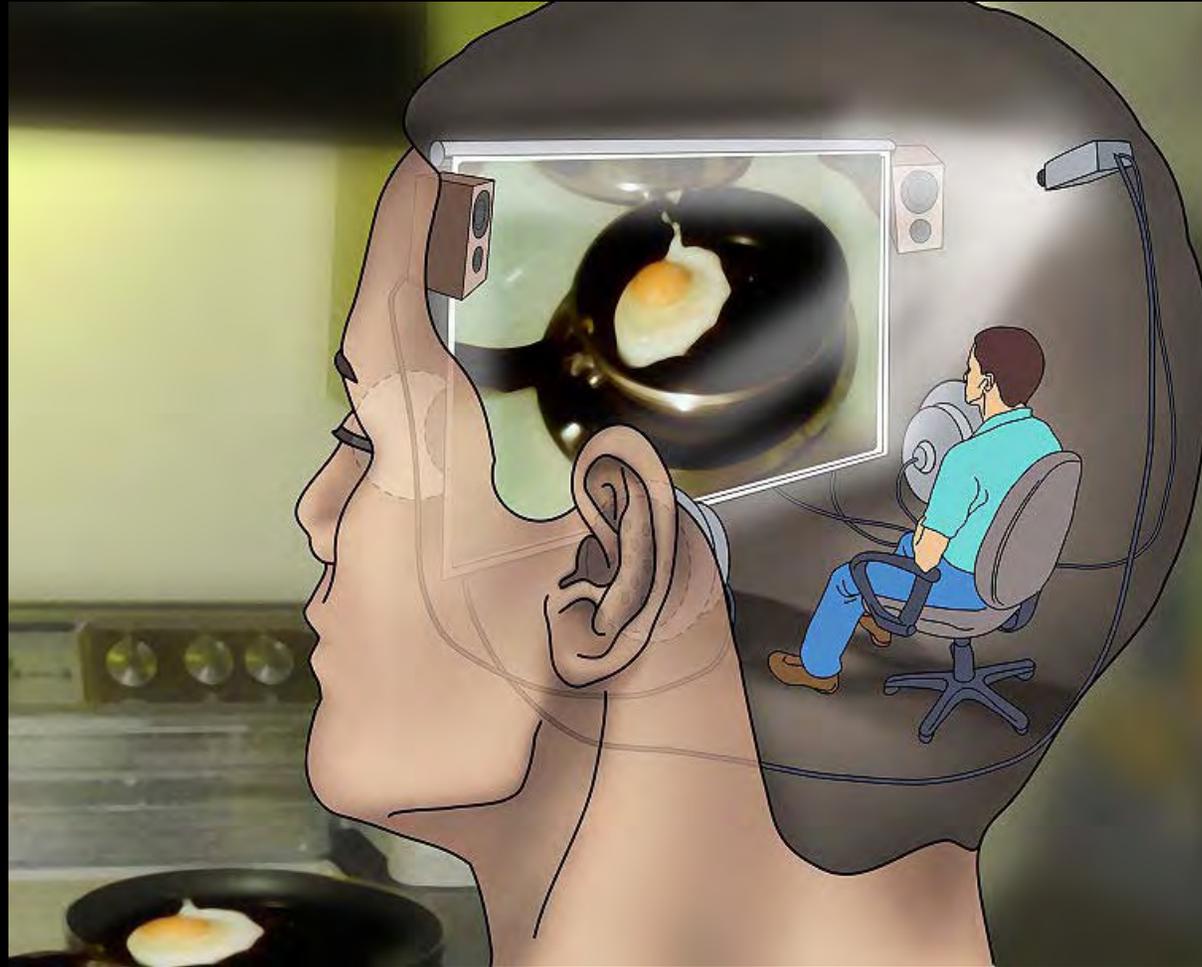


# The Transparent Brain



Ulrich Mohrhoff  
Sri Aurobindo International Centre of Education  
Pondicherry, India

In what sense is **this** a faithful depiction of **this**?



## Three arguments against faithful depiction:

1. We don't expect the sensory system of a cockroach or a chipmunk to reveal the true nature of reality. Why should our sensory system be different? The phenomenal/visual world is a species-specific user interface. A user interface—like the computer desktop with its icons—is useful precisely because its content does *not* resemble what it represents.
2. Vision is now widely regarded as a process of construction, which is guided by
  - (i) surprisingly sparse sensory data and
  - (ii) surprisingly elaborate rules.Why should this construction be a *re*-construction?
3. The construction of the visual world conforms to principles that differ greatly from the principles that structure the physical world. For instance, while bounding surfaces play a fundamental role in the construction of the visual world, there is no such thing as the boundary or surface of a particle, atom, or molecule.

