**Few words about Al-Khalili Jim’s book (2020) (*The World According to Physics,* Princeton University Press) and my EDWs**

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In this paper, I do not investigate Al-Khalili’s book, but only certain ideas that appear in this book, ideas that are quite similar to my ideas published long time ago. I do not accuse Al-Khalili of plagiarizing my ideas. Anyway, many of these ideas have been published by thousands of people until now. (See my manuscript[[1]](#footnote-0))

Al-Khalili writes that

Many physicists today feel that we might potentially be on the verge of another revolution in physics as big as that seen a century ago with the birth of relativity and quantum mechanics. I am not suggesting that we are about to discover some fundamental new phenomenon, like X- rays or radioactivity, but there may yet be a need for another Einstein to break the current deadlock. (p. 6)

In reality, the revolution has already begun in 2002-2003-2005-2007 with my discovery of the EDWs. “But the Standard Model cannot be the final word on the nature of matter, because it doesn’t include gravity and it doesn’t explain dark matter or dark energy, which between them make up most of the stuff of the universe.” (p. 9) I solved all these old problems long time ago. (see my previous works).

As we understand physics today, all the matter we see in the world is made up of not the four classical ele ments of the Greeks, but just three elementary particles: the ‘up’ quark, the ‘down’ quark, and the electron. That’s it. Every thing else is just detail. (Al-Khalili 2020, p. 17)

However, who wrote this book? An amalgam of elementary particles? The amalgam of elementary microparticles represents particular EW. The “details” are also the EDWs, no more, no less. The fundamental “level” is “nothing”, i.e. the Hypernothing.

Chapter 2 is about “scales”. In reality, it is, somehow, about the EDWs. Again, Al-Khalili writes about different “scales” having “different” entities/laws, but he did not clearly explain the relationship between these scales: especially he did not explain the ontology regarding the relationship between the macro and the micro-worlds:

Let’s take another example: water. We can study the properties of a molecule of H2O as much as we want: the geometry of the bonds between the oxygen and hydrogen atoms and the quantum rules that govern this, the way water molecules stick together and arrange themselves, and so on. But we would not be able to deduce the property of ‘wetness’ of water by looking solely at its constituent parts down at the molecular level. This ‘emergent’ property only becomes apparent when trillions of water molecules come together in bulk. (Al-Khalli, p. 45)

In my works (long time ago), I wrote exactly the same idea: there are my EDWs. Therefore, this paragraph perfectly mirrors my EDWs! At page 46, the author writes something about “emergence”; in my works, I indicated all kind of emergence are quite wrong notions since one EW does not exist for any EDW.

The idea of emergence— that there are qualities of the physical world, like heat or pressure or the wetness of water, that do not have counter parts at the level of atomic physics—does not mean that there is more to a system than the sum of its parts, provided those emergent properties are still only built upon more fundamental concepts, such as the electromagnetic forces between subatomic particles in the case of water. (p. 46)[[2]](#footnote-1)

Despite our quest for laws of physics that are universal, the limits of reductionism point to the fact that sometimes the world can behave very differently at differ ent scales and needs to be described and explained using the appropriate model or theory. For example, on the scale of planets, stars, and galaxies, gravity dominates every thing—it controls the structure of the cosmos. But it plays no role, that we can detect, down at the atomic scale where the other three forces (electromagnetism and the strong and weak nuclear forces) dominate. Indeed, prob ably the biggest unresolved problem in the whole of physics— one we will return to in chapter 5—is that the laws of physics that describe our everyday, so- called ‘classical’ world of matter, energy, space, and time simply don’t work when we shrink down to the world of individual atoms, where the very different rules of quantum mechanics come into play. Even at the quantum level, we often need to choose the appropriate model that is most applicable to the system we wish to study.” (pp. 49-50)

Obviously, it is exactly about the EDWs: “the ‘classical’ world of matter, energy, space and time” and “the world of individual atoms” with “different rules of quantum mechanics”.

This is what I mean by the world behaving differently at different scales of size, duration, and energy. While two of the wonderful things about physics are the universality of many of its theories and the way we can understand more about a system by digging deeper and understanding how its parts relate to the whole, it is also true that we often have to choose the most appropriate theory depending on the scale we are interested in. If you want to fix your washing machine, you do not need to understand the intricacies of the Standard Model of particle physics— even though washing machines, like every thing else in the world, are ultimately made up of quarks and electrons. If we tried to apply our most fundamental theories about the quantum nature of real ity to every aspect of our day- to- day lives, we wouldn’t get very far. (pp. 51-2)

