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Thermodynamics vs. Evolutionism

(including a rebuttal of Frank Steiger's [Thermodynamics FAQs](#) in the Talk.Origins Archive)

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The debate between proponents of evolutionism and creation scientists concerning thermodynamics seems likely to continue without end. This is not because the laws of thermodynamics (and their ramifications) are subject to debate or relativistic interpretation, but because a handful of dogmatic evolutionists continue to vocally and energetically deny the truth concerning a simple matter of scientific knowledge:

The second law presents an insurmountable problem to the concept of a natural, mechanistic process: (1) by which the physical universe could have formed spontaneously from nothing, and (2) by which biological life could have arisen and diversified (also spontaneously) from a non-living, inanimate world. (Both postulates form essential planks in the platform of evolutionary theory in general.)

While many highly qualified scientists who number themselves in the camp of evolutionism are candid enough to acknowledge this problem, the propagandists of evolution prefer to claim the only "problem" is that creationists "misunderstand" real thermodynamics.

This strategy is exemplified in Frank Steiger's [Thermodynamics FAQs](#) in the Talk.Origins Archive, one title of which ("Attributing False Attributes to Thermodynamics") may be said to better describe the "how-to" nature of his text than his case against the creationist writers he wishes to discredit.

Steiger accuses creationists of having created "voodoo" thermodynamics based solely on metaphors, and provides Talk.Origins readers with a detailed, albeit error-ridden, treatise on the subject. But while he may appear to have a handle on the mathematics and applied science of thermodynamics, Steiger himself steps out of the realm of scientific knowledge to defend the standard dogma of the evolutionist faith, using his own metaphors and semantic smoke and mirrors to make evolutionism appear immune to the best established scientific law known to man.

The purpose of this document is twofold:

1. To adequately familiarize the reader with the true scientific nature and ramifications of thermodynamics, as documented by leading *non-creationist* scientists.
2. To document and dispel for the reader such common pseudo-scientific evolutionist errors as those perpetuated in Steiger's essays, and elsewhere.

To accomplish this aim, the subject matter shall be presented in the following consecutive sections within one document:

- [Understanding Thermodynamics](#)
- [The Evolutionist's Spin](#)
- [Both Cannot Be Correct](#)

Every effort has been made to explain the matters addressed in this document as simply and understandably as possible. While matters of science can sometimes seem beyond comprehension, the aim here has been clarity, yet without oversimplifying where the details truly matter.

Understanding Thermodynamics

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The essence of Classical Thermodynamics concerns itself with the relationship between:

1. heat
2. mechanical energy (or work-ready energy)
and
3. the conversion of either of these into the other

All matters of physics, chemistry, and biological processes known to man, are universally subject—without exception—to the first and second laws of thermodynamics —hereafter, simply “the first law” and “the second law”.

While the properties of heat and useable energy may not seem particularly significant in a debate concerning origins, the first and second laws (which govern those properties and their transformations) speak profoundly to the nature of matter, energy, and therefore the universe itself. Within the realm of science, these are among the most immovable, universal laws of science, as the following scientific authorities testify:

“[A law] is more impressive the greater the simplicity of its premises, the more different are the kinds of things it relates, and the more extended its range of applicability. Therefore, the deep impression which classical thermodynamics made on me. It is the only physical theory of universal content which I am convinced, that within the framework of applicability of its basic concepts will never be overthrown.”

[Albert Einstein, quoted in M.J. Klein, “Thermodynamics in Einstein’s Universe”, in *Science*, 157 (1967), p. 509 and in Isaac Asimov’s *Book of Science and Nature Quotations*, p. 76.]

“No matter how carefully we examine the energetics of living systems we find no evidence of defeat of thermodynamic principles.”

[Harold Blum, *Time’s Arrow and Evolution* (1962), p. 119.]

“If your theory is found to be against the second law of thermodynamics, I can give you no hope; there is nothing for [your theory] but to collapse in the deepest humiliation.”

[Arthur S. Eddington, *The Nature of the Physical World* (1930), p. 74.]

“The second law of thermodynamics not only is a principle of wide reaching scope and application, but also is one which has never failed to satisfy the severest test of experiment. The numerous quantitative relations derived from this law have been subjected to more and more accurate experimental investigations without the detection of the slightest

inaccuracy.”

[G.N. Lewis and M. Randall, *Thermodynamics* (1961), p. 87.]

“There is thus no justification for the view, often glibly repeated, that the Second Law of Thermodynamics is only statistically true, in the sense that microscopic violations repeatedly occur, but never violations of any serious magnitude. On the contrary, no evidence has ever been presented that the Second Law breaks down under any circumstances.”

[A.B. Pippard, *Elements of Chemical Thermodynamics for Advanced Students of Physics* (1966), p. 100.]

