Notes on Pieero scaruffi's book *The Nature of Consciousness*
http://www.scaruffi.com/nature/cpt01.htm

from the Preface:

What does it take for something to be alive and to think? Can we "build" a machine that thinks and is alive? What is thought (consciousness)? And what is life? Physics provides no answer.

Any scientific theory that does not provide a credible account for consciousness and life is faulted from the beginning, as it ignores the two phenomena its own existence depends upon. We are alive and we are conscious: we know that much.

…what we have been studying for all these centuries is but us, albeit disguised under theories of the universe and of elementary particles…

The fact that we do not have yet a good theory of mind probably means that we do not have a good theory of the universe. Consciousness is perhaps the great mystery of the universe. And the reason may very well lie in a fundamental inadequacy of our Science to explain natural phenomena. In a sense, the new science of mind is doing more than just studying mind: it is indirectly reformulating the program of Science in general.

Mind and Matter
We can envision a future in which minds will exist without bodies, but not a future in which we would be happy to be bodies without minds. Ultimately, we are our minds, not our bodies.

The first part of the mystery is why and how minds became more important than bodies. The second part is, in a sense, proof that the mind is a recent accident: we ask ourselves what is the mind (a rather strange question: what am I?). When we ask what is the mind, we implicitly assume that the body is a given. The body is a given and we wonder what the mind is. We don't take the mind for granted and wonder what the body is and why we have bodies.

The quest for a rational explanation of the human mind has always started with the task of defining the relationship between mind and matter: is our mind made of matter? Is it made of a different substance? What differentiates the mental from the non-mental? How do our mind and body relate? Is our mind inside our body? Is our mind born with the body? Will it die with the body? Does it grow with the body? These days, having learned quite a bit about the brain and being reassured by countless psychological experiments that our brain is the main entity of the body responsible for our thinking, we are mostly interested in the specific relationship between brain and mind: what is the relationship between the neural and the mental? How does the mental originate from the neural?

Dualism and the mind-body debate

Historically, two main schools of thought have antagonized each other: "dualism" and "monism".

In the 18th century the Swiss biologist Charles Bonnet attempted to solve the dilemma by introducing "Epiphenomenalism", the idea that the mind cannot influence the body.

"Epiphenomenalism" therefore accepts that mind and body are made of different substances, but the mind has no influence on the body. The brain causes the mind, but the mind has no saying on the brain's work. Mental events have no material effects, whereas material events may have mental effects. Mental events are simply by-products of material events (like smoke is a by-product of a fire but has no impact on the fire).

Dualists do not doubt that the mind and the brain communicate somehow. But they are faced with the apparently insurmountable task of making two different substances communicate, even though, by definition, those two substances are not supposed to interact. One way out of this dilemma is to assume the existence of an intermediary between the two.

For example, the influential Austrian philosopher Karl Popper and the British neurophysiologist John Eccles, a Nobel-prize winner, posit the existence of a first world (the world of physical bodies), a second world (the world of mental states) and a third world (the world of products of the mind). The second world communicates with both the others. Abstract objects of mathematics, scientific theories and art products are examples of activities that belong to neither the mental world nor the physical world. Mind plays the role of intermediary between the imaginary world (World 3) and the real world (World 1). "Downward causation" operates from World 3 to World 1. The mind is basically an operator that relates abstract objects and physical ones.

Interesting things happen in this third world. First of all, objective knowledge belongs to it: the third world evolves through the growth of objective knowledge. Objective knowledge confers a degree of autonomy to the third world. For example, numbers are created by the mind, but then mathematical laws determine what happens to them, regardless of what our minds think and feel.

Eccles argues that the interaction between the mind and the brain of an individual is analogous to a probability field of Quantum Mechanics. Mental "energy" can cause neural events by a process analogous to the way a probability field causes action. He calls "psychon" the mental unit that transmit mental intentions to the neural units.

The British physicist Roger Penrose, one of the leaders in General Relativity, also subscribes to the notion that there exists a separate world of conscious states and that the mind can access that world. But Penrose's "world of ideas" is still a physicist's world: "protoconscious" information is encoded in space-time geometry at the fundamental Planck scale, and our mind has access to them (i.e., is conscious) when a particular quantum process occurs in our brain.