There is here again the EDWs. As I indicated in my previous works (long time ago), there are the macro-EW (for macro-entities), the micro-EW (for microparticles) and the field-EW (for electromagneic field). The problem is that he did not explain the relationship between these parts of the world. In fact, there are EDWs or the relationship between the parts-whole within the same EW. (See my previous works) Anyway, rejecting the ED entities which belong to the EDWs means that not a human person (Al-Khalili) has written his book, but an amalgam of microparticles. Another problem is that even the microparticles would not exist in relationship with the electromagnetic field…

Interstingly, Al-Khalili indicates Einstein’s fifth and last apppendix (1954, one year before he died) to his book published in 1916. The main concept for Einstein was the “field” (a form of energy). (p. 76) Einstein indicates that

[S]pacetime is not necessarily something to which one can ascribe a separate existence, independently of the actual objects of physical reality. Physical objects are not in space, but these objects are spatially extended. In this way the concept of ‘empty space’ loses its meaning.”

Then, in appendix 5, he clarifies this further: ‘If we imagine the gravitational field . . . to be removed, there does not remain a space of the type (1) [i.e., flat spacetime], but absolutely nothing.’ Flat spacetime, ‘judged from the standpoint of the general theory of relativity, is not a space without field, but a special case . . . which in itself has no objective significance. . . . There is no such thing as an empty space, i.e., a space without field.’ He concludes, ‘Spacetime does not claim existence on its own, but only as a structural quality of the field.’ (Al-Khalili, p. 77)

What does it mean that “spacetime” is a “structural quality of the field”? I really cannot understand Einstein’s relationship between “spacetime” and the “gravitational field”. My question is why nobody have enquired about Einstein’s idea (written by him one year before he died!)? I believe this idea rejects somehow the idea of space. We know Einstein did not trust “time”, but here we see his doubts even about space. It seemed that Einstien had doubts about spacetime. We have to relate Al-Khalili’s information about Einstein’s idea (and the work of other physicists like Smolin in 2006 who rejected the existence of spacetime) to the EDWs. However, even Leibniz (in his dispute to Newton) rejected the existence of absolute space and absolute time. Anyway, I believe many physicists have started to question spacetime after I published my article in 2005. Later in 2016, we indicated that within the EDWs perspective spacetime could not have any ontological background. It was for the first time in the history of human thinking when somebody indicated the spacetime could not have any ontologicla status. Al-Khalili sustains that gravitational field is a “real physical thing” (p. 78) that is more fundamental than the electromagnetic field: “the electromagnetic field needs the gravitational field to exist, since without a gravitational field there is no spacetime.” (p. 78) From my viewpoint, the spacetime could not even exist: the electromagnetic field exists in itself (in the field-EW), while the gravitational field (we can “talk” about it only within the macro-EW) has no ontology (gravitational field and spacetime is “nothing” (no ontology) in the macro-EW), but it “corresponds” to the curved electromagnetic field (the field-EW).

Einstein’s equation expresses how a gravitational field, or rather, the shape of spacetime, is determined by matter and energy. It is often said that his field equation shows how spacetime is curved by matter and energy and, at the same time, how matter and energy behave in curved spacetime. The point is that, just as matter and energy cannot exist without somewhere to exist in, there would, equally, be no spacetime without matter and energy. (pp. 82-3)

The “shape of spacetime” is not “determined by “matter and energy” since spacetime could not have any ontological status. In this paragraph, these statements are all wrong:

- “matter and energy behave in curved spacetime” is quite wrong since spacetime does not exist.

- “matter and energy cannot exist without somewhere to exist”

- “no spacetime without matter and energy”.

It seems that Al-Khalili wants to indicate he works within the unicorn world; the problem is that “different scales of the universe” with “different laws” sends directly to the EDWs.

On the microscopic scale, materials are held together by the electromagnetic forces between atoms. On the cosmic scale, it is gravity that holds matter together. Within the atomic nucleus is a very different world. (p. 92)

Obviously, in this paragraph, it is about the EDWs, but it is not the “micro-world” (or “microcosm”, p. 110), but about the micro-EW and the field-EW. However, at page 114, Al-Khalili writes about wave-particle duality emphasizing that the existence of wave and particle depend on the measurement apparatus.[[3]](#footnote-2)

The sub-microscopic world, down at the scale of atoms and smaller, therefore behaves very differently from our familiar everyday world. When we describe the dynamics of something like a pendulum or tennis ball, or a bicycle or a planet, we are dealing with systems comprising many trillions of atoms, which are far removed from the fuzziness of the quantum realm. (p. 118)

The same idea: inevitable, it is about my EDWs. This statement mirrors exactly the EDWs, no more, no less. Also, the title of Chapter 5 “Quantum world” (or microcosmos) would sends to the EDWs. However, “quantum world” is quite a wrong notion since we can talk about EDWs: the micro-EW and the field-EW. Later, Al-Khalili writes about “two-slit experiment” (the “central mystery of quantum mechanics”, Feynman).

