The Emergence of Consciousness from Chaos

Stephen H. Jarvis.

GRAVIELECTRIC, stephen.jarvis@gravielectric.com, www.gravielectric.com

Abstract: The idea of consciousness emerging from chaos is not a new idea. In fact, it is one of the oldest ideas of philosophy. What makes it an important idea to herald here (in the context of quantum gravity and a new type of string theory incorporating the Golden Ratio) is how the idea has been derived, namely from "chaos theory" sprung from two key preliminary papers [1][2]. This third paper shall take up from where the second paper [2] left off. Here, we shall explain the Schrodinger equation for light, and then present an improved equation for the energy of a photon, then confirm the emergence of light from the atomic level represents a well-known equation for chaos theory, the "logistic map equation". From there we shall present the idea of consciousness as a need for this system of time and space to resolve the disparity between light and particle location, together with the need to reach an exact value for "π" (as was the basis for the axioms of time upon space in the development of the atom in the second paper). A list of features of this proposal of consciousness as an emergent entity will be presented that describes well-known features of the idea of our own ability to reason and be aware.

---

1.   Introduction

A key underscored idea in the first paper [1] was the determination of the concept of "time-now" t_N to represent the value of "1". "1" as a line is "1", "1" squared as surface area is "1", "1" cubed as volume (of a square) is still "1". Here, labelling "time-now" t_N as "1" holds "now" as that absolute reference of axial definition around which the other facets of time, namely "time-before" t_B and "time-after" t_A can be modelled, regardless of the multiplicity of dimensionality being applied to it. Another key underscore, as in the second paper [2], was the idea of light to trace "π" is what defined a "quanta", a wavelength of light, as an "all or nothing" package of energy. Associated to this was the assumption that the atom alone is not enough to find an exact value for π nor properly resolve independently the disparity between light and a particle's exact location, thus the need for separate atomic references that would resolve these disparities with each other based on electron behaviour in the electron shells (namely a release of energy as light, a package of light, that would be released from the atom for every electron shell step-down).

In defence of these underscoring's, what was not presented in the second paper was an equation for the energy of a package of light released from an electron shell. To explain this, we will rewind the contemporary Schrodinger wave function equation [3]. We also didn't describe how light would operate outside the confines of the constructed atom other than presenting the feature that it would suggest space is expanding at an accelerating

rate. Let us begin therefore with a review of the wavefunction presented in the second paper [2], and compare this to the Schrodinger equation [3]. Then we shall present an equation for a "photon" of energy, following which a formula for time as this package of light in this new extra-atomic context will be forwarded. From there we will explain a new process of time and space that would qualify and satisfy the "directive" of time in space in that extra-atomic context, reasoning at this point that a concept of "consciousness" [4] would emerge, presenting a list of features the "directive" of time in space would enlist to maintain its golden ratio principle.

2.   Golden Ratio Time-Wave Mechanics in Space

The construction of the light wave was the core discussion of the second paper [2]. There, we modelled axes of time onto axes of space, delivering a wave-function with electric and magnetic components, while explaining the dimension of the fine structure constant, and the disparity between light and its association to the subatomic particles and those dimensions leading to the idea of "uncertainty" in locating the position of an elementary particle using light ([2]; p11 fig.13). By comparison, the Schrodinger equation $i\hbar\frac{\partial}{\partial t}\Psi(r,t) = \hat{H}\Psi(r,t)$ [3] provides a description of a wave relevant to the idea of quantum states (packages of energy) [5] and wave-particle uncertainty [6]. Yet with the way we have explained the time-equation for light as a sinusoidal wave per each axis in a 3-d 0-scalar spatial grid, we have detailed the exact nature of the uncertainty regarding the disparity between the actual measured value for light and the particles separated by the scale of the fine structure constant (like forceps), together with why light is quantised, this as a process of *deriving* the fine structure constant together with deriving the speed of light from the charge of an electron. This is so owing to the "directive" of time to trace a circle perfectly as π. Yet on the atomic and subatomic level the exact value for π hadn't been reached ([2]; p8 eq.3, p10 eq.6, errors of ~0.021% and ~0.0013%(10 quotient factored in) respectively), hence the need for the atom to generate electron shells as a way of calibrating closer to the value of π. How? By atomic building and interaction with other atoms (as we shall soon explain). With that assumed directive we nonetheless went ahead in the initial paper to generate the energy shell modelling to further understand the spatial characteristics of the t_A time front ([1]; p13-15). In the second paper, we detailed what would be the existence of an elementary particle substructure to the subatomic particles ([2]; p16 fig.16), and then suggested that matter would "emerge" from that level, explaining the equation $e_p = m_p c^2$ upon that emergent basis ([2]; p16, eq.15). What we didn't take a step toward was the energy value of a package of light, a photon [7].