“Although it is true that the amount of matter in the universe is perpetually changing, the change appears to be mainly in one direction—toward dissolution. The sun is slowly but surely burning out, the stars are dying embers, and everywhere the cosmos heart is turning to cold; matter is dissolving into radiation, and energy is being dissipated into empty space.

“The universe is thus progressing toward an ultimate ‘heat death’ or, as it is technically defined, a condition of ‘maximum entropy’ . . . And there is no way of avoiding this destiny. For the fateful principle known as the Second Law of Thermodynamics, which stands today as the principal pillar of classical physics left intact by the march of science, proclaims that the fundamental processes of nature are irreversible. Nature moves only one way.”

[Lincoln Barnett, *The Universe and Dr. Einstein* (1957), pp. 102-103.]

“...there are no known violations of the second law of thermodynamics....”

[Dr. John Ross, Harvard scientist, *Chemical and Engineering News*, vol. 58, July 7, 1980, p. 40]

Having had a glimpse at the significance and respect afforded the laws of thermodynamics within the scientific community, let’s now examine what these laws say, and to what they apply.

The First Law

Since the controversy between evolutionists and thermodynamics involves mainly the second law, we will only briefly look at the first law, sometimes referred to as the law of conservation, which tells us essentially that

Nothing is now coming into existence or going out of existence; matter and energy may be converted into one another, but there is no net increase in the combined total of what exists.

Regarding this first law, Isaac Asimov offers this noteworthy comment:

“This law is considered the most powerful and most fundamental generalization about the universe that scientists have ever been able to make. No one knows why energy is conserved... All that anyone can say is that in over a century and a quarter of careful measurement scientists have never been able to point to a definite violation of energy conservation, either in the familiar everyday surroundings about us, or in the heavens above or in the atoms within.”

[*Smithsonian Institution Journal*, 1970, p.6]

The Second Law

On the other hand, the second law tells us what can and cannot take place in terms of the relationships and transformations between matter, energy, and work, and their respective properties, as well as those of information and complexity, saying

Every system, left to its own devices, always tends to move from order to disorder, its energy tending to be transformed into lower levels of availability (for work), ultimately becoming totally random and unavailable for work.

...or...

The entropy of a closed system cannot decrease.

(Entropy is a measure of (1) the amount of energy unavailable for work within a system or process, and/or (2) the probability of distribution or randomness [disorder] within a system.)

To help ensure an adequate understanding of what the second law means, consider the following, also from Isaac Asimov:

“Another way of stating the second law then is: ‘The universe is constantly getting more disorderly!’ Viewed that way, we can see the second law all about us. We have to work hard to straighten a room, but left to itself it becomes a mess again very quickly and very easily. Even if we never enter it, it becomes dusty and musty. How difficult to maintain houses, and machinery, and our bodies in perfect working order: how easy to let them deteriorate. In fact, all we have to do is nothing, and everything deteriorates, collapses, breaks down, wears out, all by itself -- and that is what the second law is all about.”

[*Smithsonian Institute Journal*, June 1970, p. 6]

This is the essence of Classical Thermodynamics. Similarly, the “**generalized 2nd law**” applies to probability of distribution matters in Information Theory in such a way that, left to itself over time, the information conveyed by an information-communicating system will end more distorted and less complete than when it began (again, a **higher** measure of, or increase in, entropy—in this case **informational entropy**)—and likewise, applied to matters Statistics, left to itself over time, the order or regularity of a system will be less than when it began (and again, a **higher** measure of, or increase in, entropy—in this case **statistical entropy**).

The Evolutionist’s Spin

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Evolutionist theory faces a problem in the second law, since the law is plainly understood to indicate (as does empirical observation) that things tend towards disorder, simplicity, randomness, and disorganization, while the theory insists that precisely the opposite has been taking place since the universe began (assuming it had a beginning).

Beginning with the “Big Bang” and the self-formation and expansion of space and matter, the evolutionist scenario declares that every structure, system, and relationship—down to every atom, molecule, and beyond—is the result of a loosely-defined, spontaneous self-assembly process of increasing organization and complexity, and a direct contradiction (i.e., theorized violation) of the second law.

This hypothesis is applied with the greatest fervor to the evolutionists’ speculations concerning biological life and its origin. The story goes that—again, in violation of the second law—within the midst of a certain population of spontaneously self-assembled molecules, a particularly vast and complex (but random) act of self-assembly took place, producing the first self-replicating molecule.

Continuing to ignore the second law, this molecular phenomenon is said to have undergone multiple further random increases in complexity and organization, producing a unique combination of highly specialized and suitably matched molecular “community members” which formed what we now know as the incredibly efficient, organized self-sustaining complex of integrated machinery called the cell.

