



Article

Second Law and Three Evolution Paradoxes: Life, Evolve, and Soul

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Abstract: Three main paradoxes are prevalent in attempts at a unification of Charles Darwin's 1859 theory that species have *evolved over time* — by *natural selection*, in the *struggle for life*, from earlier forms, deriving from a warm pond, filled with all sorts of chemicals, i.e. atoms and molecules, such as “ammonia and phosphoric salts”, subjected to light, heat, and electricity — with Rudolf Clausius' 1865 pronouncement that the *energy* U of the universe is conserved and the *entropy* S of the universe tends to a maximum, are discussed, namely: life paradox, evolve paradox, and soul paradox; the former two being pointed out directly in 1903 by Jean Perrin: “molecules and atoms are lifeless beings that never evolve”, the latter evidenced colloquially by the cultural divide about belief in the theory of evolution; in America, e.g., some 60 percent of people do *not* believe that humans evolved over time from earlier species.

Keywords: second law; entropy; evolution; life; soul; origin of life, thermodynamics

1. Introduction

There exist a number of paradoxes prevalent in attempts at unification of evolution theory and thermodynamics; many of which not becoming apparent until prolonged introspection on the thermodynamics side of the fence, i.e. viewing all “things”, as Aristotle would say, and processes, from a heat, energy, and work perspective—a vision opening discernment similar, in effect, to how, anecdotally, the Indians were not able to “see” the ships in the harbor, when Columbus arrived to the new world.

The paradoxes, to note, can be grouped according to whether one views the world through the eyes of a left brain thinker, i.e. the “Clausius culture”, using C.P. Snow's famous division, which assumes that the world is but atoms and molecules moving about in a void and subject to the laws of energy conservation (first law) and entropy increase (second law), or a right brain thinker, i.e. “Shakespeare culture”, who presume, for the most part, that the humans, in some way or another, either were created by supernatural means or evolved over time, from earlier life forms, amid which there was some type of ontic opening or metaphysical principle involved. The perspective employed, here, particularly on this latter paradox, will be that coming from the “extreme atheism” point of view, e.g. of the Julien la Mettrie variety, who griped about Descartes that “dualism is a trick of skill, a ruse of style, to make the theologians swallow a poison” and who ridiculed Leibniz and his followers that they have “spiritualized matter, rather than materialized the soul.” [1]

The total number of so-called Clausius-Darwin paradoxes pointed out over time would seemingly count into the dozen range. The general blanketed statement of Darwin + Clausius

embedded paradoxes, to note, was pointed out in 1973 by Roger Caillois who stated: "Clausius and Darwin cannot both be right". [2] A more detailed statement of this, what we might call "Caillois conjecture", was touched on in the form of a general query in 1892 by German physicist Karl Pearson, who, in his chapter subsection "Natural Selection in the Inorganic World", of his *The Grammar of Science* — the first book on Einstein's famous "Olympia Academy" reading list — asked the following discerning question: [3]

"There is a problem [Caillois conjecture], however, with regard to 'natural selection' which deserves special attention from both physicist [Clausius] and biologist [Darwin], namely: Within what limits is the Darwinian formula a valid description? Assuming the spontaneous generation of life as a plausible, if yet unproven, hypothesis, where are we to consider that selection as a result of the *struggle for existence* began? Again, for what, if any, forms of life are we to consider it as ceasing to be an essential factor in descriptive history? We may not be able to answer these questions definitely, but some few words at least must be said with regard to their purport. In the first place we notice that as soon as we conceive a perfectly gradual and continuous change from inorganic to organic substance, then we must either call upon the physicist to admit that natural selection applies to inorganic substances, or else we must seek from the biologist a description of how it came to be a factor in organic evolution."

Here, firstly, to clarify, we see Pearson crouching is argument in a conceptual "organic and inorganic" divide, which is but a chemical dualism ruse, as La Mettrie would say, but nevertheless a repairable ruse: organisms, i.e. "things" with *organs*, derive from the periodic table, 6 to 26 specific elements, i.e. the CHNOPS+ group, of the periodic table, depending on organism; there is no "animal life", "vegetable life", "mineral life" divide of the periodic table, as Carl Linnaeus would have Pearson believe. [4]

Secondly, and most importantly, Pearson, here, is indirectly asking the question: if Clausius and Darwin were engaged in a frank dialogue, with say Aristotle or Bacon as mediator, who would defer to whom? Darwin would undoubtedly defer to Clausius, albeit likely not without some unspoken reservation—such as were voiced in the heated 1897 to 1907 "what is entropy debate?" between primarily English physicist James Swinburne and Irish mechanical engineer John Perry (former assistant to William Thomson), and a dozen or so others, including Max Planck, Henri Poincare, and Oliver Lodge, to name a few. [5] Clausius certainly would not "admit", as Pearson conjectures to be one of the two solution options, that Darwin's theory of natural selection applies to or underpins the mechanical theory of heat or is involved in the selection of states of operation of the heat engine or general material bodies of the universe; rather, the converse is the correct orientation. This is what Pearson was grasping at in his "some few words at least must be said" comment.