3.   Establishing the correct time and space granularity for a basic scale of extra-atomic energy

The equation for the energy of a package of light on the extra-atomic level would follow the same rules as presented in the second paper; note equation $e_p = m_p c^2$ ([2]; p16, eq.15). Once again, why is the total "energy" of mass beyond the elementary 30c level ([2]; p16 fig.16), and more specifically, proportional to mass and c^2? The answer is that all there would be "beyond" the 30c manifold is a "c" factor that can only be "squared" as a "future" event beyond the primary 30c "before" and "now" event ([2]; p16 fig.16).

Beyond the atom (beyond the subatomic particles, and beyond the electron shells), electrons in going between electron shells would release light as packaged quanta. Research confirms this would represent a photon (massless, no electric charge, yet behaving as though having mass) of light [7]. This photon would obey the dual-state (golden ratio) light cone modelling presented in the initial paper ([1]; p4-6). The functionality though here is extra-atomic and obeys the protocol of $e_p = m_p c^2$ ([2]; p16, eq.15). So, in the same manner of that equation, we

could say that the total energy released by an electron jump would be as though it exists as a feature of the charge of the electron, its signature of energy, differentiated by time in the context of the scale of electron migration. Essentially, light from this new extra-atomic level would become malleable in its characteristics of wavelength and thus frequency, still though upholding the required speed of light so as not to undermine the fundamental basis of the atom. "Charge" as time (and thus charge times frequency) would be the electrical charge of the electron for each wavelength jump it makes in the electron shell at the speed of light, thus the charge per unit of time, as charge "differentiated by time", namely $e_c \cdot f$, where e_c is the electron charge and f the frequency of wave effected by jumping between an electron shell. Such would be the full energy under consideration owned by the electron in electron shells undertaking electron shell jumps. Now, if we apply $e_p = m_p c^2$ ([2]; p16, eq.15), the mass of a photon would represent the energy of the photon E, as the photon has zero mass in travelling at the speed of light. Here though also we are considering light fractioned by 19.8 as a quantum of light, differentiated by 19.8, $\frac{c}{19.8}$, as the equation for light was generated thus ([2]; p16, eq.15), with such differentiation. Thus, the following equation would suit:

$$e_c \cdot f = E \cdot (\frac{c}{19.8})^2 \tag{1}$$

Now, if we change the equation to look like this $E = e_c(\frac{19.8}{c})^2 f$, then $e_c(\frac{19.8}{c})^2$ is by our knowledge of the Planck equation $E = hf$ [8] the value for h. Is the value the same? The value $e_c(\frac{19.8}{c})^2$ is $7.0163 \cdot 10^{-34} \, Cm^{-2}s^2$. This value is slightly higher than the value for h ($6.626 \cdot 10^{-34} \, Js$) as we didn't factor in the notion that 19.8 is a _held_ level within the atom, and when the "19.8" (21.8) standard is lifted from fine structure atomic axiom _forceps_ between the electron and the proton, then the value should drop 0.5 points on the fine structure gradient to 19.3, the same value the $\frac{-1}{\varphi}$ was initially "out" in the initial modelling ([2]; p11, fig15). We now get a perfect result as $e_c(\frac{19.3}{c})^2 = 6.626 \cdot 10^{-34} \, Cm^{-2}s^2$ albeit using a different set of dimensional variables. Thus, once again it can be confirmed that the Planck scale is considered inoperable as a scale, for we have found that the Planck scale is well below, much smaller, than the most fundamental level of the atomic and elementary particles. The problem it seems is that the Planck constant was too simple in being a sole constant in attempting to join the energy of a photon with its frequency.