In physics one has to make a distinction between two worlds:

- the so-called “macroworld” (a.k.a. the “classical domain”)
- the so-called “microworld” (a.k.a. the “quantum domain”)

Understanding the relation between these two “worlds” is essential for understanding the relation between the cherry “made of molecules” and the cherry “made of qualia.”

The relation of the microworld to the macroworld is one of *supervenience* :

Molecules, atoms, and subatomic particles are what they are because of what happens or is the case in the macroworld, rather than the other way round, as we are wont to think.

In the microworld, a property exists only to the extent that its possession is indicated by—or inferable from—an actual event or state of affairs (a “measurement”). In the microworld, to *be* is to be *measured*.

By analyzing the manner in which quantum mechanics assigns probabilities to measurement outcomes, one arrives at the following conclusions:

- The so-called “ultimate constituents” of matter, considered by themselves, are identical in the strong sense of *numerical identity*.
- Physical space is “made of” (more or less fuzzy) relations between formless relata. (The shapes of things are made of spatial relations. An object without parts, lacking internal spatial relations, is therefore formless.)

The world thus contains exactly one substance. If we call it **UR** (for “ultimate reality,” or after the German prefix “ur-” meaning “original” or “primary”), we have this:

- By the simple device of entering into spatial relations with itself, UR creates both matter and space, for space is the totality of existing spatial relations, while matter is the corresponding apparent multitude of relata—“apparent” because the relations are *self*-relations.

Now we seem to have *three* worlds—the phenomenal world, the macroworld, and the microworld—and we may be tempted to make the following identifications...

- macroworld = phenomenal world
- microworld = real world

...and thereby vindicate the old myth that the senses give us appearances, while science describes things as they *really* are.

But this doesn't square with the supervenience of the microworld on the macroworld.

It is no longer appropriate to ask:

What are the ultimate building blocks,  
and how do they interact and combine?

The right question to ask is:

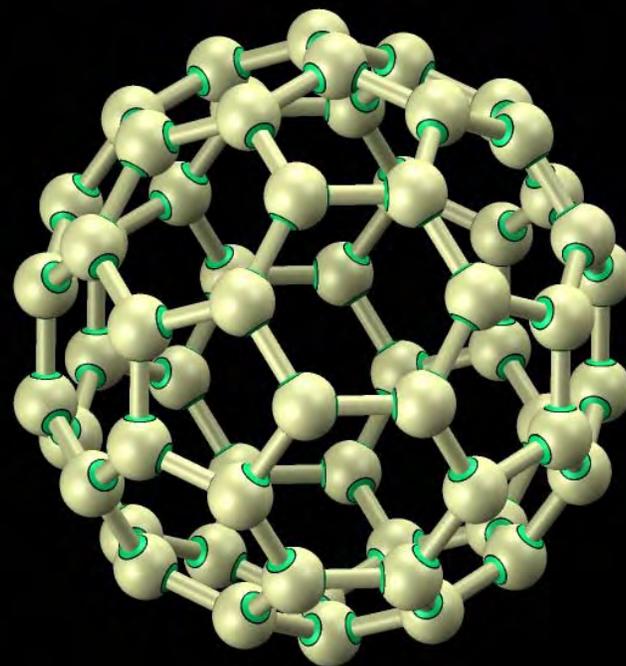
How does UR manifest itself?

The macroworld is the *manifested* world. Quantum mechanics affords us a glimpse at what lies “behind” the manifested world, but this is not another world. Particles, atoms, and such do not inhabit another world, nor are they the manifested world's constituent parts or structures. They are instrumental in its manifestation. They are intermediate between UR and the world.

This conclusion is supported by the fact that quantum mechanics explains how form arises from formless UR, via an (apparent) multitude of formless relata.

Forms in the widest sense are sets of fuzzy spatial relations; they can only be described abstractly, as multidimensional probability distributions. This applies, in particular, to the forms of atoms.

Forms in a narrower sense can be visualized “as they are.” The smallest structure that can so be visualized corresponds to the sticks in the chemist’s balls-and-sticks model of a molecule.



But quantum mechanics does not allow us to describe what is instrumental in the world’s manifestation except in terms of the finished product—the manifested world. Hence the supervenience of the microscopic on the macroscopic.

Let's return to the arguments against faithful depiction.

The third argument—invoking structural differences between the phenomenal world and the physical world—was a red herring. The “principles that structure the physical world” are actually principles involved in the world's manifestation.