A noted historical realization of a Darwin mindset deferring to a Clausius mindset is found in the anecdote of how English philosopher-biologist Herbert Spencer in *circa* 1858 commented to Irish physicist John Tyndall that he was "staggered" and "out of spirits" for some days after Tyndall told him what equilibrium meant in physics' terms; an anecdote that has come to be known, in some circles, as the "Spencerian dilemma"; a dilemma which, to note, in the 20th century, some erroneous concluded was solved either by Emile Durkheim, and his physics based sociology theories, Ilya Prigogine, and his internal entropy theory, or Ludwig Bertalanffy, and his open systems theory. [6]

In 1991, American philosopher Robert Pirsig, in his *Lila: An Inquire into Morals*, gave a more direct rendition of Pearson's few words said on the struggle paradox, when, via character dialogue, he pointedly asked: "when did C, H, O, P, S, etc., start 'struggling' to survive to form me?" The full statement of this query is as follows: [7]

"This is the sort of irrelevant-sounding question that seems minor at first, and the mind looks for a quick answer to dismiss it. It sounds like one of those hostile, ignorant questions some fundamentalist preacher might think up. But why do the fittest survive? Why does any life survive? It's illogical. It's self-contradictory that life should survive. If life is strictly a result of

the physical and chemical forces of nature then why is life opposed to these same forces in its struggle to survive? Either life is with physical nature [natural] or it's against it. If it's with nature there's nothing to survive. If it's against physical nature [unnatural] then there must be something apart from the physical and chemical forces of nature that is motivating it to be against physical nature. The second law of thermodynamics states that all energy systems 'run down' like a clock and never rewind themselves. But life not only 'runs up,' converting low energy sea-water, sunlight and air into high-energy chemicals, it keeps multiplying itself into more and better clocks that keep "running up" faster and faster. Why, for example, should a group of simple, stable compounds of carbon (C), hydrogen (H), oxygen (O), and nitrogen (N), 'struggle' for billions of years to organize themselves into a professor of chemistry? What's the motive? If we leave a chemistry professor out on a rock in the sun long enough the forces of nature will convert him into simple compounds of carbon, oxygen, hydrogen and nitrogen, calcium, phosphorus, and small amounts of other minerals. It's a one-way reaction. No matter what kind of chemistry professor we use and no matter what process we use we can't turn these compounds back into a chemistry professor. Chemistry professors are unstable mixtures of predominantly unstable compounds which, in the exclusive presence of the sun's heat, decay irreversibly into simpler organic and inorganic compounds. That's a scientific fact. The question is: Then why does nature reverse this process? What on earth causes the inorganic compounds to go the other way? It isn't sun's energy. We just saw what the sun's energy did. It has to something else. What is it?"

This ripe and intellectually pregnant statement is otherwise known as the "chemistry professor paradox", i.e. should a physical chemistry professor continue to defer, per established protocol, to Darwin or should he or she confront the paradoxes? [8]

In this direction, using this so-called "Pirsig paradox recipe", one can insert any number of ingrained or assumed belief-conceptualized terms, into the previous statement by Pirsig, to arrive at any number of new paradoxes; three of which, shown below, will be our focus herein:

LIFE: "when did C, H, N, O, P, S, etc., come 'alive' to eventually form me?"

EVOLVE: "when did C, H, N, O, P, S, etc., start 'evolving' to form me?"

SOUL: "when did C, H, N, O, P, S, etc., aggregate to obtain a 'soul'?"

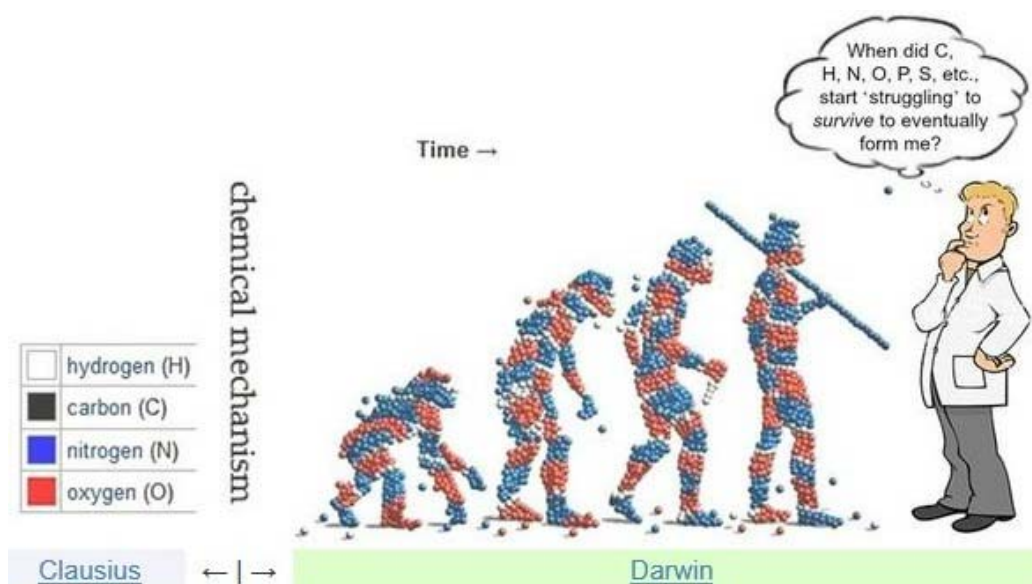


Figure 1. Chemistry Professor Paradox.

In these query statements, the first, i.e. “life”, is a metaphysical term (Gilbert Lewis, 1925), the second, i.e. “evolution” is a theoretical term (Charles Bonnet, c.1760), and the latter, i.e. “soul”, a religio-mythology term (Imhotep, c.2600BC), handed down to us culturally from Egyptian-Greco-Roman ideas about what constitutes the composition of a human—a connective logic passed along to us by the study abroad method initiated by Thales, who, according to Aristotle, was the first philosopher in the Greek tradition to initiate the study of Egyptian philosophy of nature, by himself traveling to Egypt. Thales then advised Pythagoras to study in Egypt, which he did; thereafter both Democritus and Plato studied abroad in Egypt; hence, many modern beliefs are of Egyptian origin.