Once again, why do electrons jump between shells? It is the atom's way to still find the perfection of π while trying to resolve the error of light and its association to subatomic particles (and in the case with the electron shells, the electron), as we did entertain π-estimates in the second paper ([2]; p8, eq.3, p10, eq.6). The atom can only then try to find the perfection of π and rectifying the error between light and the elementary particles by developing to a point where it cannot develop any more, and thus as a process of time upon space (as per the axiomatic atomic modelling in the second paper ([2; p16 eq.16]) entertain new atomic references to interplay via photonic interaction to reach the perfection of π and resolve the error between particles and light. In fact, the idea of light to trace "π" is what defines a "quanta", a wavelength of light, as a necessary all or nothing package. The fact that we have defined a package of energy through this atomic modelling process confirms the correct level of consideration, and not a singular constant determination (which would otherwise lead to erroneous placements of mass and dimension in regard to light(time)).

4.   Extra-atomic "time" as chaos

This new platform beyond the atom deserves more attention, a platform we have termed "extra-atomic". We have derived a value for the energy of a photon as it jumps through energy shells, releasing energy with each

energy shell descent, highlighting the energy provided care of the charge of the electron per wavelength for each speed factor (and thus per time), or simply the charge of the electron factored with its frequency, which resulted here in eq.1. This, from considering $e_p = m_p c^2$ ([2]; p16, eq.15). Now we must consider a new "extra-atomic" equation for time that recognises this primary $t_A, (t_B^2)$, realm.

The principle equation for time was presented as $\frac{t_A + t_B}{t_A} = \frac{t_A}{t_B}$ ([1]; p4, eq.6), or more simply $t_B + 1 = t_A$. Then, when applied to space it became $(t_B \cdot - 2\sqrt{3}) + 1 = \pi$ ([2]; p7, eq.2). Now we must consider a new process for time beyond the atom; we must also consider that time would still, beyond the atom, seek a way of upholding its need to trace a perfect circle, to put multiple atomic references together in an ultimate context of time seeking to trace a circle. Simply, the atomic context can't be undermined, but developed upon. How to do this?

Ultimately t_A as per eq.7 of the first paper ([1]; p4), would need to be as $t_B^2 = \varphi \cdot - \frac{1}{\varphi} = -1$. Doing this is bringing equality for time for both results of the golden ratio, which is the problem it is trying to resolve. This gives t_B the value of "i". If therefore we continue to consider time to represent a complex axis, as we have in first paper ([1]; p4-6, fig.9, fig.9.1, fig.9.2, fig.9.3), note the logic there of the future being the inverse negative of time-now t_N, using the golden ratio for time-now t_N and time-after t_A, time-before t_B became complex, given that time-after t_A would represent -1 if time-now t_N would be defined as "1". Thus, the equation for time becomes $t_B + 1 = -1$. This can be expanded to $t_B + 1 = t_B - t_A$, if indeed $t_B - t_A = -1$. Thus, we get the following: $t_B + 1 = t_B(1 - t_B)$. Now let's add in a spatial point "x" that represents this new extra-atomic condition for time for the x-axis in 0-scalar space:

$$x_{(t_B + 1)} = x_{t_B}(1 - x_{t_B}) \tag{2}$$

It is not as simple as this though; it's an ideal, yet the reality would hold that time is still seeking to trace a perfect circle while still needing to uphold its basic elementary particle dual golden ratio result wave-function processes. Thus, we must add a new constant k; thus repairing eq. 2 we now have:

$$x_{(t_B + 1)} = k \cdot x_{t_B}(1 - x_{t_B}) \tag{3}$$

This constant k represents the feature that highlights a *sensitivity* to the underlying wave-function atomic processes at play, as what we can term "*initial conditions*". This equation would represent how any extra-atomic condition for "x" would evolve in time, would propagate through time; it has underlying structure to it for it obeys the golden ratio time equation. This is not the first time we have seen this equation, as it represents the "logistic map equation" [9]. It is used in chaos theory [10], and defines the idea of chaos with an underlying sensitivity to initial conditions [11], promoting fractal lattices [12]. The equation has been used to successfully study sentient being population growth [10]. One key feature of the underlying order for our modelling of time and space is for time to trace a circle, and for the disparity between light and the position of a particle to be resolved. We can present though that the extra-atomic level would be chaotic yet sensitive to the underlying initial conditions of the atom, and that the value "k" can be adjusted to accommodate for the proposed directive of time in space. One way it can do this is through a fractal Fibonacci sequence [13] process of spatial modelling, given that the Fibonacci sequence is a golden ratio algorithm [14].

5.   The directive of "time" in chaos and the emergence of consciousness

The need for the system to define π perfectly and eliminate the error between light and particle location would be the "directive" in this chaotic extra-atomic manifold. This would happen through the assembly of all these chaotic yet (golden ratio) fractal conglomerations (which would follow what we know as a Fibonacci sequence of layered building, a sequence that adheres to the golden ratio, and in this case a way to build structures upon sub-

structure dimensions [13], a most practical form of spatial modelling without corrupting underlying sub-structure "initial conditions") of atoms all undertaking their force-associations (as per gravitational and electromagnetic interaction, ([1]; p8-10). The overall structure of reality logically would play out as vast conglomerations undergoing circular formations as 3-d spherical structures in a context of (in all appearance) chaos. Note that the set feature within the atom required light had a certain "uncertainty" to it owing to how the wave function developed and the need to step from a 19.8-manifold to a 21.8-manifold owing to the quantised features of that wavefunction; light would be still vulnerable to that same set of conditional uncertainties that the atom was able to deal with as per its construction. How though can light behave extra-atomically to honour these underlying conditions of reconciliation?

The only thing we can consider is that we must invite a new dimension that can address this error and the fallibility of chaos, beyond the simple idea of the chaos at play, that tries to rectify the observed position of a body (particle or groups of particles) with their actual placement. The proposal here is that such a "thing", such an extra-atomic manifestation, is consciousness [15], a merging of the immediacy of 0-scalar space as quantum entanglement, as also fractal mass and photon interaction along a Fibonacci sequence [13] gradient, with the need to bring synthesis to what is observed as what is exactly found to be observed where it should be. Consciousness would represent that feature of time and space extra-atomically that aims to keep everything together in a perfect circle without corrupting the atomic and subatomic protocols of time's placement upon space as the golden ratio. Simply, consciousness would be a bringing together of a certain set of conditions, and not a primary concept of itself. Thus, as a "bringing together" it would represent vast array of different references of spatial context, working as one, along the directive for time to achieve π and have the error of light and the observation of particles relevant to light rectified. Moreover, consciousness would be that feature of time and space that sets the value of "k" in the logistic map equation (eq. 3) towards fulfilling the given protocols. To resolve these issues, let us detail therefore this hypothetical manifold and see if it bears all the ingredients of what we could consider as consciousness:

(i)   Ultimately, when the system reaches the state of having collectively defined π and rectified the disparity between light and particles, it would trace a perfect circle in time, let's say as a universal "time-wheel".

(ii)   This process would logically involve two references; light, and particle matter, both as one, which would need to be traced in the one time-wheel in being brought together as one (in order to resolve the disparity between light and any infinitesimal number of particle locations within that system, as consciousness).

