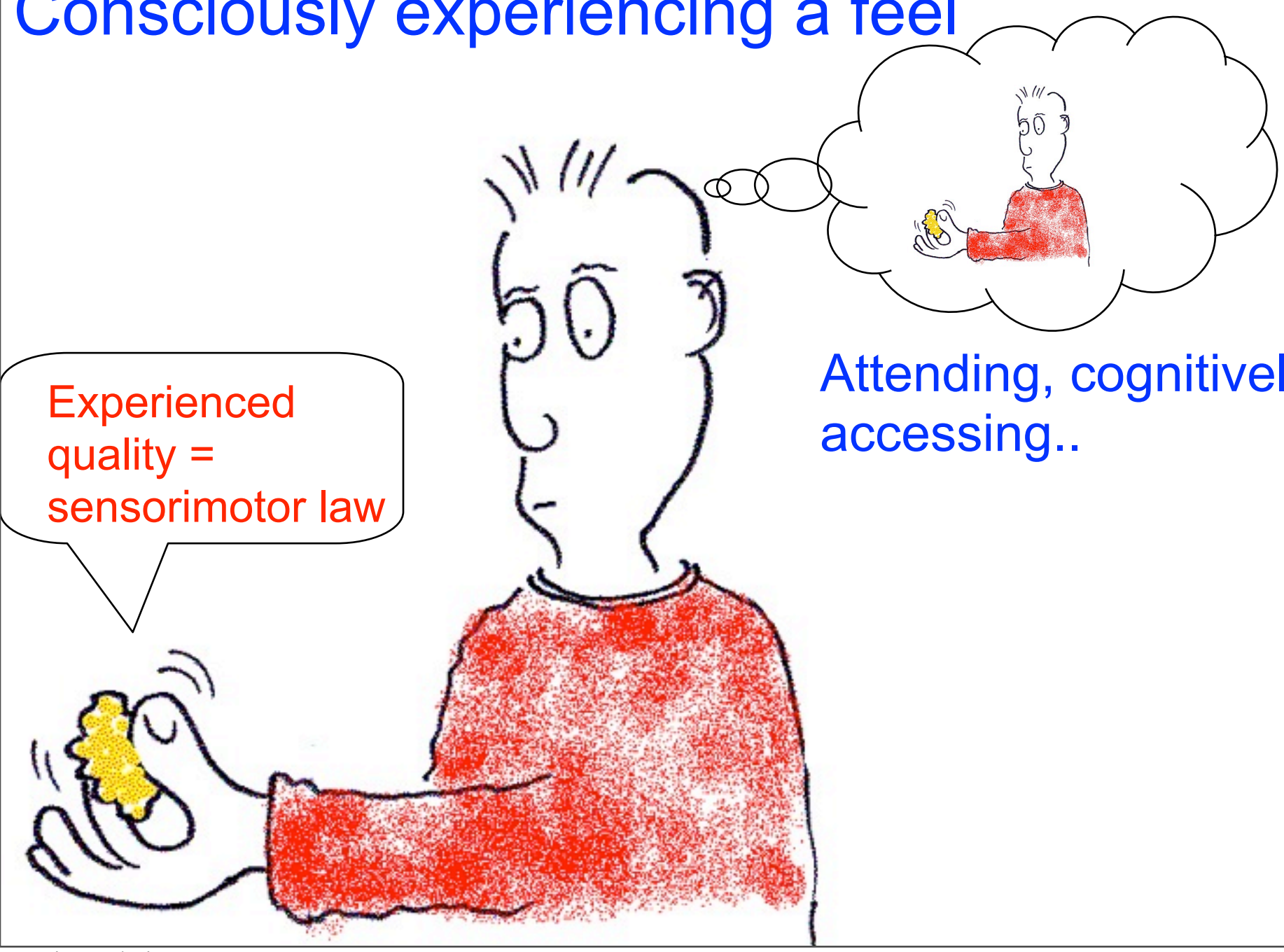
Here's an example made by my ex student Malika Auvray, where you have to follow the coin under the cup. It's a bit tricky because there are lots of hands and cups all moving around: so concentrate!