An important point to adhere to here is to keep in mind what is “real” as opposed to what is hypothetical, metaphysical, or religio-mythological, i.e. not real. It should universally be agreed upon, as a starting point, e.g., that “heat”, symbolized in differential element form by dQ , is real, just as we believe now, as did the ancients, that earth, air, and water are real. Likewise, when we divide a real quantity, e.g. dQ , by a positive integer, e.g. the absolute temperature T of a body, we should still have a real thing, i.e. dQ/T , aka entropy, should be real. The elements: carbon C, hydrogen H, nitrogen N, oxygen O, phosphorus P, and sulfur S, likewise, are also real, i.e. “atoms exist” as a matter of scientific fact.

Thales, to exemplify a case of *non-reality*, theorized that “spirit” is what gave amber its attractive properties, e.g. the ability to attract pieces of straw or cloth; Thales, supposedly, also theorized that loadstone attracts iron because it has a “soul” — the prevailing view at the time being that movement of any kind indicated life, or a soul, or a god:



Figure 2. Amber attracts straw; loadstone attracts iron.

Thales’ assertions were based on the premise that the loadstone’s moving of the iron was caused by itself rather than by the intervention of some god. We now know, retrospectively, that the ability of amber to attract dry straw and of loadstone to attract iron is NOT the result of spirit or soul but rather of the interactions of photons with charged electrons and oriented electrons, respectively, i.e. soul and sprit are not real. While the majority of the modern world, for the most part—panexperientialists, etc., aside—agrees with the non-reality of spirit and soul in amber and loadstone, the same is not the case in respect to the non-reality of soul and or spirit in the social world.

This is but an issue of causality complexity ignorance. Just as Hippocrates long ago said: “Men think epilepsy divine, merely because they do not understand it. We will one day understand what causes it, and then cease to call it divine. And so it is with everything in the universe”, so to we can state presently that “people think social phenomena divine, or soul or spirit imbibed, merely because they do not understand certain things. We will one day understand what causes it, and then cease to call it divine, or soul-filled, or for people to think of themselves a spiritually-empowered. And so it is with everything in the universe”. Attractions and repulsions in society, like the movements in and around amber or the load, are the result of the photon-electron interactions, in particular, or boson-fermion interactions, in general, nothing more, nothing less. One day we will understand social

causality in more detail, like we now understand causality in amber and loadstone, and on that day we will cease to call it divine.

2. Life | Paradox

That people believe that atoms exist and are real is not something that has always been the case: it has only been in the last century that atomic reality has been accepted as true. Ludwig Boltzmann, e.g., infamously was forced to hang himself owing to the intense and violent opposition, coming from energetics school led by Wilhelm Ostwald and Ernst Mach, to his atomic theory based statistical mechanics interpretation of the second law of thermodynamics. In 1905, Boltzmann, a year before his forced demise, in his *Popular Writings*, wrote:

“May I be excused for saying with banality that the forest hides the trees for those who think that they disengage themselves from atomistics by the consideration of differential equations.”

In 1909, however, atoms became ‘cool’, no pun, metaphor, analogy, or simile intended. That year Jean Perrin, in his “Brownian Motion and Molecular Reality”, proved, once and for all, that atoms exist and are ‘real’ via three different means, namely: first, he used a gamboge soap-like emulsion, second by doing experimental work on Brownian motion, and third by confirming Einstein’s theory of particle rotation in the liquid phase. Seventeen years later, in 1926, Perrin was awarded the Nobel Prize for this atomic proof, officially acted to close a 2,400-year-old lid on Leucippus’ 450BC or 2200BG (Before Goethe) refreshing theory of atoms and voids, which Augustine, in c.400AD or c.1350BG, wished would have disappeared: [N1]

“Let those philosophers disappear, who attribute natural corporeal principles to the intelligence attached to matter, such as Thales, who refers everything to water, Anaximenes to air, the Stoics to fire, Epicurus to atoms, that is to say, to infinitely small objects that can neither be divided nor perceived.”

In 1903, six years prior to this famous proof, Perrin made a more startling statement, namely, in his chapter “The Principle of Evolution”, in his *Treatise on Physical Chemistry*, Perrin pointed out the following fact: [9]

“Molecules are lifeless beings that never evolve.”

The following diagram shows the basic step-wise formation of humans from atoms and molecules over time :

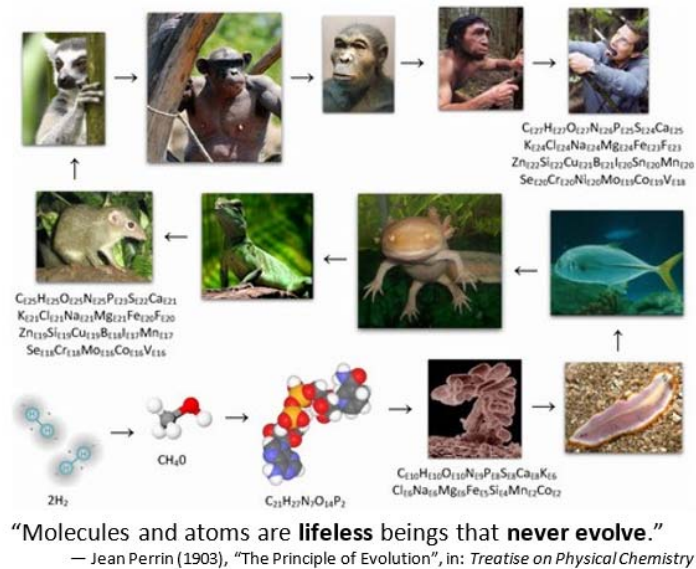


Figure 3. Evolution of Humans from Hydrogen Diagram.