(iii)   Logically to achieve this, one time-wheel would be used with an identical time-wheel, creating the idea of an ever-repeating time-wheel; the error of particle location of one time-wheel would calibrate exactly to the location of the next time-wheel, and vice-versa, and thus as an identical and thus repeating time-wheel, two time wheels with a gap in between (to accommodate for the perceived error of particle location) creating a never-ending cycle, like a race between two one-directional time-wheels that never ends.

(iv)   To achieve this, the time-wheels would need to be pure time, pure energy, in accommodating for the common singular location of matter within each of them; thus, the edge of the universe would represent the break-down of matter, within which would be the bulk of space and mass undergoing a process of only logically spatial rotation and precession [16] of mass to accommodate for (iii).

(v)   The size of the universe thus would be calibrated accordingly harbouring the required rotation and precession of matter for this "eternity-wheel".

(vi)   Part of this process in the overall consciousness manifold requires this universal manifold to link with its constituent parts as resonance within the eternity-wheel that alleviates the disparity between what is observed and what is located within itself.

(vii)   Ultimately the idea of chaos would in all appearance be overarched by such an eternity-wheel order.

(viii) Associated to the universal eternity-wheel, space would harbour conscious sub-structures (networks leading to the ultimate level) as "conscious-references".

(ix)   Consciousness for the system would exist as a fundamental process for any reference in the eternity-wheel with the "ideal" aim to uphold the eternity-wheel process, as a process of exercising observation and calculation of structures in diminishing the atomic-generated disparity between what is observed and where mass is located.

(x)   In that system of consciousness would therefore exist the idea of "knowledge" [17], as a recognition of what is observed according to its correct placement; as $t_A = t_B^2$ the idea of "memory" t_B would represent a dual complex axis as a surface area of recorded knowledge for conscious references and mass references.

(xi)   This knowledge would represent a process of the system's need to correct "errors" of observation and "reason" (reason being knowledge with the directive understood and in use), and to have this clearly documented in the form of symbols conveying such knowledge, symbols relevant to the conscious level of the time wheel of eternity and understood to conscious references within that time-wheel.

(xii)   These underlying references would though in not being the ultimate structure be considered as inherently incomplete, flawed.

(xiii)   Consciousness would be more greatly concentrated in complex emergent systems (from chaos), less concentrated on the level between atoms.

(xiv)   Consciousness in these references would nonetheless be an event between vast-networks of atoms seeking their own π-perfection while aiming to address the disparity between light and particles.

(xv)   Quantum entanglement between atoms would be in play between free particles or atoms in a general context of universal 0-scalar space, logically creating the differentiation in the context of consciousness of subject and object [18] for conscious-references.

(xvi)   This incomplete state, as a sub-structure state within the eternity-wheel, in the context of a universal consciousness, would manifest as "choice", an inherent vulnerability and uncertainty that needs correcting through deliberation of what is observed and where it is observed.

(xvii)   Given the quantum entanglement principle in effect for 0-scalar space, ultimately two types of consciousness determination would emerge in each conscious-reference network in the one system with the goal of working together to reach the ultimate level of consciousness, two types through all spectrums of chaotic-fractal structures.

(xviii)   These two types could be considered as two features of consciousness, one a positive value, the other the negative inverse value of consciousness (two results for the golden ratio in quantum entanglement).

(xix)   Each reference would be subject to this inherent dual process whether it is enacted as choice, or conscious entanglement (manifesting as a type of role-play), or any other system of consciousness deliberation using the idea of entanglement according to the golden ratio equation.

(xx)   The closer to the ultimate (pure directive), the less choice, the further away from the ultimate (chaos), the more choice (ultimately becoming random decision making).

(xxi)   The ultimate level would be the logical hallmark of what must be as a standard set for the system, looking after the system, being the establishment of consciousness "power", the bottom destructive, negligent of what could only be the vast vicissitudes of conscious purpose and deliberation.