At the end of the sequence : did you see anything bizarre?

It was the green pepper replacing one of the cups. Many people don’t notice this at all, presumably because they're busy following the coin. And this is despite the fact that the green pepper is in full view and perfectly obvious.

Inattentional blindness (Neisser; Mack & Rock; Simons & Chabris, 2000

Consciously experiencing a feel



So in conclusion up to now:

Consciously experiencing a feel requires you first to be engaged in the skill implied by that feel. If the skill has the properties that sensory feel have, that is, if it has richness, bodiliness, insubordinateness and grabbiness, then it will have the sensory presence or "what it's like" that real sensory feels possess.

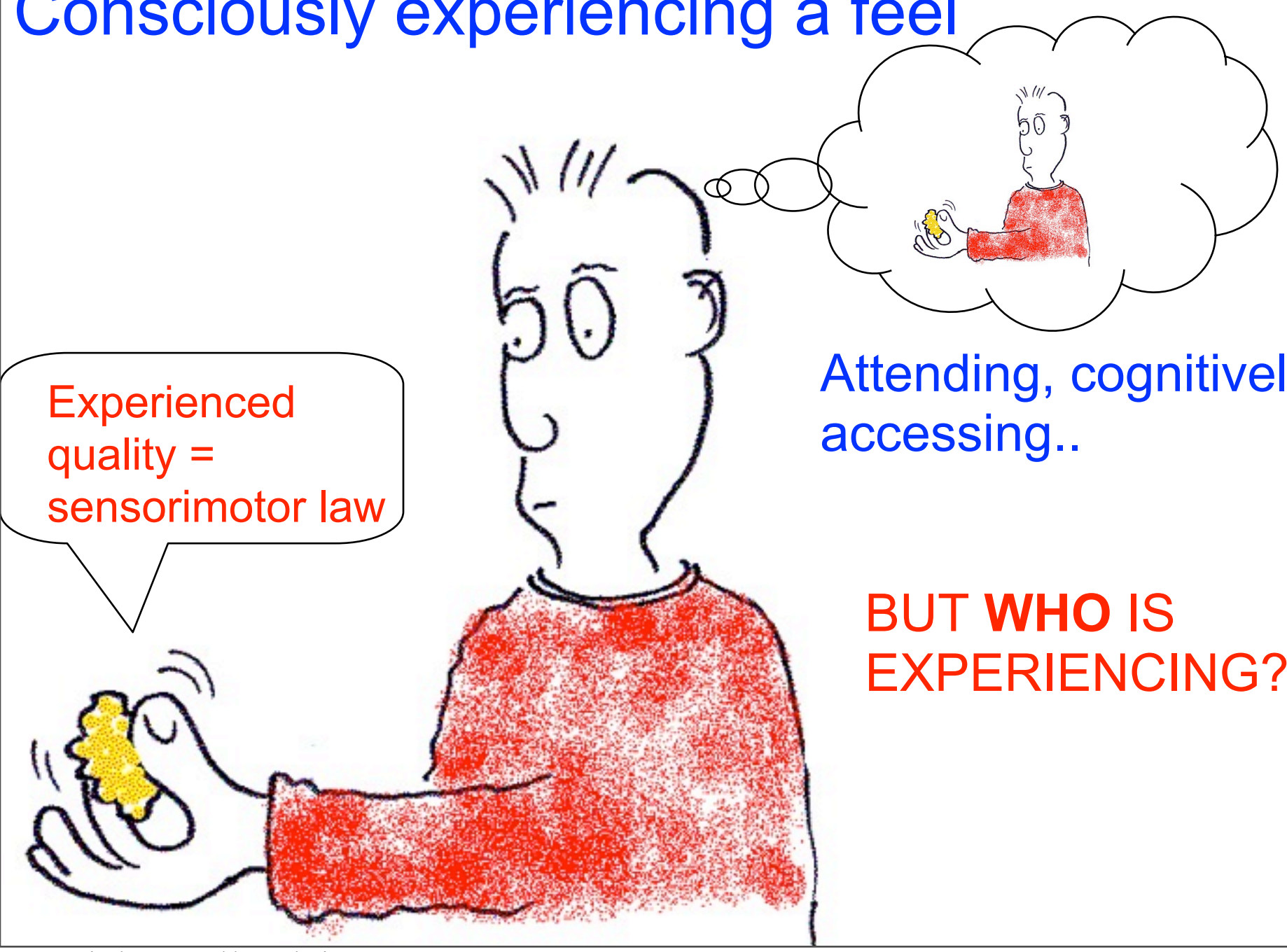
If then you are attending, or cognitively accessing the feel, you will be conscious that you are doing so.