Here we see a double paradox: leading scientific thinkers, for the most part, believe they are 'alive' and that they 'evolved' over time, and that they derive from atoms and molecule, which Perrin says are NOT alive and NEVER evolve? Perrin, to note, in respect to his religious beliefs, as they pertain to this sentence, was an atheist, as was his son French physicist Francis Perrin, a statement of this as follows: [10]

"Jean and Francis Perrin held similar political and philosophical ideas. Both were socialists and atheists. Like many nineteenth century French men of science, Jean Perrin viewed science almost as a religion."

The focus here on religious belief in respect to the terms "life" and "evolve", as we will discuss, is that, etymologically, they each have theistic and or religio-mythology conceptual origins, whereas "atom" and "molecule" do not; a seeming dualism divide which has existed nearly since the coining of the word *atomos*, meaning uncuttable, by Leucippus some 2,465 years ago.

Here, to continue, in Perrin's 1903 statement, we see a double paradox, namely: molecules, such as H_2O or CO_2 , or atoms, such as N or Se, are NOT, by definition, "alive", and do NOT, according to physical chemistry, "evolve". Darwin, however, informs us that we are alive, i.e. that we are involved in a process of "natural selection" in the "struggle for life", which are the subtitles to his famous *Origin of Species*. Darwin also informs us that we "evolved" over time, a terminology he later adopted from Herbert Spencer (*First Principles*, 1862). Spencer, in turn, adopted the term "evolve" from the 1830s work of Jean Lamarck, who in turn employed this term based on Charles Bonnet's circa 1760 coining of the term "évolution" (French), which he used synonymously with "révolution" and "métamorphose", in the linguistic etymological sense of: [11]

évolution = [révolution + métamorphose]

meaning that something that "evolved", e.g. a tree shrew, according to Bonnet, is something that goes through form change via a process of revolution and metamorphosis, organisms stepping upward through the "great chain of being" or steps of higher spiritual and corporeal perfection, as shown below, which is an artistic step-wise chain of being illustration from Bonnet's 1783 *Works of Natural History and Philosophy*. [12]

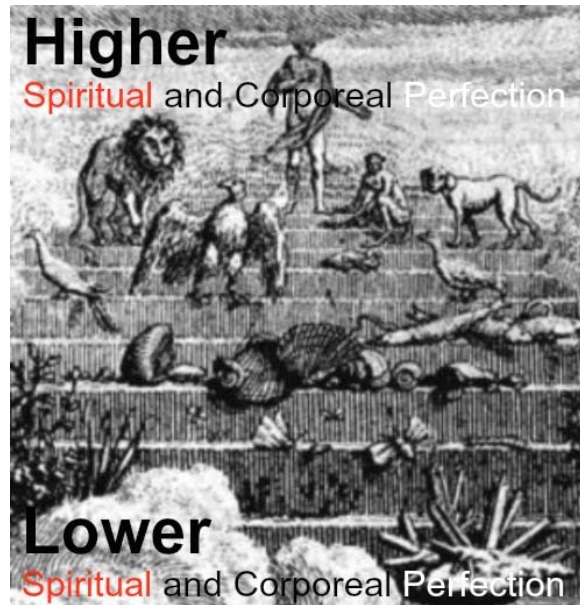


Figure 4. Bonnet Ladder of Being diagram (1783).

While Darwin's concept of the evolution chain or mechanism was materialistic in basis, Bonnet's chain was religiously-ingrained, i.e. god held the first and last link in the chain; his 1764 statement on this is as follows:

"Between the lowest and the highest degree of 'spiritual' and corporal perfection, there is an almost infinite number of intermediate degrees. The succession of degrees comprises the universal chain. It unites all beings, ties together all worlds, embraces all the spheres."

The term "evolve", in short, at least as Bonnet employed the term, has "spiritual" etymological underpinnings. On Darwin's views and beliefs, in respect to this fourth so-called "spiritual paradox" conflict, Darwin being mostly an agnostic leaning towards atheism, such as evidenced by his 1860 letter to Asa Gray on wasps. [13]

Stepping into the 21st century, we now have Clausius-based periodic table model of form change over time. Instead of humans deriving from lower spiritual and corporeal forms of perfection, over time, up a stairway to heaven, we now have hydrogen atoms reacting over time to form 92 naturally-occurring elements, which were heated cyclically over time producing 26-element humans. As there is no lower form of "spiritual" in the hydrogen atom, contrary to the views of many who have ventured down this path (e.g. Pierre Teilhard, 1936), the modern thinker is thereby forced into reconceptualization of previously held beliefs, concerning deeply ingrained belief system terms such as: soul, spirit, life, etc., into a new language of: heat, energy, work, and derivative terms, such as entropy, Gibbs energy, temperature, pressure, etc., which in the end actuate a resolution of the paradoxes; albeit, not done so via religious-based amalgamations or portmanteau formulations, such as "bio-gibbs energy" (Mark Jaynes, 2008) or "spiritual entropy" (Gilbert Wedekind, 2003).