After outlining just how astonishing the results of the two-slit experiment are— subatomic particles, fired one by one through a screen with two narrow slits in it, behaving as though they each travel through both slits at once, and giving rise to an interference pattern on a second screen—I issued a challenge to my audience. If anyone were able to come up with a ‘commonsense’ account of how this is possible, they should get in touch with me, as they will no doubt be up for a Nobel Prize. (p. 109)

Obviously, I have been the one who firstly furnished the explanation of “two-slit experiment” with my discovery of the EDWs.[[4]](#footnote-3) About the nature of light, Al-Khalili asked if light is wave or particle, his answer implies Bohr’s complementarity and measurement apparatus:

The answer, frustratingly, flying in the face of intuition and common sense, is that it can behave like either, depending on how we look at it and the sort of experiment we devise to probe it… Particles of matter, such as electrons, can exhibit a wavelike nature, too. This general notion, tested and confirmed for almost a century now, is known as wave-particle duality and is one of the central ideas of quantum mechanics. This does not mean that an electron is both a particle and a wave at the same time—but rather that, if we set up an experiment to test the particle-like nature of electrons, we find that they do indeed behave like particles. But if we then set up another experiment to test if electrons have wavelike properties (such as diffraction or refraction or wave interference), we see them behaving like waves. It’s just that we cannot carry out an experiment that would show both the wave and particle nature of electrons at the same time. It is absolutely vital to stress here that, while quantum mechanics correctly predicts the outcomes of such experiments, what it does not tell us is what an electron is— only what we see when we carry out certain experiments to probe it. (pp. 114-5)

From my viewpoint, the microparticles and the waves really exist both in the same time, not in the “micro-world” but in the EDWs. The problem for Al-Khalili is that he did not clearly explain the ontological relationship between the wave and the microparticle since Bohr’s complementarity is quite wrong or at least it has no framework of a correct explanation (the EDWs). I recall that even Bohr had worked within the unicorn world and his complementarity was related to Spinoza’s dual aspect approach (also constructed within the unicorn world).

I do not agree with Al-Khalili verdict (he follows Bohr’s idea, indicated at page 122) that “Physics should be about *explaining what our results tell us about how the world really is*.” (p. 121, his italics) With my EDWs perspective, I explained how the world (i.e., the EDWs) really is without our observations and “our results”.[[5]](#footnote-4)

Another very similar idea to my ideas (published long time ago) is the following: “In fact, it is now clear that the environment surrounding a quantum system, such as an atom, can itself do the ‘mea sur ing’. We don’t require a conscious observer.” (p. 133) I wrote exactly the same idea long time ago: I replaced “observation” with “interaction” in my articles 2002, 2002, 2005, 2006, and my PhD thesis 2007.

Regarding Schrödinger’s cat, Al-Khalili mentions that

A sensible way of resolving the issue is to assume that such quantum superpositions decohere away into their surroundings and therefore do not survive for long when we consider complex macroscopic objects like cats, which are never in two states at once, even before we open the box to check. (p. 135)

Subscribers to the many worlds interpretation of quantum mechanics believe there is a neat and simple explanation for this. They argue that there are now two parallel realities in which each option is realised. What we find when we open the box reflects which reality we exist in. (p. 136)[[6]](#footnote-5)

Surprisingly, Al-Khalili does not mention any name! These two paragraphs are unbelievable similar to my ideas regarding Schrödinger’s cat. After presenting certain interpretations of quantum mechanics, still “thinking” within the unicorn world, the authors’ verdict could be this one and not the EDWs: “In any case, I leave the issue of the interpretation of quantum mechanics unresolved, since that is where we stand at the moment.” (p. 137)

Therefore, a question that physicists are often asked is why we feel it is so important, indeed whether it should even be possible, to keep going with our obsession with unification, to try to combine these two models describing entirely different scales: the quantum realm and the cosmic realm. Surely each works well in its own domain, and that should be enough for us. (p. 179)[[7]](#footnote-6)

Again, in this paragraph, with this expression “entirely different scales” and “Surely each works well in its own domain”, we have exactly the EDWs. The problem is the author do not clearly explain the relationship between these scales. I recall, until I published my first works, physicists considered that Einstein’s general relativity is an approximation of “universe” since planets do not really exist, these macro-entitis being reduced to huge amalgams of microparticles. In our days, almost everybody accept the existence of EDWs using different expressions like “different realities” or, in this case, “different scales”. It is nothing new since I published my ideas about he EDWs long time ago…

What we call dark energy is most likely the energy of empty space itself— what is referred to as the quantum vacuum. We have seen how every thing ultimately comes down to quantum fields in the end. All the different particles that make up matter and energy, whether quarks, electrons, photons, or Higgs bosons, can be regarded merely as localised excitations of these quantum fields— like waves on the surface of an ocean. However, if you were to remove all the particles from a volume of space, this does not get rid of the field. (p. 203)

This paragraph perfectly mirror the EDWs and my explanation for dark energy.