So let’s take the example of consciously experiencing the feel of softness of a sponge. Does this scheme adequately account for what it’s like to experience softness?

First of all, what does consciously experiencing the quality of softness mean? It means attending to the fact that the laws of softness are currently being obeyed by what youre doing.

Then what does consciously noting that there is something it’s like, rather than nothing it’s like mean? It means attending to the fact that potentially your interaction with the sponge at this moment possesses qualities that give the interaction the typical presence of real sensory interactions: you know, when you’re intereacting witht he sponge that you cannot describe all the things about this interaction, there are so many things to describe. You know that if you move your body, ... you know grabbiness...

Consciously experiencing a feel



Attending, cognitively accessing..

BUT **WHO** IS EXPERIENCING?

But wait, there's a problem: who is "you"?!

It doesn't make much sense to say that a person or an agent is consciously experiencing the feel, unless the person or agent exists as a person, that is unless the agent has what we call a SELF.

The cognitive self

Self distinguishing

Self knowledge

- Goals, planning, (reasoning)

Knowledge of self knowledge

- “Theory of mind”, empathy, beliefs, desires, motivations
- selfishness, cooperation, misleading,
- shame, pride, embarrassment, contempt…
- (language), “intentional stance” (Dennett),

Is this a problem for science? Philosophers have looked carefully at the problem posed by the notion of self and come to the conclusion that though the problem is tricky, it is not a "hard" problem in the same sense as the problem of feel was.

One aspect of the self is what could be called the COGNITIVE self, which involves a hierarchy of cognitive capacities.

At the simplest level is "self-distinguishing", that is the ability for a system or organism to distinguish its body from the outside world and from the bodies of other systems or organisms.

The next level is "self-knowledge". Self knowledge is something a bird or mouse must possess in order to distinguish its body from the world, and from other individuals. On the other hand the bird or mouse *as an individual* has no concept of the fact that it is doing these things, nor that it even exists as an individual.

Having that kind of meta-knowledge is situated at the next level of my classification. It is really only found in primates.

The individual can have a "Theory of Mind", that is, it can empathize with others, and interpret other individuals' acts in terms of beliefs, desires and motivations. This gives rise to social interactions ranging from selfishness to cooperation to misleading, and involving notions like shame, embarrassment, pride, and contempt.

Knowledge of self-knowledge is most typically human, and may involve language. It underlies what philosopher Daniel Dennett calls the "intentional stance" that humans adopt in their interactions with

The cognitive self

Self distinguishing

Self knowledge

- Goals, planning, (reasoning)

Knowledge of self knowledge

- “Theory of mind”, empathy, beliefs, desires, motivations
- selfishness, cooperation, misleading,
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- (language), “intentional stance” (Dennett),

ACCESSIBLE TO SCIENCE !

Accessible to science

The sense of “I”

Who is I?

- cognitive/social construct
- useful abstraction
- “narrative fiction” (D. Dennett)

Why so real?

- Self-validating (like money!)
- Self-referring

On the other hand there does still seem to be something missing. We as humans have the strong impression that there is someone, namely ourselves, "behind the commands".

It is I doing the thinking, acting, deciding and feeling. How can the self seem so real to us, and who or what is the "I" that has this impression?

And here I want to appeal to current research in social and developmental psychology. Scientists in these fields agree that although we have the intimate conviction that we are an individual with a single unified self, the self is actually a *construction* with different, more or less compatible facets that each of us gradually builds as we grow up.