On the first paradox, i.e. the apparent absurdity of the concluding assertion that moving humans are "alive", but also types of molecular movement that derived from so-labeled lifeless atoms and molecules, here we have what is called a "la Mettrie loophole", for lack of a better name. Similar to the way the followers of Gottfried Leibniz attempted to spiritualize matter, rather than materialize the soul, modern thinkers or followers of Darwin will tend to "alive-alize" the elements of the periodic table with anthropomorphic labels, e.g. "dead atoms" or "living chemicals", similar to how many physicists of the 19th century attempted to "ether-ize" discussions of movement in space, whereas we now know, as has been proved, that ether does not exist.

In order to be convinced that there is no apparent life paradox, typical thinkers will firstly tend to be pacified by thermodynamics-based classics, such as: Miller-Urey experiment, lightning origin

theory of life, thermal vent theory origin of life, clay substrate theory origin of life, Galvani electrified frog leg experiments, or panspermia, among others, all of which indirectly point to the assertion that “life” metaphysically or magically started on one particular “emergence” point in the distant past, when heat, energy, and work interacted in particular perpetual motion like way with atoms.

Given time, however, these will become unpalatable to the inquisitive mind, i.e. the magical mechanism emergence day will be seen for what it is, namely : chemical perpetual motion. Nikola Tesla, and his 1915 statement: “there is no thing endowed with life—from man, who is enslaving the elements, to the humblest creature—in all this world that does not sway it in turn; whenever action is born from force, though it be infinitesimal, the cosmic balance is upset and universal motion result”, being the apex mindset of this avenue of belief digression.

Having rejected thermodynamic emergence theories, he or she will then jump into variations of panbioism theories: panpsychism, panexperientialism, among others, i.e. attempting to hold in one’s mind the blurry “everything is alive” model, a living monism sort of view, which ruminates on ideas about how sub-atomic things are alive, or how the hydrogen atom is “sort of alive” (Parson, 1892) or intermediate sized molecules are half-alive (Haldane, 1929). [14]

This latter path, however, while being very close to the correct solution—in fact a fence sitter jump away—will quickly lead in to more absurdities than the original absurdity the course of thought was aiming to reconcile in the first place.

The solution to this first paradox, in short, is that concluding statement that “life does not exist” (Szent-Gyorgyi, 1948) and that resultantly we “should abandon the world ‘alive’” (Crick, 1966). [15] This issue, however, has now largely been resolved, such as been dealt with in the 2007 to 2014 issues of the *Journal of Human Thermodynamics*, and there now are a number of historically-established physicochemcially-neutral upgrades for all “life”, “bio”, or “viva” usages, the main core substitute being terminological replacement of anything previous deemed “alive” by the phrase “powered CHNOPS+ structure”, or variations thereof; an upgrade that enters all the former defunct terms, each being religio-mythology based in origin. [16]

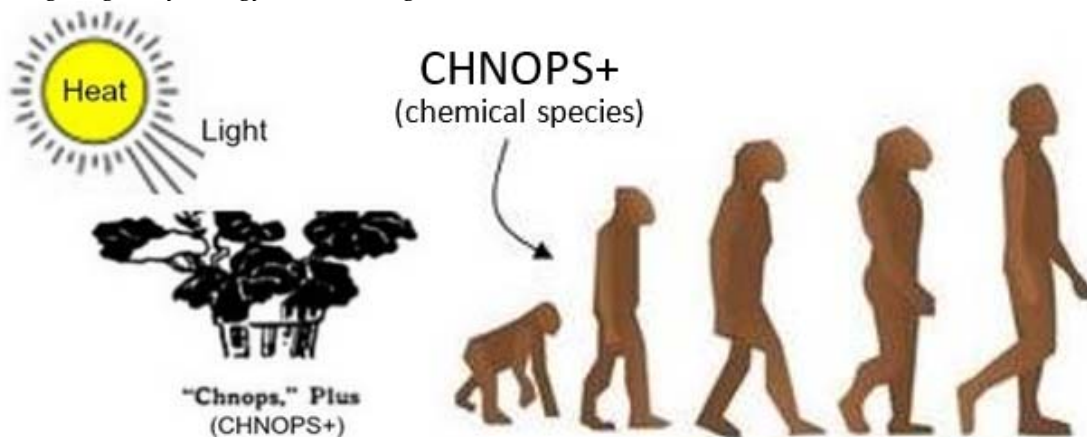


Figure 5. Types of CHNOPS+ organisms

Just as a plant, e.g., as shown above, is a CHNOPS+ system, as Frank Thone (1936) referred to plants, so to is a human a CHNOPS+20 ‘animate thing’ as Gilbert Lewis (1925), referred to himself or as and Wilhelm Ostwald (1926) defined himself, a CHNOPS+ combination:

“I am made from the **C-H-N-O-S-P combination** from which a Bunsen, Helmholtz, Kirchhoff came.”

— Wilhelm Ostwald (1926), *Lifelines: an Autobiography*

On the second paradox, i.e. the Perrin “evolve paradox”, namely: atoms and molecules never evolve, here we have an issue not so easily resolved by simple act of terminological reform. In the first place,

many people tend to think of atoms and molecules and moving about “randomly” by “blind” forces. This view, however, is but Greek atomic theory regurgitation, and incorrect. In the second place, people tend to think of people as having “choice” and the ability to “select” different reaction pathways, whereas these types of traits tend not to be associated with atoms and molecules. People have a feeling of choice, which derives from the sense, which is but force, which mediates the choice, but the selection, in the end, is still ‘forced’. This, however, gets into free will ideas and concept of soul, which will be touched on in the third paradox.