The American philosopher John Searle does not go that far, but he too rejects the idea that the universe can be partitioned into physical and mental properties. After all, things such as "ungrammatical sentences, my ability to ski, the government and points scored

in football games" cannot be easily categorized as mental or physical. The traditional "mental versus physical" dichotomy appears to be pointless.

A more humble formulation is due to the American mathematician Rudy Rucker, who believes in the existence of a separate "mindscape". Rucker asks: "Is what you thought yesterday still part of your mind?" The question is not easy to answer if you assume that ideas are part of minds. Rucker's conclusion is that there exists a world of ideas separate from the mental and the physical. Our minds can travel the mindscape that contains all possible thoughts just like our bodies can travel the physical space that contains all possible locations.

Supervenience

There exists two main brands of dualism: "substance" dualism (the mind is a different substance altogether from the brain), such as Popper's and Eccles' "interactionism", and "property" dualism (the mind is the same substance as the brain, but comes from a class of properties that are exclusive of the brain), such as "**supervenience" theory (Jaegwon Kim, David Chalmers).**

The Korean-born philosopher Jaegwon Kim applied the concept to mind: mental properties are supervenient on physical (neural) properties. According to Kim, then, the mental is supervenient on the physical just like the macroscopic properties of objects supervene on their microscopic structures. Intuitively this means that mind is to brain what lightning is to electrically charged particles: the same phenomenon, that presents itself in two different ways.

The British philosopher Charles Dunbar Broad had already showed in the 1920s that the universe is inherently layered and that each layer yields the following layer but cannot explain the new properties that emerge with it.

Supervenience takes it for granted that nature works this way, but offers no explanation at why at a higher level we would find electricity instead of, say, "huicity" or "flowixity" (imaginary properties): why and how just those properties? Why and how the mind emerges from the brain? Ultimately, this is the dilemma of "mental causation": how does the brain cause the mind? In general, this is the dilemma of "second-order properties": how do properties at one level cause properties at another level?

All facts of the universe depend (and are therefore supervenient) on physical facts, but the nature of such "dependence" is not trivial, according to the Australian philosopher David Chalmers. Properties that are supervenient on the physical world can normally be reduced to it (i.e., explained in terms of it), but consciousness is not truly, completely supervenient on the neural, and therefore it cannot be reduced to the neural. Consciousness is to some extent supervenient on the physical, but (by the nature of its kind of supervenience) it cannot be explained in physical terms.

The New Physics:
The Ubiquitous Asymmetry
The vast majority of theories of mind still assume that the world is a Newtonian world of objects, of continuous time, of absolute reality and of force-mediated causality. What that

means is very simple: most theories of mind are based on a Physics that has been proven wrong.

The Classical World: Utopia

Since we started with the assumption that our Physics is inadequate to explain at least one natural phenomenon, consciousness, and therefore cannot be "right" (or, at least, complete), it is worth taking a quick look at what Physics has to say about the universe that our consciousness inhabits.

In 1833 the Irish mathematician William Hamilton, building on the 1788 work of the Italian mathematician Luigi Lagrange (the trajectory of an object can be derived by finding the path which minimizes the "action", such action being basically the difference between the kinetic energy and the potential energy), realized something that Newton had only implied: that velocity, as well as position, determines the state of a system. He also realized that the key quantity is the overall energy of the system. By combining these intuitions, Hamilton redefined Newton's dynamic equation with two equations that derived from just one quantity (the Hamiltonian function, a measure of the total energy of the system), that replaced acceleration (a second-order derivative) with the first-order derivative of velocity, and that were symmetrical (once velocity was replaced by momentum). The bottom line was that position and velocity played the same role and therefore the state of the system could be viewed as described by six coordinates, the three coordinates of position plus the three coordinates of momentum. At every point in time one could compute the set of six coordinates and the sequence of such sets would be the history of the system in the world. One could then visualize the evolution of the system in a six-dimensional space, the "phase" space.

The New Physics: The Ubiquitous Asymmetry
Got to The Removal of Consciousness