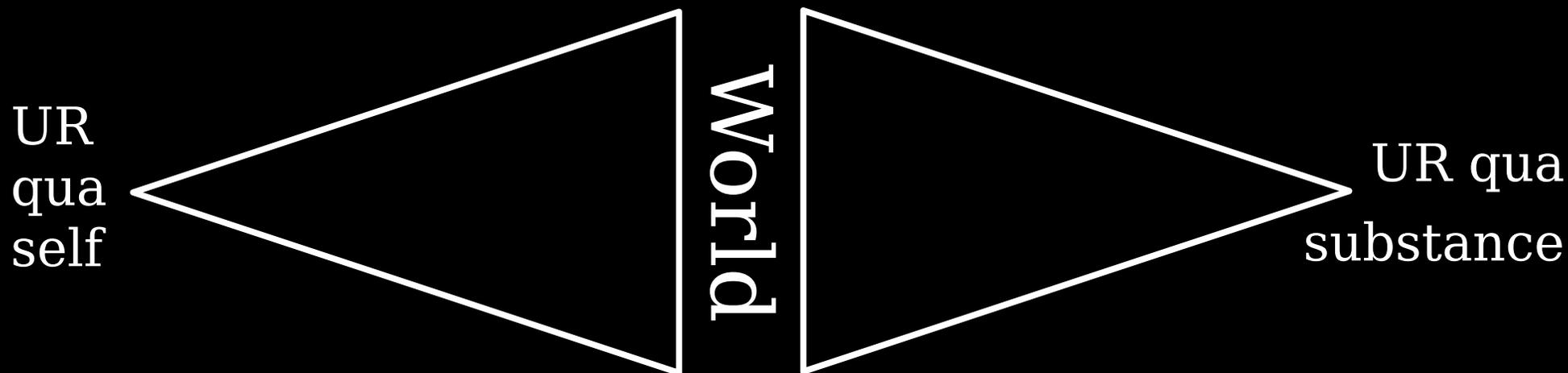
The second argument—invoking the visual world's constructedness—raises more questions than it answers. No doubt, visual information gets processed along several pathways (concerned with form, color, motion, etc.). But these pathways do not converge anywhere in the brain.

- Where are the features put together again? In the mind?
- What is the phenomenal world made of? Qualia?
- Do neural goings-on give rise to qualia? (Recall that there is evidence of correlation or covariation but not of causation.)
- Do neural goings-on or qualia further give rise to a conscious, perceiving self?

To my mind, the conceptualization of vision as a causal process reaches its absurd climax when attempts are made to account for even the conscious self in causal terms.

Here is my proposal:

The relation between UR and the world has a dual aspect: UR is not only the substance by which the world exists but also the self for which it exists.



What is instrumental in the manifestation of the world (represented by the right triangle) is particles, atoms, and such.

The proposition is that what is instrumental in the self's consciousness of the world (represented by the left triangle) is the *brain*.

The brain is *instrumental* in the self's seeing a cherry much as a telescope is instrumental in a person's seeing the rings of Saturn.

If UR lies in any direction relative to the world, this direction is “perpendicular” to every axis in space.

The proposition is that much the same is true of the self: it looks *through* the brain, from a direction that is “perpendicular” to space.

Looking along one axis (through the telescope) you see the rings of Saturn but not the telescope. Looking along any other axis, you can see the telescope but not the rings of Saturn.



When a neurosurgeon opens a patient's skull, she looks along a non-spatial axis through her own brain (without seeing it)...

...and she looks along a spatial axis at her patient's brain (which she sees).

The fact that vision may be thought of as an elaborate process of construction cuts two ways.

While it encourages the notion that the visual world is a construction rather than a *re*-construction, the fact that so much has been learned about the “underlying” neural processes suggests that phenomenal brains are not altogether unlike real brains.

For what has been learned, has been learned by studying *phenomenal* brains, and phenomenal brains do not construct visual worlds. *Real* brains do.

This attenuates the first objection against faithful depiction. While it would be naive to deny the existence of *unperceived* aspects of the manifested world, nothing stands in the way of thinking of a phenomenal object as a *directly perceived* aspect of a manifested (“real”) object.

The brain’s “telescopic” aspect is a case in point: Extending as it does into a non-spatial dimension, it is inaccessible from an objective point of view. And to the self that looks through it from its non-spatial vantage point, it is transparent. Either way it remains unperceived.

There is an impressive body of data concerning the neural processes associated with vision. These processes are first and foremost, and perhaps exclusively, *analytic* (that is, concerned with analyzing the visual field). Neural processes that are *synthetic*, in the sense of being engaged in the construction of a phenomenal world, are conspicuous by their absence.

It therefore makes a great deal more sense to think of the neural processes associated with vision as mediating a self's (direct) perception of (an aspect of) the manifested world, than as being engaged in the construction of a phenomenal world.