(xxii)   This ultimate order of consciousness would nonetheless harbour chaos as consciousness albeit in a restrained fashion else corrupt the fundamental principal of keeping the system ordered.

It does therefore seem that this hypothetical manifold bears some resemblance to our ideas of consciousness [15]. Despite this hypothetical proposal, perhaps we can do more with this manifold, the actual t_A process in play, as there does appear to be an element of determinism [19] in the process of consciousness on this "time-after" t_A manifold.

6.   Consciousness as an extra-atomic "after" event

The feature to note is that consciousness would operate in this t_A realm, *the* manifold for the process of the emergence of consciousness ([1]; p4 eq.7, p.6 fig.9.3). As such, consciousness would represent the "time-after" paradigm. Thus, let us suggest this as an "after-life" manifold for time and space, as consciousness, given that in using the term "consciousness" we are implying "life". The following points could be considered:

(xxiii) The "after life" would exist as an ultimate basis in the t_A realm, a type of "super"-consciousness.

(xxiv) All the facets of consciousness from this afterlife level would resonate through the system to a "sub"-conscious level, and a "time-before" level of "knowledge recording" (memory).

(xxv) The t_A manifold would thus resonate the idea of determinism in this grand system of consciousness, a "set option" we can choose for or against from a sub-reference (a choice between order or chaos).

(xxvi) Consciousness primarily would operate from the "order" level, and thus less as an "ability" in matter (sub-conscious), less inside the atomic structure, more where the ability has found perfection (super-conscious).

(xxvii) The atomic primordial level would thus logically give in to an ultimate non-matter energy-based t_A level.

(xxviii) The highest consciousness as a directive would resonate through the system as a directive which would take the form in each reference as an intuitive [20] drive to uphold the system directive.

A few questions: can this theoretical system be compared to our own actual system and if so how vast is the universe, how long would be an "eternity-cycle", and of course is there a God [22]? All the mathematical values plug in for the key equations of physics, so this scheme does fit more than well with our own system. In terms of the size of the Universe, that would be relevant to the length of time of an eternity cycle and the type of rotation and precession of all the major celestial bodies in that universal system. As for the length of time of an eternity cycle, the thinking is that with all things considered equal, we as an intelligent and system-consciousness cognisant species could logically be considered to be asleep for half a wheel of eternity to how time and space could actually work, and awake the other half. So, given we can plug in our usefulness here, and that we have roughly 6000 years of history accounted for (dating back roughly to 4000BC with the emergence of the bronze age and associated discovery of the wheel [21]), it wouldn't be unreasonable to suggest the time for one cycle of eternity would be double 6,000 or so years and thus ~12,000 years. Is God real? According to the theory here, if the ultimate system consciousness could be considered as "God", God would be that system consciousness, the highest level, maintaining time and space order. It would be difficult for us to understand God given our human form vastly different to the ultimate shape of time and space, yet the paper here suggests that consciousness is in fact a system directive for time and space to resolve its issues with particle location, light/observation, and its need to trace a circle of time as π. The fact that we as a species have many accounts for the one God perhaps highlights how vastly difficult it is to understand God using just one type of human identity reference.

7.   Conclusion

The findings here to the idea of consciousness being an emergent feature of chaos are interesting, for it almost appears there is a system directive in play, a type of "determinism", that we could be either consciously or sub-consciously be a part of. The aim of the paper here though has been to keep this as scientific as possible and on track with scientific ideas, yet we did remain methodical and thorough in examining how a system would "use" the idea of consciousness to satisfy a prime directive of reducing the uncertainty between light and matter together

with the need of time to trace π. What resulted appears similar to how we have regarded not just consciousness but the idea of an absolute consciousness (which should deserve another discussion in a different manner). Here though, in considering contemporary ideas in science, the key finding in this paper has been a value for the energy of a photon, together with an equation for time on the extra-atomic level that in all structure represents what we already know to be the "logical map equation", a key equation used in the investigation of chaotic systems. From that equation, we suggested that upon that manifold, that extra-atomic manifold, would need to emerge the idea of consciousness as a process of light/observation finding parity with the calculation of a particle regarding its location, resulting in many ideas regarding consciousness we may find familiar.

