

# THE CREATIVE UNIVERSE

*The universe creates and perceives  
its own information. Creation and  
perception are fundamental.*

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## WHAT IS FUNDAMENTAL?

Lawrence Krauss, the author of "A Universe from Nothing" and a physicist who gives talks all round the world, has misled the world with his fake version of "nothing" [1]. Physics starts from a situation in which there is already "something" that it can represent with mathematical symbols: this always takes the general form of categories of information, relationships between these categories, and number information. The fact that physics always assumes that "something" is the source of the universe, as opposed to a true "nothing", should be acknowledged by physicists.

But physicists tend to wear self-imposed mental blinkers, where blinkers are "*a pair of small leather screens attached to a horse's bridle to prevent it seeing sideways and behind and being startled*" ☺ [2]. So don't expect physics to accept the reasonable proposition that what is fundamental is what creates information in the universe, and its corollary: what somehow perceives/"knows about"/responds to this information.

The creation of information might seem like an issue only relevant to the early universe, an issue not relevant to the later universe or to the present moment. But physicist "*John Archibald Wheeler said it this way, and we follow suit, 'Each elementary quantum phenomenon is an elementary act of 'fact creation'.'"*"; as physicists Christopher Fuchs and Blake Stacey put it: "*quantum measurements are moments of creation*" [3]. The "something" that is created is new information. This creation of new information in the universe (and the necessary perception of the information by the universe) is an everyday occurrence, an issue relevant to quantum physics today.



Surely we should assume that the fundamental substance, what it is that creates and perceives, is the universe itself? Surely we shouldn't assume that anything else exists external to the universe, like a God or a platonic realm, unless and until the assumption that the universe itself creates and "knows about" information ceases to be useful? But this fundamental substance (the universe), at least now, is not monolithic: the substance exists in minute portions, in the form of particles, corresponding to the particles or strings of physics. The particle form seems to correlate with the fact that most number information in the universe only exists from a point of view within the universe: most numerical quantity information is purely subjective.

The primary substance (particles), and the characteristics of the primary substance (they create and perceive information), are the *most* fundamental aspects of the universe: these aspects can never be explained as being *derived* from information.

Pre-existing information, e.g. in the early universe, is physics starting point. But *new* information continues to be created in quantum events, by the primary substance (and presumably also by secondary substances like atoms, molecules and living things). So, the creative and perceptive aspects of the universe are relevant to quantum physics today, even though these aspects can't be mathematically represented: only information can be mathematically represented.

So, what is this "information"?

## FUNDAMENTAL INFORMATION, CHANGE AND TIME, COMPLEXITY AND EVOLUTION

### INFORMATION

The most important thing to know about information in the universe is that it informs. Somehow, something in the universe in some sense knows about it, because this "something" in some way responds to, or is moved by, this information. Fundamental-level information in the universe might be symbolically represented by human beings in words, as mathematical equations, or as binary digits (bits): in one sense, it doesn't matter, because it is only an attempt at a symbolic representation of the reality. But, as we shall see, there can be no such thing as what is implied by the loose and contradictory term "*bits of information*" as used by physicist Seth Lloyd [4].

No matter how it is represented, the most fundamental-level information in the universe can only be:

1. The aspect of the universe that we represent as law of nature [5] mathematical equations, and it can be argued about which are the most fundamental-level equations or theories [6]; and
2. The aspect of the universe that we represent as numbers:
  - a. The aspect of the early universe that we would represent as numbers when assigning guesstimated initial numeric values to the variables in these law of nature equations; and
  - b. The aspect of the current universe that we represent as numbers when assigning new initial numeric values to the variables in these law of nature equations after measuring the outcomes of a quantum event.

What underlies the equations seems to be fundamental natural categories (these are represented in the equations as variables) like energy and momentum. But these categories don't ever exist as separate entities: as the mathematical equations show, they only exist in relationship to other such fundamental natural categories of information.

There seems to be a pattern here: seemingly all information categories are interconnected with and made out of relationships with other such information: seemingly it's "*turtles all the way down*" [7], with fundamental natural categories, perhaps energy and momentum, at the base. Information is not particle-like, not bit-like, not the answer to a question; seemingly information in the universe is, of necessity, more like a network or a fabric where each new category of information is constructed out of relationships between previously existing categories of information, "all the way down" to the

fundamental natural categories. How could information, how could something that informs, have any other structure?

And this pattern, where all new information in the universe is made out of relationships between existing information, must surely also apply to numbers. Number information in the universe cannot be rarefied platonic entities, numbers in the universe cannot be the objects that are constructed using set theory, because these “numbers” don’t naturally fit into the existing pattern of relationships. To fit in, initial value numbers in the universe are of necessity constructed out of relationships, in a similar way that laws of nature are seemingly constructed out of relationships between categories. But initial value numbers are, also of necessity, relationships where the numerator and denominator categories cancel out, leaving a thing that has no category: the categories are in effect hidden. What physics represents as algebraic and non-algebraic numbers in the universe must seemingly all ultimately derive from simple information category relationships, if these numbers are to fit in and conform to the existing pattern of categories and relationships between categories, if these numbers are to be intelligible information that informs the universe.

