Book Chapter

Quality and the Physics of Biology

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In this essay I will explore the frontier between biology and physics, and derive a new way of thinking about living things. This will bring us closer to understanding how life fits into the cosmos.

I will review the principles of both disciplines and suggest how they fit together. The radical distinction between them, embedded in their separate approaches to analysis and research, is an illusion that has for centuries prevented constructive dialogue. Obscure terminologies camouflage each from the other, and have prevented cross-border exploration. There are some difficult concepts to demystify, but we need not be afraid of that. Analytical mathematics will not form any part of my reasoning.

I start by declaring two general conjectures. I cannot prove either, but rely on both to make sense of my subject.

I do not accept that living things are merely machines. Biochemistry, biophysics and genetics provide insights into mechanism, but cannot define the essence of life, or reproduce it. We hugely underestimate the scope of epigenetics. In rejecting vitalism out of hand, we blinded ourselves in one eye.

I maintain instead that the essence of life resides in quality - questions of who, why and how. These predominate over, are quite distinct from and cannot be reduced to quantities – what, where or when. The Renaissance drive to focus on quantity at the expense of quality, created science as we know it, complete with the limitations mentioned above.

Fundamentals

Most of the energy in the universe resides in the vacuum that constitutes almost all of space. That includes the space between the elementary particles that make up the atoms of matter. On that small scale, physical events are not smoothly continuous but occur discontinuously, and are called quanta. Generalising across the entire universe, therefore, we have a quantum vacuum full of energy. And we know almost nothing about it.

Physics now acknowledges this quantum vacuum, first described by Dirac [1] as a huge field of massless negative virtual charges that are immensely energetic [2] and are never quite still. Because this field still fluctuates at the absolute zero of temperature, when all real matter comes to rest, this vacuum energy is termed zero point energy. However, most physicists assume these fluctuations are incoherent – random, therefore self-cancelling, amounting to nothing. So theorists feel justified in ignoring zero point energy for the purpose of quantum mechanics.

Nevertheless, physicists are very uneasy with this. They agree that elementary particles are excitations of the underlying quantum field [3]. In other words, the tiny minority of energy that can be detected as matter, results from coherent, non-random fluctuations of the quantum vacuum - an aspect of zero point energy that cannot, after all, be ignored.

What kind of fluctuations are these likely to be? Dirac did not enlarge on this but 35 years later Lazslo [4] felt able to. The real oscillations that physical instruments can detect as elementary particles, are vector waves. The conjecture is that virtual fluctuations that do not surface as real particles, are scalar waves [5]. In a massless field such as the quantum vacuum, without friction or inertia, scalar waves can travel at many multiples of the speed of light.

All waves, by interfering with each other, provide a holographic [λ] form of memory. In a real, viscous medium such as water or air, these decay with time. Scalar waves, however - propagating in a massless, frictionless medium - are potentially everlasting. They can build up information of great complexity and density: the Library of Congress would fit in the space of a

[λ] Holographic memory is real, and differs in three important ways from digital memory. Comparison with 3D image projection illustrates these differences. 3D photography uses two cameras set slightly apart.

a) The pattern on the single holographic film is unrecognisable, bearing no resemblance to the twin images captured by 3D cameras. Yet it can record the immense amounts of wave behaviour referred to already.
b) Projection of a laser beam through any small part of the pattern on the film produces the whole image: as the beam spreads across the film, the image only becomes more detailed. This is to say that the whole image is represented everywhere on the filmed pattern, not piece by piece. In a pair of 3D photographs, each small part is like a jigsaw piece, with only a tiny part of the picture: only when they are all connected can the entire picture be seen.
c) The image recreated from a 2D holographic plate is real, projected in 3D space and visible from any angle. 3D cameras do not do this: the image is virtual, reconstructed by the eyes of the viewer, like one's face in a mirror.

An important additional conjecture is that holographic fields can record qualities ,such as form and feeling, as well as quantities. Digital fields are confined to quantities.

cube of sugar [6]. They are distributed everywhere in the quantum vacuum – the entire universe - and readily accessible anywhere.

So physics acknowledges, more or less officially, that space contains a quantum field of massless virtual charges with immense reserves of zero point energy. Only the most basic physical properties of the quantum vacuum are acknowledged, however, sufficient to account for the anomalies that arise otherwise in quantum theory. Vector fluctuations of this field produce coherent ripples on its "surface" that we detect as elementary particles of matter, subject to quantum mechanics. The behaviour of these particles is recorded holographically as a vector wave interference pattern in the quantum field, but may decay gradually with time.

Most of the holographic record does not relate to real particles, however. It is within the apparently incoherent, virtual scalar wave activity of the field, hidden from instrumental detection. And for the purposes of theoretical physics, it is ignored and an embarrassment.

Quality

My conjecture is that all the *qualities* of the universe are recorded as scalar wave patterns in the quantum vacuum. A physicist would expect that record to be random and chaotic. Strangely, it is not. A large part of it, associated with living, is surprisingly harmonious. This includes the diverse forms and functions of all living species, the morphogenetic fields [7] with which they resonate [8] in life, their growth programmes and their ecological relationships. These phenomena arrange themselves into a tissue of whole entities. "Wholesomeness" is a quality we appreciate subjectively: more formally, it turns out to constitute the fundamental quality of life.