Conflicts of Interest

The author declares no conflicts of interest; this has been an entirely self-funded independent project.

References

1. Jarvis S. H. (2017), Gravity's Emergence from Electrodynamics, http://vixra.org/abs/1704.0169, www.gravielectric.com.
2. Jarvis S. H. (2017), Golden Ratio Axioms of Time and Space, http://vixra.org/abs/1706.0488, www.gravielectric.com.
3. Schrödinger, E. (1926). "An Undulatory Theory of the Mechanics of Atoms and Molecules" (PDF). Physical Review. 28 (6): 1049–1070. Bibcode:1926PhRv...28.1049S. doi:10.1103/PhysRev.28.1049
4. Robert van Gulick (2004). "Consciousness". Stanford Encyclopedia of Philosophy
5. Klein, Martin J. (1961). "Max Planck and the beginnings of the quantum theory". Archive for History of Exact Sciences. 1 (5): 459. doi:10.1007/BF00327765
6. Heisenberg, W. (1927), "Über den anschaulichen Inhalt der quantentheoretischen Kinematik und Mechanik", Zeitschrift für Physik (in German), 43 (3–4): 172–198.
7. Kragh, Helge (1 January 2014). "Photon: New light on an old name" (PDF-1.5). arXiv:1401.0293
8. http://physics.nist.gov/cgi-bin/cuu/Value?plkmc2gev
9. Boeing, G. (2016). "Visual Analysis of Nonlinear Dynamical Systems: Chaos, Fractals, Self-Similarity and the Limits of Prediction". Systems. 4 (4): 37. doi:10.3390/systems4040037. Retrieved 2017-07-04.
10. May, Robert M. 1976. "Simple mathematical models with very complicated dynamics." Nature 261(5560):459-467.
11. Baumol, William J., Economic Dynamics, Macmillan Co., 3rd edition, 1970, p160
12. Mandelbrot, B. (1982). The Fractal Geometry of Nature. New York: Macmillan. ISBN 0716711869.
13. Singh, Parmanand (1985), "The So-called Fibonacci numbers in ancient and medieval India", Historia Mathematica, 12 (3): 229–44, doi:10.1016/0315-0860(85)90021-7
14. Livio, Mario (2002). The Golden Ratio: The Story of Phi, The World's Most Astonishing Number. New York: Broadway Books. ISBN 0-7679-0815-5.
15. John Searle (2005). "Consciousness". In Honderich T. The Oxford companion to philosophy. Oxford University Press. ISBN 978-0-19-926479-7.
16. Schaub, Hanspeter (2003), Analytical Mechanics of Space Systems, AIAA, pp. 149–150, ISBN 9781600860270, retrieved 4 July 2014
17. knowledge: definition of knowledge in Oxford dictionary (American English) (US)". oxforddictionaries.com. Archived from the original on 2017-07-03.
18. Descartes, René. "LIII". The Principles of Philosophy. Retrieved 3 July 2017.
19. Hoefer, Carl (Apr 1, 2008). "Causal Determinism". In Edward N. Zalta, ed. The Stanford Encyclopedia of Philosophy (Winter 2009 edition).
20. Intuition and consciousness – Rosenblatt AD, Thickstun JT. Psychoanal Q. 1994 Oct;63(4):696-714.
21. Anthony, David A. (2007). The horse, the wheel, and language: how Bronze-Age riders from the Eurasian steppes shaped the modern world. Princeton, N.J: Princeton University Press. p. 67. ISBN 0-691-05887-3.
22. https://www.merriam-webster.com/dictionary/god