Not only did this alleged remarkable random act of self-transformation take place in defiance of the

second law, but the environment in which it happened, while itself presumably cooperating with the second law's demand for increased disorder and break-down, managed (by some further unknown random mechanism) to leave untouched the entire biological self-assembly process and the self-gathered material resources from which the first living organism built itself.

Evolutionism takes its greatest pride in applying this same brand of speculation to the classic Darwinian hypothesis in which all known biological life is said to have descended (by means of virtually infinite—yet random—additional increases in organized complexity) from that first hypothesized single-celled organism. This process, it is claimed, is directly responsible for the existence of (among other things) the human being.

Details, Details...

Perhaps the reader should be reminded (or informed) at this point that not one shred of unequivocal evidence exists to support the above described self-creation myth. Yet very ironically, it's the *only* origins account treated in the popular and science media, nicely blurring in the public mind the distinction between bona fide science and popular beliefs.

To be sure, many corollary hypotheses have been produced to show how one or another biological or geological phenomenon—or an empirical fact gathered in any scientific discipline—might be *explained* in evolutionary terms (often not without the use of highly convoluted, incredible, and unprovable stories). But as Karl Popper observed, a theory that seems to explain everything really explains nothing. Popper insisted that a theory's true explanatory power comes from making narrowly defined, risky predictions—success in prediction being meaningful only to the extent that failure is a real possibility in the first place. Evolutionists find ways to explain and/or produce after-the-fact “predictions” for any and every empirical fact or phenomenon presented to them—frequently ignoring established standards for logic and scientific method.

In the same manner, many evolutionists are so convinced of evolution as a “fact” that they are compelled to either ignore or dismiss the applicability of the second law to biological processes. The presupposition of evolution as “fact” leaves no alternative but that it *must* be possible *in spite of* the second law. But no one can explain satisfactorily how a presumed process of nature (evolution) has moved steadily towards higher arrangements of ordered complexity, when the foremost law of nature demands that (in Asimov's words) “all we have to do is nothing, and everything deteriorates, collapses, breaks down, wears out, all by itself.”

Open vs. Closed Systems

The classic evolutionist argument used in defending the postulates of evolutionism against the second law goes along the lines that “the second law applies only to a closed system, and life as we know it exists and evolved in an open system.”

The basis of this claim is the fact that while the second law is inviolate in a closed system (i.e., a system in which neither energy nor matter enter nor leave the system), an apparent limited reversal in the direction required by the law *can* exist in an open system (i.e., a system to which new energy or matter may be added) *because* energy may be added to the system.

Now, the entire universe is generally considered by evolutionists to be a closed system, so the second law dictates that within the universe, entropy as a whole is increasing. In other words, things are tending to breaking down, becoming less organized, less complex, more random on a universal scale. This trend (as described by Asimov above) is a scientifically observed phenomenon—fact, not theory.

The evolutionist rationale is simply that life on earth is an “exception” because we live in an open system: “The sun provides more than enough energy to drive things.” This supply of available energy, we are assured, adequately satisfies any objection to evolution on the basis of the second law.

But simply adding energy to a system doesn't automatically cause reduced entropy (i.e., increased organized complexity, or "build-up" rather than "break-down"). Raw solar energy alone does not decrease entropy—in fact, it increases entropy, speeding up the natural processes that cause break-down, disorder, and disorganization on earth (consider, for example, your car's paint job, a wooden fence, or a decomposing animal carcass, both with and then without the addition of solar radiation).

Speaking of the general applicability of the second law to both closed and open systems in general, Harvard scientist Dr. John Ross (not a creationist) affirms:

“...there are no known violations of the second law of thermodynamics. Ordinarily the second law is stated for isolated [closed] systems, but the second law applies equally well to open systems ... there is somehow associated with the field of far-from equilibrium phenomena the notion that the second law of thermodynamics fails for such systems. It is important to make sure that this error does not perpetuate itself.”

[Dr. John Ross, Harvard scientist (evolutionist), *Chemical and Engineering News*, vol. 58, July 7, 1980, p. 40]

So, what is it that makes life possible within the earth's biosphere, appearing to “violate” the second law of thermodynamics?

The apparent increase in organized complexity (i.e., decrease in entropy) found in biological systems requires two additional factors besides an open system and an available energy supply. These are:

1. a “program” (information) to direct the growth in organized complexity
2. a mechanism for storing and converting the incoming energy.

Each living organism's DNA contains all the code (the “program” or “information”) needed to direct the process of building (or “organizing”) the organism up from seed or cell to a fully functional, mature specimen, complete with all the necessary instructions for maintaining and repairing each of its complex, organized, and integrated component systems. This process continues throughout the life of the organism, essentially building-up and maintaining the organism's physical structure faster than natural processes (as governed by the second law) can break it down.

Living systems also have the second essential component—their own built-in mechanisms for effectively converting and storing the incoming energy. Plants use photosynthesis to convert the sun's energy into usable, storable forms (e.g., proteins), while animals use metabolism to further convert and use the stored, usable, energy from the organisms which compose their diets.