The idea is that the self is a useful abstraction that our brains use to describe, first to others and then later to ourselves, the mental states that "we" as individual entities in a social context have. It is what Dennett has called a narrative fiction.

But then how can the self seem to us to be so real? The reason is that seeming real is part of the narration that has been constructed. The cognitive construction our brains have developed is a self-validating construction whose primal characteristic is precisely that we should be individually and socially convinced that it is real.

It's a bit like money: money is only bits of metal or paper. It seems real to us because we are all convinced that it should be real. By virtue of that self-validating fact, money actually becomes very real: indeed, society in its current form would fall apart without it.

The sense of “I” (ctd)

The impossibility of changing “I”

Part of story. Danger to society

Breaking the taboo:

Voluntarily: "culturally bound" syndromes

- Possession trances, ecstasies, channeling, oracles, latah, amok, koro, zar, hypnosis

Involuntarily:

- Abuse, brainwashing, cults, war, PTS, Dissociative Identity Disorder (MPD)

But actually this does not work. It is necessarily part of the very construction of the social notion of self, that we must be convinced that it is very difficult to change our selves. After all, society would fall apart if people could change their personalities from moment to moment.

But couldn't we by force of will just mentally overcome this taboo? If the self is really just a story, changing the self should surely in fact be very easy.

It turns out that we can under some circumstances break the taboo and flip into altered states where we become different, or even someone else. Such states can be obtained voluntarily through a variety of "culturally bound" techniques like possession trances among others, or sometimes involuntarily under strong psychological stress.

Hypnosis is interesting because it is so easy to induce, confirming the idea that the self is a story we can easily control if we could only decide to break the taboo. Basic texts on hypnosis generally provide an induction technique that can be used by a complete novice to hypnotize someone else. This suggests that submitting to hypnosis is a matter of choosing to play out a role that society has familiarized us with, namely "the role of being hypnotised". It is a culturally accepted loophole in the taboo, a loophole which allows people to explore a different story of "I". An indication that it is truly cultural is that hypnosis only works in societies where the notion is known. You can't hypnotise people unless they've heard of hypnosis.

This is not to say that the hypnotic state is a pretense. On the contrary, it is a convincing story to the hypnotized subject, just as convincing as the normal story of self. So convincing, in fact, that clinicians are using it more and more in their practices, for example in complementing or replacing

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The impossibility of changing “I”