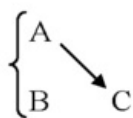
In any event, in order to resolve the “evolve” paradox, one has to reconfigure one’s mind into the “reaction theory” view of form change, past to present, and temporal “bound state” atomic existence view of reality. This was first worked out in basics by Goethe (1796), who conceived that humans are animated chemicals who “metamorphosized” from smaller chemicals, over time—as governed by the great principle of chemical affinity, introduced by Newton in his “Query 31” (1718).

“But the great principle of organic development through the struggle for existence, involving descent with modification, was distinctly enunciated by both Goethe and Erasmus Darwin before the close of the 18th century.”

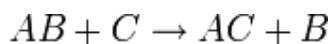
— Lester Ward (1907), *Pure Sociology* (pg. 537)

Stepping forward two centuries, we now see that Goethe’s views are generally correct, i.e. just as hydrogen will react with oxygen to form water a “new formation”, so too will man react with woman to form child a “new formation”, as Ludwig Buchner (1855) famously put it, but it is difficult to say that the products in both cases “evolved” from the former (reactants), just as in theory of nucleosynthesis we do not say that carbon evolved from hydrogen in stars, rather we say that carbon was “synthesized” from hydrogen via mechanism.

The following is the basic reaction schema mechanism for how nature ‘selects’, aka *natural selection*, as Darwin would call it, as pioneered in the 18th century lectures of William Cullen:



The entities A, B, and C, in Goethe’s view of evolution, or “metamorphology”, as he referred to it, culling terminology from Ovid, could be three people, three animals, or three chemicals. The dart represents the force of the chemical affinity, i.e. the gravito-electromagnetic force in modern parlance. The bracket represents the bond, quantified by Gibbs energy or fermion exchange force theory in modern parlance. This equates to the following in modern reaction notation terms:



In words, if A and B are in a chemical union in a system into which C is placed, C having a greater affinity or chemical force of attraction for A than A has for B or B for A, then A will have no “choice” but to detach from B and form the new AC union; all of which is but the result of changes in charge stability geometries of the protons and valence electrons involved, i.e. changes in plus/minus pattern formations.

In 1856, German physicist Rudolf Clausius came along and said that the quantitative governing rule overseeing these types of reaction processes or pattern formation changes is that when such reactions are put into a system, and heated and cooled over time, cyclically, the following relation will hold:

$$N = - \int \frac{dQ}{T}$$

where dQ are the differential amounts of heat entering or leaving the system, T is the absolute temperature of the boundary of the system where the heat enters or leaves, and N is the “equivalence value of all uncompensated transformations” that have occurred during the cycle of operations,

which is the quantitative measure of the "equivalence-values", or mechanical equivalent of heat changes associated with internal irreversible work process that exist at the end of one cyclical process or what are called "uncompensated transformations". This name "equivalence-value of all uncompensated transformations" is the early extended synonym for what would famously become termed, in 1865, as "entropy". Clausius stated that this value of N , being the measure of the nonreversible heat-work transformations occurring in the system, in magnitude, will increase until a maximum value, at which point the overall forward "change" in the system will cease.

If, during the course of one day, e.g., a person is cajoled, by the sense of "force" of the system, i.e. 'feel the force' terminology, deriving from the heat input, during the expansion phase, of the solar day heat cycle, into doing a certain amount of work, 'work' equating to the force moving a body through a unit distance, that produces something new, e.g. say a new article, a heat-transforming-into-work type of transformation, or positive transformation, as Clausius would say; and then, during the contraction phase, as heat leaves the social system, during the night, reverses the process, doing a work-transforming-into-heat type transformation, or negative transformation, the difference in summation of the dQ/T increments, at the end of the day's cycle will be N , which could say be quantified by the amount of joules per kelvin of the irreversibly produced new product, to a first approximation.

The translation of this logic, as Gilbert Lewis (1923) showed, to freely running reactions seen on the surface of the earth, e.g. iron rusting, wood burning, ants foraging, animals mating, wars actuating, etc., of the type Darwin ruminated about, occur such that nature will 'select' those reactions who adhere to the following inequality: [17]

$$dG < 0$$

which means that for such reactions the magnitude of N is small, at its initial state configuration, the processes is peaked at a heightened level of spontaneity, and that when the reaction process, metamorphosis transformation, or "evolution" reaction, as Darwin would say, stops, the value of N will be at its maximal value, and one colloquially says that entropy is at a maximum, NOT, to clarify, that "chaos" or disorder is at a maximum, but only that the process won't "work" anymore, i.e. go on its own, naturally, anymore.

A second factor involved when nature "selects" which products will form, i.e. which species will evolve or be selected and or go extinct, in Darwinian speak, is that reactions are also determined by kinetic factors. In other words, the two reacting species, whether two hydrogen atoms moving in the gas phase, or two humans moving in the social phase, have to collide with enough energy, and at the right time in space and in the correct orientation, so to break reactant bonds and get into the activation state. A sociological example would be that scenario when to people feel they are right for each other, but the timing is off, such as seems to have been touched on in the premise of Goethe's *Elective Affinities* about how in their youth Charlotte and Eduard were passionately in love with each other, but their respective arranged marriages kinetically forbid the thermodynamic formation of union between them, but that in their later years, both being freed from their previous marriages, they kinetically were able to bind to form marriage, but one without the same thermodynamic intensity of passion in the previous state of dynamical collision. Their trajectories were off, in short.