Neural processes are concatenations of causal links across space and time. They do not reach into the non-spatial dimension that houses the self. The perceiving self is therefore neither constituted by nor causally related to neural processes.

How then is it related to the brain?

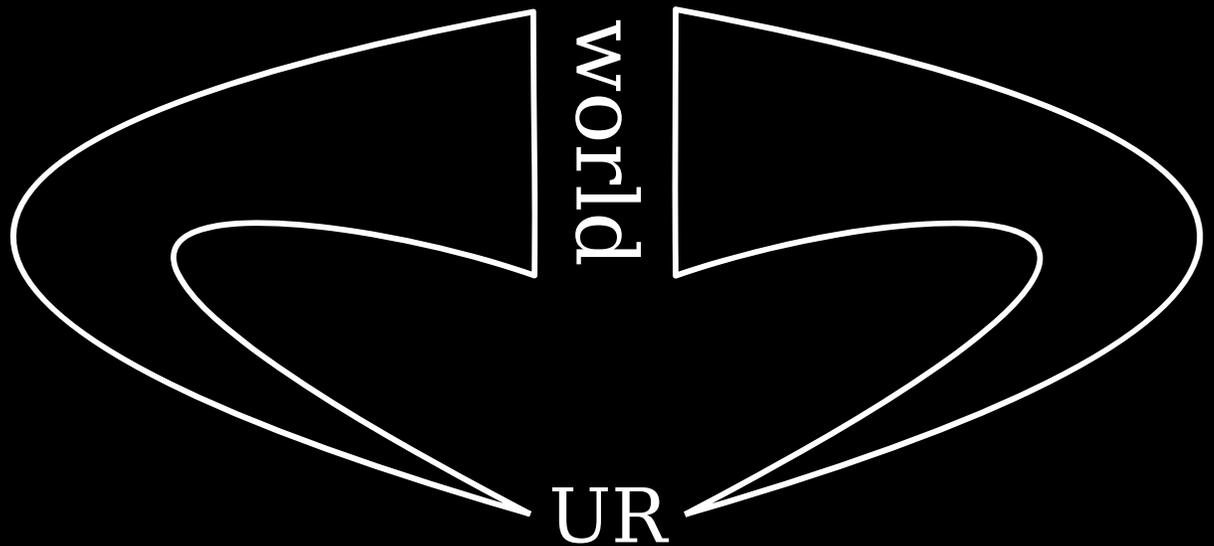
There are two fundamental relations between UR and the world.

As said, UR relates to the world

- as the substance by which the world exists

and

- as the self for which the world exists.



While the two relations are mutually irreducible, they do not split reality into halves, for the relata are identical.

At one end of both relations is the world.

At the other end is UR (once as substance and once as self).



Colors exist in the directly perceived aspect of the manifested world. As particles, atoms, and molecules are instrumental in the manifestation of surfaces, so they (or the light they emit or reflect) are instrumental in the manifestation of color.

This does not make the correlations between qualities (such as colors) and quantities (such as frequencies or reflectances) any less mysterious, but it situates them at an ontological level appropriate for a fundamental mystery—not in brains, but in the dual aspect of the relation between UR and its manifestation: existence *by* and existence *for*.

It used to be said that at bottom qualities (such as colors) are “nothing but” quantities (such as frequencies or reflectances). In reality, quantities are merely instrumental in the manifestation of qualities.

As mentioned, if we go on dividing a material object, its so-called “constituents” reveal their numerical identity.

By the same token, if we conceptually partition the world into smaller and smaller regions, we reach a point at which the spatial distinctions we make no longer correspond to anything in the world. (Our spatial and substantial distinctions are warranted by property-indicating events—a.k.a. “measurements”—and these do not license an unlimited objectification of such distinctions.)

Going beyond this point, we lose sight of colored surfaces and encounter the colorless and surfaceless things—particles, atoms, and such—that are instrumental in the manifestation of colored surfaces. And going further still, we lose sight of these things and what remains is undifferentiated UR.



What about optical illusions, after-images, color blindness? What about people suffering from achromatopsia (who see only shades of gray)? What about Penfield's demonstration that micro-electrode stimulation of the visual system results in visual experiences?

All of the above have been cited as evidence that the visual world is constructed, rather than directly perceived, and that colors are "in the mind," rather than "in the external world."

Yet all of the above can also—and with better justification—cited as evidence that the brain *mediates* the self's direct perception of (an aspect of) the manifested world.

Perhaps the telescope was too simplistic an analogy. Let's think night vision goggles instead. The goggles can malfunction, giving us colors where there are none, or wrong colors, or no colors, and so on.