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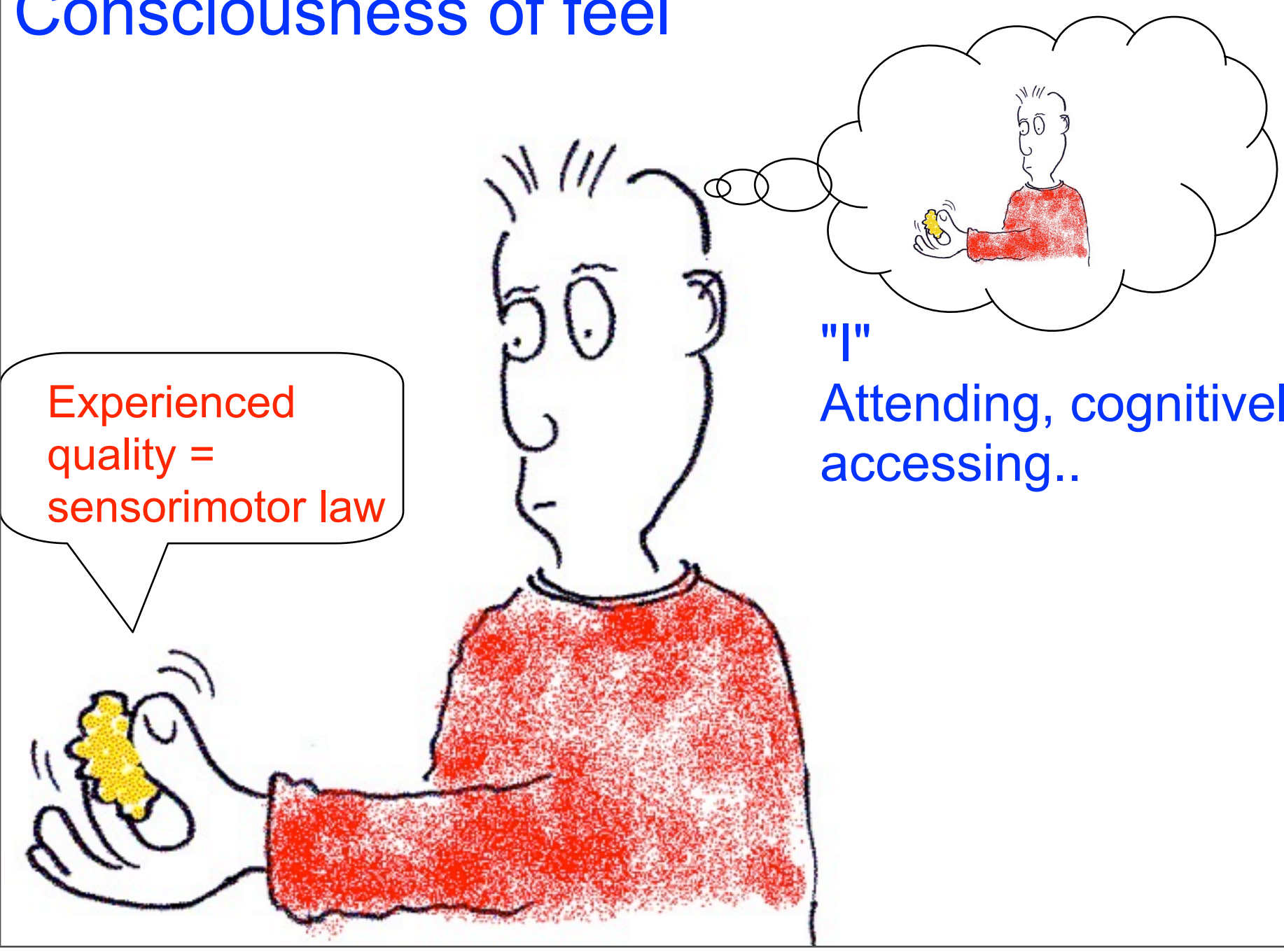
ACCESSIBLE TO SCIENCE !

Accessible to science!