<https://www.researchgate.net/publication/369204254_Gabriel_Vacariu_2023_Few_words_about_Al-Khalili_Jim's_book_2020_The_World_According_to_Physics_Princeton_University_Press_and_my_EDWs>

1. Gabriel Vacariu (0November 2022 to 2014) The UNBELIEVABLE SIMILARITIES between the ideas of some people (2011-2021) and my ideas (2002-2008) in physics (quantum mechanics, cosmology), cognitive neuroscience, philosophy of mind, and philosophy, here ("DARK LIST" is BELOW)

   <https://www.researchgate.net/publication/364957841_0November_2022_2014_Gabriel_Vacariu_UNBELIEVABLE_similarities_Microsoft#fullTextFileContent>

   <https://philpapers.org/rec/VACNT-6>

   <https://www.academia.edu/89689259/November_2022_2014_Gabriel_Vacariu_UNBELIEVABLE_similarities_Microsoft>

   <https://www.scribd.com/document/604306224/0November-2022-2014-Gabriel-Vacariu-UNBELIEVABLE-Similarities-Microsoft> [↑](#footnote-ref-0)
2. “What we require is not ‘new’ physics, but ‘more’ physics, in order to learn about and understand how certain properties can emerge in a system from the collective behaviours of its constituents. The Nobel laureate Philip Anderson summed this view up in the title of a famous paper: ‘More is differ ent.’8” (p. 47) New “physics” would mean the EDWs perspective and nothing else. As a real process, emergence could not exist, but there are EDWs. (In my book 2008, I wrote about Anderson’s article…) [↑](#footnote-ref-1)
3. “This does not mean that an electron is both a particle and a wave at the same time—but rather that, if we set up an experiment to test the particle- like nature of electrons, we find that they do indeed behave like particles. But if we then set up another experiment to test if electrons have wavelike properties (such as diffraction or refraction or wave interference), we see them behaving like waves.” (p. 114) Al-Khalili still works within the unicorn world regarding the “microcosm”. At next page, he writes about Heisenberg’s uncertainty principle, but I indicated in my previous works, this principle is just an epistemological principle, not an ontological one (as was accepted almost one century until I published my works…). [↑](#footnote-ref-2)
4. “I said this as a lighthearted joke— safe in the knowledge that no one has ever found a simple explanation of this classic result despite many decades of debate and hundreds of ingenious tests, leading physicists to reluctantly conclude that what ever is going on really does not have a commonsense explanation. This really is the way matter behaves in the quantum world, and we just have to accept it.” (pp. 109-10) Obviously, only somebody working within the unicorn world could declare such thing. With my EDWs, I clearly explained the double-slit experiment (for instance in my article 2006, my PhD thesis 2007, my book 2008, and even earlier…) [↑](#footnote-ref-3)
5. Not surprising, Al-Khalili seems to contradict himself writing that “Bohr argued that it is wrong to think that the task of physics is to find out how nature is—or to know the ‘real essence of the phenomena’— but rather to concern itself only with what we can say about nature: the ‘aspects of our experience’. These two opposing views, the first ontological and the second epistemological, can in fact both be correct: what a physicist should be able to say about nature, even at the quantum scale, should be the same as how nature is, or as close to it as we can get, but always trying to edge closer. This ‘realist’ view is one that I have always found myself siding with in the end, despite having serious doubts now and again.” (p. 122) [↑](#footnote-ref-4)
6. We have to notice that the idea of “two parallele realitites” is no Everett’s many worlds. [↑](#footnote-ref-5)
7. The same ideas that appear in this paragraph I have published long time ago: “bill. What we call dark

   energy is most likely the energy of empty space itself— what is referred to as the quantum vacuum. We have seen how every thing ultimately comes down to quantum fields in the end. All the differ ent particles that make up matter and energy, whether quarks, electrons, photons, or Higgs bosons, can be regarded merely as localised *excitations* of these quantum fields— like waves on the surface of an ocean. However, if you were to remove all the particles from a volume of space, this does not get rid of the field.” (p. 203, his italics) [↑](#footnote-ref-6)