Where the difficulty comes in, in modern times, is that affinities are now quantified by Gibbs energies, meaning that one has to digest the 700-equations of Willard Gibbs' 1876 meticulously detailed chemical thermodynamics framework. This was proved in 1882 by Helmholtz in his "On the Thermodynamics of Chemical Processes", the long and the short of which states the following:

$$A = - \left(\frac{\partial G}{\partial \xi} \right)_{p,T}$$

which states that forces of affinities of the reacting species, whether atoms, bacteria, tree shrews, or humans, i.e. the positive affinities or negative affinities, aka 'love' and 'hate', respectively, in Henry Bray (1910) speak, will equal the change in the partial of the Gibbs energy of the system per "extent

of reaction" or timescale when the evolution, for a given system, stops or reaches equilibrium, i.e. $N = \text{maximum value}$.

Very little core work has been done on his problem, of correcting or rather upgrading Darwin into the Goethe-Clausius reaction theory based model of form change, beyond what has been said above. Here we will point out two historical avenues of notable headwind on this problem, namely that of American physical chemist, physiologist, evolutionist, and sociologist Lawrence Henderson (1918) and building on his work American physicochemical physiologist-zoologist Harold Blum (1934), both of whom initiate an attempt to gut through evolution theory via Gibbs, the latter of whom explicitly doing so in what he calls a "religious-free" form. [18]

In 1913, Henderson, in his *The Fitness of the Environment: An Inquiry into the Biological Significance of the Properties of Matter*, without going into prolonged detail, cites Gibbs three times, and begins to usurp or rather reform Darwin, with the following statement:

"Matter and energy have an original property, assuredly not by chance, which organizes the universe in space and time."

Chance is one of the faulty linchpins of Darwinism hand down to him by the Greek atomic theorists. The following, to encapsulate the situation, shows the change in citation count in Henderson's three main works: [19]

The Fitness of the Environment (1913): Gibbs, 3+ pgs; Darwin, 14+ pgs

The Order of Nature (1917): Gibbs, 22+ pgs; Darwin, 14+ pgs

Pareto's General Sociology (1935): Gibbs, 10+ pgs; Pareto, 88+ pgs, Darwin, 0 pgs

Darwin, in short, over the course of twenty-two-years, in Henderson's mind, has taken a backseat in respect to Gibbs, who is now driving the car and running the equations governing the engine of form change over time in nature.

Henderson, in his *The Order of Nature*, cites Lamarck: "Nature is an order which together constitute an unalterable power in its essence, subject in all its acts, and constantly acting on all parts of the universe ; an order able to give successively the existence of so many different things ; that power which did so much, and yet is constantly confined to only do those", which is the basis of his book's title, then states that we should keep our mind fixated on one simple question, namely: "What are the physical and chemical origins of diversity among inorganic and organic things, and how shall the adaptability of matter and energy be described? He may then see his way through all the difficulties which philosophical and biological thought have accumulated around a problem that in the final analysis belongs only to physical science, and at the end he will find a provisional answer to the question."

Henderson's use of the "organic/inorganic" divide, similar to Pearson, as touched on, is but a chemically-coated life/non-life divide handed down to us from Linnaeus and his 1735 three kingdom division: mineral (inorganic), plant (organic), animal (organic) which became a two division organic/inorganic in the 1820s chemical publications of Jacob Berzelius, to which most, like Henderson, have unwearingly adopted, despite its vacuous foundation. [4] Henderson, nevertheless, is stepping in the right direction. The physicochemical science of Gibbs, according to Henderson, will provide the answer to the question, philosophical, biological, and in respect to changes in the orderings of nature via power. Henderson, to note, avers that he is a novice in respect to the work of Gibbs; hence he only outlined how chemical thermodynamics will eventually reform Darwin, atoms to humans.

In 1934, American physicochemical physiologist-zoologist Harold Blum, in his "A Consideration of Evolution from a Thermodynamic View-Point", cites Lawrence Henderson (1913) and Gilbert Lewis (1923), to outline a coupling theory plus free energy decrease based theory of orthogenesis (directional-change) conceptualized evolution, in the explicitly-stated "religious-free" form of what he refers to as "chemical peneplanation", i.e. an synonym the semi-modern term Gibbs landscapes, as seems to be the case. [20] Blum's "chemical peneplanation" is a sort of modern upgrade, so to say, in dart throw aspects, to Goethe's pre-Darwinian 1790s theory of the origin of humans from chemicals via "metamorphology", based on chemical "affinities" as the driving force behind form change,

minerals, to vegetables, to animals, to humans; affinities being the forerunner to chemical “free energies”. Here we see hues of the reformation that Darwinian evolution models will eventually undergo. The task is large, but the initial steps have been taken.

4. Soul | Paradox

On the third paradox, namely the “soul paradox”, i.e. the implicit Darwinian assertion that if humans arose or reactively formed, over time, via sequence mechanism, from heated chemicals in a warm electrified pond, as Darwin posted, or from the hydrogen atom as modern science sees things, then where does that leave the theory of the soul, the question of the nature or “sense” of right or wrong, and the great question of existence and continuity amid a seemingly dynamical universe. This is a large topic, which historically has continued to be swept under the Darwinian rug of the world’s physical chemistry departments. The following 1912 quote by Frank Stockbridge gets quickly to the gist or heart of the matter: [21]

“Life is a chemical reaction; death is the cessation of that reaction; living matter, from the microscopic yeast spore to humanity itself, is merely the result of accidental groupings of otherwise inert matter, and life can actually be created by repeating in the laboratory nature’s own methods and processes! Think for a moment what this declaration signifies. If it be true, where is the theology? If you and I are merely physico-chemical compounds, slightly more complex than a potato, a little less durable than a boulder, what is the basis of our moral code? If man can lump together sand and salt and by pouring water on them create life, what becomes of the soul?”