Consciousness of feel



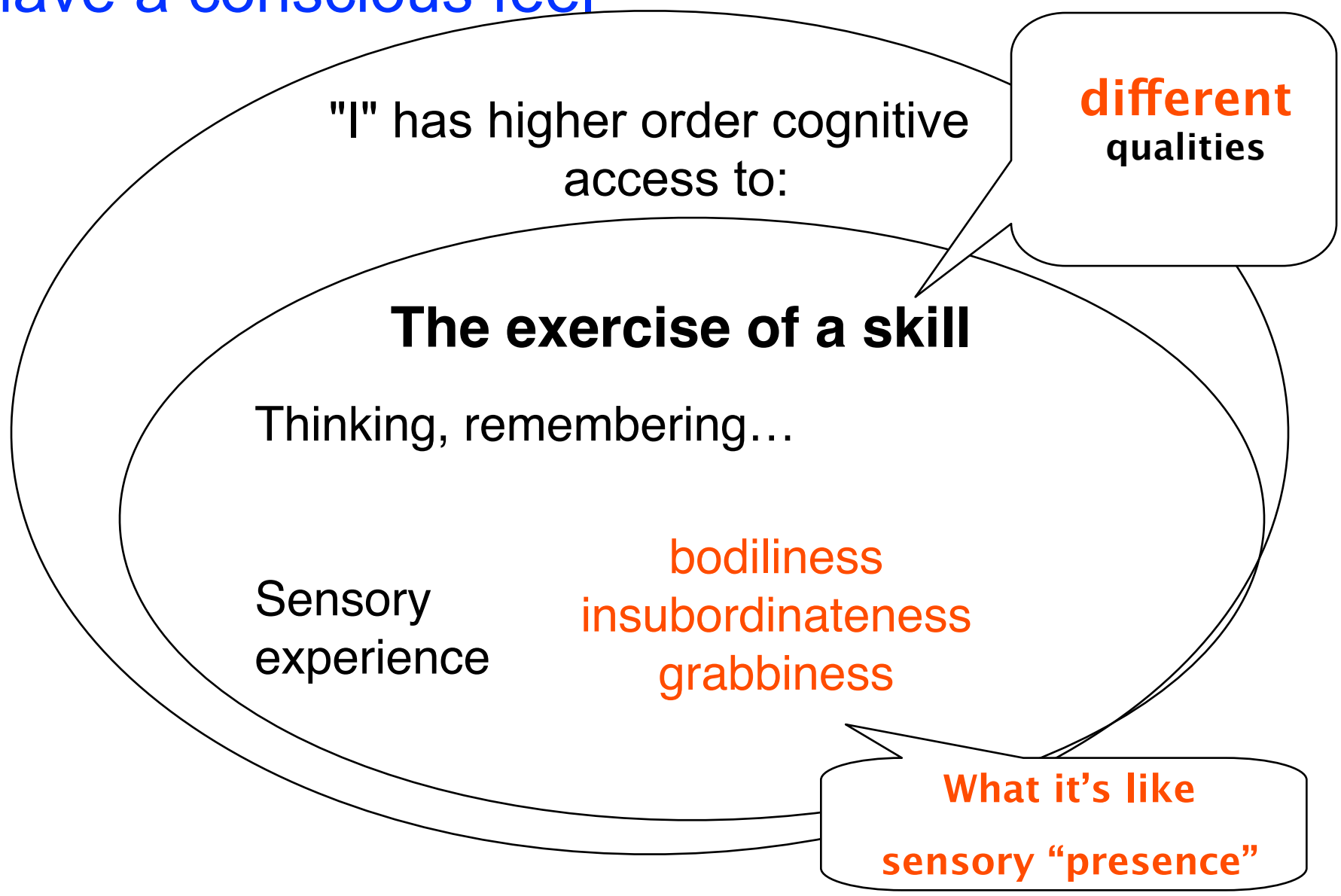
So we can now finally come to the conclusion. The idea is that I have a conscious phenomenal experience when this social construct of "I" engages cognitively in the exercise of a sensorimotor interaction with the environment

The experienced quality of the feel will be constituted by the sensorimotor law that underlies the interaction that is taking place.

The reason the qualities of feel appear ineffable, the reason they have structure and presence or "what it's likeness" falls out naturally from the nature of the sensorimotor laws.

In particular, the more the interaction with the environment involves the properties of richness, bodiliness, insubordinateness and grabbiness, the more the quality will have sensory presence. The more it will seem like there's "something it's like" to have the feel.

I have a conscious feel



So we can now finally come to the conclusion. The idea is that I have a conscious phenomenal experience when this social construct of "I" engages cognitively in the exercise of a skill. If the skill is a purely mental skill like thinking or remembering it will have no sensory quality. But if it involves a sensorimotor interaction with the environment, then it will have, bodiliness, insubordinateness, and grabbiness. In that case it will have the "presence" or "what it is likeness" of a sensory experience.

Notice that there are two different mechanisms involved here. The outside part, the knowing part is a cognitive thing, it involves cognitive processing, paying attention. There is nothing magical about this however, it is simply a mechanism that brings cognitive processing to bear on something so that that thing becomes available to one's rational activities, to one's abilities to make decisions, judgments, possibly linguistic utterances about something. It is perhaps what Ned Block calls access consciousness.

The inside part is the skill involved in a particular experience. It is something that you do. Your brain knows how to do it, and has mastery of the skill in the sense that it is tuned to the possible things that might happen when it ...

The outside, cognitive part determines WHETHER you consciously sense the experience.

The inside, skill part, determines WHAT the experience is like.