To summarise: Information informs the universe: the universe somehow perceives information. The symbolically representable content of this perceived information, including fundamental-level information, is categories which are themselves relationships between other categories, and numbers (relationships where the categories are hidden). Physics represents the fundamental information mathematically as law of nature equations and initial value numbers.

But what would cause the initial value numbers assigned to the variables to ever change to new numbers? Except for quantum jumps in numeric value, the law of nature equations indicate that numbers should change smoothly in time. But what is change and what is time? What fundamental aspect of reality is driving the universe system forward?

### INFORMATION CHANGE AND TIME

The idea that we are living in a computer simulation of the universe seems absurd, and theoretical physicists Zohar Ringel and Dmitry Kovrizhin have recently shown that it is impossible [8]. But the one advantage of the absurd idea of a computer-simulated universe is that it solves the problem of what is moving the numbers forward to new values (e.g. the numbers representing energy or momentum): it’s the computer program, and the electricity powering the computer, that changes the numbers output by the program to new values.

The imaginary example of a computer-simulated universe illustrates the “problem” with our actual universe: there is nothing moving the numbers to new values. Nothing, that is, except quantum events where new number information is created, i.e. new initial values are created for particular variables, thereby seemingly deterministically affecting the rest of the information fabric, thereby seemingly moving the numbers associated with other variable categories to new relative values. The potential for such a scenario to occur is founded on the assumption that both number and law of nature information exist as a fabric of relationships between existing categories.

Quantum events, where new information is created, are what is powering the universe: a universe where information is seemingly constructed out of non-algorithmic relationships, and where seemingly the only algorithm-like “steps” are the “steps” where new number information is created [9]. This contrasts with the imaginary computer-simulated universe where, by virtue of the algorithmic

steps in a computer program and the electricity powering the computer, representations of new number information are output.



Is there a relationship or a connection between change of number information and time? Or is there no relationship between information change and time, meaning that time is an independent aspect of the universe which exists whether or not information change occurs? [10] If time is like an independent component or dimension, that has no connection or relationship to the universe's changing fabric of information, then clearly time is superfluous: it has no function in the universe. Time can only exist if there is a relationship or a connection between information change and time, i.e. if time itself is an information category.

Any "perception" by the universe, that number information relating to a variable has changed, can only be likened to an algorithmic step in a computer program. The "perception" of a quantitative change of number is an algorithmic step whereby the universe has acquired an extra level of information about itself. A unit of time is seemingly the information category that is born when the universe perceives that some aspect of information (e.g. number information) has changed. The time category is another "level" of information, and it can seemingly only arise from quantum events, because quantum events are where new, changed, number information, is created.

When seen from the above point of view, the time category seems to be an example of emergence or evolution of a new level of information.

#### COMPLEXITY, EMERGENCE AND EVOLUTION

*"Complexity is generally used to characterize something with many parts where those parts interact with each other in multiple ways, culminating in a higher order of emergence greater than the sum of its parts ... Ultimately Johnson adopts the definition of "complexity science" as "the study of the phenomena which emerge from a collection of interacting objects" [11]*

Despite complexity, there seems to be only two types of information in the universe that could potentially emerge: categories/qualities [12], and quantities (representable as numbers). And, as the above argument about the nature of the time category illustrates, seemingly there are also levels of category information, where categories at a new higher level derive from a simple algorithmic analysis of category and/or quantity information at lower levels.

Also as argued above, fundamental-level categories are seemingly identical to non-algorithmic relationships between other such categories. Somewhat similarly, higher-level categories must seemingly be identical to simple algorithmic "relationships" [13] connecting lower-level category and quantity information. These "relationships" seemingly must genuinely exist, but to test for the existence of non-algorithmic relationships is relatively simple; to test for the existence of specific algorithmic relationships would seemingly be more difficult or even impossible.

Notions of "weak emergence" and "strong emergence" [14] are actually about categories of information: weak emergence can be seen as a situation in which new categories/qualities of information *are not* created in the observed phenomena, and strong emergence can be seen as a situation in which new categories/qualities of information *are* created in the observed phenomena.

With strong emergence, “*qualities produced this way are irreducible to the system's constituent parts*” [15] only because a new relationship has been created *out of* “the system’s constituent parts”. New categories of information are relationships that must be constructed/created out of existing categories: new information relationships can’t just spontaneously emerge out of nothing, with no context; and new relationships can’t emerge deterministically out of existing category relationships.

The difficulty in perceiving whether or not genuinely new relationships have been created (have “emerged”) in the observed phenomena is seemingly due to the fact that relationships/categories only exist from a point of view. “Weather” is a category that might exist from the point of view of a human observer, because it physically exists as a category in the human brain. But the “weather” category does not exist from the point of view of the observed phenomena, from the point of view of the molecules whose mainly-deterministic behaviour makes up the weather.

But clearly, there can be no evolution without the creation/“emergence” of new categories, especially “algorithmic” categories, in the universe.

## CONCLUSION

As physicist Christopher Fuchs puts it: “*The stuff that is most real in the world is the stuff that cannot be captured by an equation*” [16]. The creation of information and the perception of information are fundamental aspects of the universe that are not themselves information. Information is what is created and what is perceived. Only information can be symbolically represented.

Our universe is fundamentally creative, and it can only evolve by creating new categories of information.



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