The holographic record in the quantum vacuum includes functions we know as memory and consciousness (incorporating meaning and purpose) and all other aspects of mind, as well as the phenomenon we call soul or spirit.

Besides memory, the mass of historical information distributed in the quantum vacuum, there is the bustling energy and drive that we associate with life. It has many popular names - vivacity, vitality, pep, go, sparkle. Biologists once termed it élan vital. It accounts for the actions, perceptions and processes of life itself, with its many familiar experiences – love, orgasm, bliss, insight, tingles down the spine, the light in one's eyes, creative inspiration and instinct. I propose to sum these up under the one term "will", which embraces mental as well as physical drive.

In physical space, we are used to linear coordinates defining position, and specific vector values (such as wind velocity) associated with each position. Something analogous applies in the quality realm of the quantum vacuum, considered as a field. Each quantum field location has two aspects: memory, and will [9]. However, memory is simultaneously both specific to the location, and distributed universally across the field, in keeping with its holographic mechanism. Will also has two aspects - intensity, and purpose – and is in addition widely variable with time. This framework introduces the possibility of analysing how large, complex organisms are formed, and function as wholes.

Wholeness

Love describes the over-arching will of whole beings to form, bond and so create new wholes. I considered the behaviour of wholes in a previous paper [10]. Without the wholeness process, located in the quantum vacuum and powered by its will, no fertile seed or egg could differentiate towards an adult multicellular form, and could not therefore realise its full adult potential. Cell division would produce only identical copies, a formless spawn of eggs. The formation of gametes would be pointless.

Instead, the wholeness process enables the fertile egg to divide coherently and asymmetrically, each division realising a morphic quality expressed in the quantum field memory, channelled and powered by its will. So each cell division creates new quality, as well as doubling the quantity of cells. First, in an animal embryo,

come left and right halves; then dorsum and ventrum, endoderm and ectoderm – complexity increasing geometrically.

The cells in this differentiating mass are glued in relationship, by the same whole morphic memory the original egg possessed. That has not divided, only unfolded and complexified, like a blossoming flower. Each whole cell, at every stage in the process, overlies a point in that field defining a particular cellular memory and will - type and function. Will powers division, and the quantum field memory bonds the twin offspring, recreating their parent cell and expressing the orderly relationship dictated by the qualities of the field where they are. Each such division develops the organism's complexity a stage further.

A morphic pattern in the quantum vacuum field may not yet be detectible by physical instruments, but is much the most permanent and stable possession of the organism it defines. Its constituent cells die and are replaced, but always in accordance with the pattern. If the pattern should fade or become distorted, or will wane disastrously, cellular behaviour can stray from the morphic pattern, and cancer becomes possible.

In general one whole, of any size, seeks to bond with – that is, love - another whole of complementary quality, the two between them creating a third whole, equivalent but novel, without diminishing or constraining the original two. This applies, as I argue above, to twin daughter cells during ontogenesis. More generally, it applies to any adult wholes on the look-out for meaning and purpose – pairing with a mate, creating a home, designing a concept. Their "arithmetic" differs radically from that of quantities: one plus another make three, not two. This trinitarian principle can be traced throughout living nature - from the single cell, through large complex organisms, to ecosystems, human communities and religions.

This is a way of thinking quite alien to prevailing scientific norms. However, that makes sense. Science has confined itself to study of a minority of universal phenomena – matter and its quantitative behaviour. The vast majority – the qualities housed in the quantum vacuum - remain unclaimed.

I propose that life scientists should, with the help of physicists, stake their claim to this uncharted territory. By resolving their differences with scholars like Hans Driesch [11] and Rupert Sheldrake [12], they would revive and modernise an ancient stream of thought. This dates back to Aristotle's notion of entelechy [13], and survived well into the 20th century as vitalism. They would grasp what now inspires authors like Philip Pullman [14]. Indeed, they could reconcile the arts with biology, with the whole-hearted blessing of physics.

References

1. Dirac P. The Principles of Quantum Mechanics, 4th Edition. Oxford: OUP. 1958.
2. $9x10^{107}$ Joules per cubic centimetre, by Dirac's calculation. Dirac, P Roy Soc Proc. 1930; 126: 360.
3. Today, all theories of elementary particles . . . are quantum field theories. Particles are thought of as energetic excitations of the underlying field. Polkinghorne J Quantum Theory: A Very Short Introduction page 75. New York: OUP. 2002.
4. Laszlo E. The Creative Cosmos page 139. Floris Edinburgh. 1993.
5. Scalar waves were identified by Nicola Tesla around 1900. They propagate quite differently and in different media than the more familiar vector waves – e.g. electromagnetism.
6. Laszlo E. op cit page 125.
7. https://en.wikipedia.org/wiki/Morphogenetic_field
8. Sheldrake R. The Presence of the Past Chapter 6. London: Harper Collins. 1994.
9. Scott Williamson G, Pearse I. Science Synthesis and Sanity Scottish. Edinburgh: Academic Press. 1980.
10. Mansfield P. Health: The No-Man's Land Between Physics and Biology J Alt Comp Med 21.10. 2015; 593-597
11. https://www.britannica.com/biography/Hans-Adolf-Eduard-Driesch
12. Sheldrake R. A New Science of Life: The Hypothesis of Formative Causation Icon Books. London. 2009.
13. https://www.britannica.com/topic/entelechy Accessed 4 Aug 2020.
14. Author of the trilogy His Dark Materials, among other titles.