What does Terminator feel?

cognitive component

self is:

poised to cognitively make use of the fact that:

organism poised to make use of sensory info

Amenable to Science
Easy part of Consciousness
-- soon on iphone/android !!

phenomenal component

"Feel"

~~"Explanatory gap"~~

- 1. why feels differ?
  - red / green / ring like a bell?
- 2. why feels "feel like something" ?
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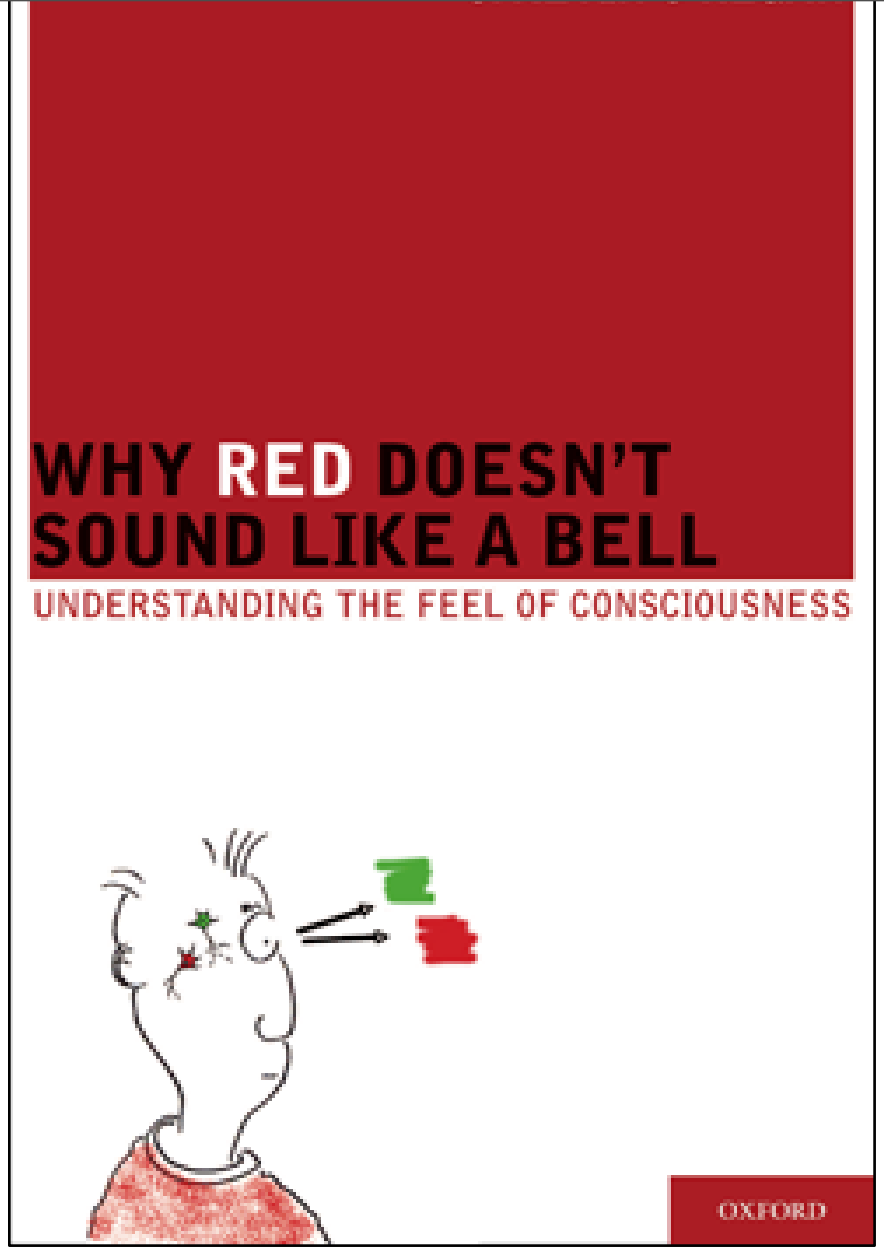
Amenable to Science

So in conclusion... both the cognitive and phenomenal part of Feel are amenable to science...



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http://www.kevin-oregan.net