Noted thinkers including Carl Gaither (*Chemically Speaking*, 2001) and Philp Ball (*Unnatural: the Heretical Idea of Making People*, 2012) have been drawn to this quote. Greek atomic theorist Epicurus, to note, attempted a patch fix of the soul paradox with the assertion that certain atoms have a property called “swerve” which allows humans to have free will and thereby have a soul. This, however, is what is classified as an ontic opening argument, similar to how people nowadays like to cite Heisenbergian indeterminacy in a similar manner to Epicurus’ swerving atoms.

Just as, to clarify, there is no “life” in the hydrogen atom, so too is there no “soul” involved when hydrogen reacts with oxygen to form water, nor is there any soul involved in any of the mechanism steps up the reaction chain to the formation of humans. The latter concept is but a principle of right and wrong in need of modern correction and reformulation. We have to physico-chemically “materialize”, as La Mettrie would say, the historically-passed along concept of the soul, or the nature of right or wrong actions or choices, e.g. when is it right or wrong to steal, rather than soulifying or spiritualizing matter, as Leibniz and others have tried.

Just as, to elaborate via simple examples, it can be explained by pure physics that it is inherently “wrong” to drive on the right-hand side of the road south of the equator, owing to the rotation direction of the molten lava inside the earth, and just as it can be determined by pure chemistry why R-thalidomide is inherently “good”, e.g. cures morning sickness, and S-thalidomide “bad”, e.g. causes limb deformity birth defects, owing to the handedness of the molecule, so too did Goethe, via pure physicochemical arguments, in his *Elective Affinities* (1809), “brood over the juridical procedures of god”, as Friedrich Gundolf put it in 1916. The following, which is similar to Gregory Bateson’s 1970s to kick a dog or to kick a stone comparison, alludes to this subtle distinction :

“We can, indeed, kill all organic beings and thus render them inorganic at will. But these changes are not the same as those which we induce in a piece of chalk by pouring sulphuric acid upon it; in this case we only change the form, and the inorganic matter remains. But when we pour sulphuric acid upon a worm, or when we burn an oak-tree, these organisms are not changed into some other animal and tree, but they disappear entirely as organized beings and are resolved into inorganic elements.”

— August Weismann (1889), *Essay on Heredity*

One can, e.g., pour sulphuric acid on chalk for the purposes of “demonstrating” morality based on the laws of nature, such as Goethe did in his *Elective Affinities*, or alternatively one can pour hydrochloric acid into a hole drilled in a person’s head, such as Dahmer did in his Milwaukee apartment, for the purposes of “testing” whether morality exists among the laws of nature, and from each scenario a certain state, level, or measure of right or wrong or naturalness or unnaturalness can be quantified for each, and therefrom one can derive a system of justice, based on universal principles.

In other words, what is ‘just’ or ‘unjust’ in the universe, i.e. the balancing of the forces of nature on a conceptualized sort of universal grand weighted scale, is amenable to physicochemical analysis, according to which “god” become superfluous and soul becomes a theoretical reform problem, in the sense not that “soul” is something that exists in the universe, as we have shown in the Thales loadstone example, but rather that electromagnetic force exists in the universe as do “natural” ($dG < 0$) and “unnatural” ($dG > 0$) exist in the universe, as first stated as a matter of fact by Edward Guggenheim (*Modern Thermodynamics by the Methods of Willard Gibbs*, 1933), and these are coupled together as modern physiology has shown via ATP hydrolysis and cellular work coupling. The scaling up of these cellular natural + unnatural coupling models to the level of social interactions and social work processes, so to answer Stockridge’s gripe about “what is the basis of our moral code?”, if we are synthesized chemicals, is a project in need of work. Herein, we have ‘said a few words on the matter’.

5. Summary and conclusion

The words “life” and “evolve”, as Perrin pointed out, are devoid of foundational meaning, as per atomic theory and thermodynamics define the universe. The physicochemically-neutral upgrade to “life” is “powered CHNOPS+ forms” and the chemical thermodynamically-neutral upgrade to “evolve” is a work-in-progress, but the historical precursors of “affinity-based chemical metamorphosis” (Goethe, 1809) and “free energy-based orthogenetic chemical peneplanation” (Blum, 1934) are steps in the ‘right’ direction, similar to how it is ‘right’ to drive on the ‘right’ hand side of the road north of the equator. Lastly, as entropy increase (natural) and entropy decrease (unnatural) changes determine the naturalness of social reactions via Gibbs energy differentials, so to do these work to reformulate the old-timer’s ideas certain acts of right or wrong working to create a heavy or light soul. In other words, right and wrong can be measured in terms of Gibbs energy per act, and thereby work to elevate the morality void issues left in the wake of Darwin. In sum, whatever further paradoxes one encounters, according to Henderson, the physicochemical approach will provide the answer.

Abbreviations

N1. The abbreviation BG stands for Before Goethe, “Before Goethe”, which dates years to the reaction synthesis (birth) inception of Johann Goethe (1749-1832), i.e. years before or after 1705 [round off], in Goethean calendar years, which is used in place of BC, “Before Christ”, which is a date that never existed. The author has used this dating system for some years in now in Hmolpedia articles. [22]

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