So we see that living things seem to “violate” the second law because they have built-in programs (information) and energy conversion mechanisms that allow them to build up and maintain their physical structures “in spite of” the second law's effects (which ultimately do prevail, as each organism eventually deteriorates and dies).

While this explains how living organisms may grow and thrive, thanks in part to the earth's “open-system” biosphere, it does not offer any solution to the question of how life could spontaneously begin this process in the absence of the program directions and energy conversion mechanisms described above—nor how a simple living organism might produce the additional *new* program directions and alternative energy conversion mechanisms required in order for biological evolution to occur, producing the vast spectrum of biological variety and complexity observed by man.

In short, the “open system” argument fails to adequately justify evolutionist speculation in the face of the second law. Most highly respected evolutionist scientists (some of whom have been quoted above with care—and within context) acknowledge this fact, many even acknowledging the problem it causes the theory to which they subscribe.

Steiger's Brand of Thermodynamics

Frank Steiger has published two essays in the Talk.Origin archive, in which he does a respectable job of iterating the common evolutionist answer to this problem. But while the answer he presents may be adequate to convince many willing believers in evolutionism, careful examination proves it to be nothing less than the same inadequate work-around commonly served up as an answer to second law objections.

Steiger also wrongly attributes false and misleading claims to his creationist counterparts, which, if taken at face value, would lend to Steiger much more relative credibility than he otherwise deserves. Add this to his failure to meet the second law's challenge to evolutionism, and Steiger's work is reduced in simple terms to the same old song and dance with a few pot shots thrown in for effect.

Not far into the more lengthy of his two Talk.Origins [essays](#) ("The Second Law of Thermodynamics, Evolution, and Probability"), Steiger attributes to "creationists" a:

wide-spread and totally false belief that the second law of thermodynamics does not permit order to spontaneously arise from disorder.

...which he then attempts to dispute by means of a grossly erroneous generalization:

In fact, there are many examples in nature where order does arise spontaneously from disorder: Snowflakes with their six-sided crystalline symmetry are formed spontaneously from randomly moving water vapor molecules. Salts with precise planes of crystalline symmetry form spontaneously when water evaporates from a solution. Seeds sprout into flowering plants and eggs develop into chicks.

The "order" found in a snowflake or a crystal has nothing to do with increased information, organization or complexity, or available energy (i.e., reduced entropy). The formation of molecules or atoms into geometric patterns such as snowflakes or crystals reflects movement towards equilibrium—a lower energy level, and a more stable arrangement of the molecules or atoms into simple, uniform, repeating structures with minimal complexity, and no function. These are not examples of matter forming itself into more organized or more complex structures or systems (as postulated in evolutionist theory), even though they may certainly reflect "order" in the form of simple patterns.

Steiger fails to recognize the profound difference between these examples of low-energy molecular crystals and the high-energy growth process of living organisms (seeds sprouting into flowering plants and eggs developing into chicks). His equating these two very different phenomena reveals a serious misunderstanding of thermodynamics (as well as molecular biology) on his part, and he perpetuates this error in the balance of both his essays, as we shall see.

On the other hand, Jeffrey Wicken (an evolutionist) has no problem recognizing the difference, having described it this way:

"Organized' systems are to be carefully distinguished from 'ordered' systems. Neither kind of system is 'random,' but whereas ordered systems are generated according to simple algorithms and therefore lack complexity, organized systems must be assembled element by element according to an external 'wiring diagram' with a high information content ... Organization, then, is functional complexity and carries information. It is non-random by design or by selection, rather than by the a priori necessity of crystallographic 'order.'" [Jeffrey S. Wicken, *The Generation of Complexity in Evolution: A Thermodynamic and Information-Theoretical Discussion*, Journal of Theoretical Biology, Vol. 77 (April 1979), p. 349]

Nobel Prize winner Ilya Prigogine also has no problem defining the difference:

"The point is that in a non-isolated [open] system there exists a possibility for formation of ordered, low-entropy structures at sufficiently low temperatures. This ordering principle is

responsible for the appearance of ordered structures such as crystals as well as for the phenomena of phase transitions. Unfortunately this principle cannot explain the formation of biological structures.”

[I. Prigogine, G. Nicolis and A. Babloyants, *Physics Today* 25(11):23 (1972)]

Thaxton, Bradley, and Olsen make the same clear distinction:

“As ice forms, energy (80 calories/gm) is liberated to the surroundings... The entropy change is negative because the thermal configuration entropy (or disorder) of water is greater than that of ice, which is a highly ordered crystal... It has often been argued by analogy to water crystallizing to ice that simple monomers may polymerize into complex molecules such as protein and DNA. The analogy is clearly inappropriate, however... The atomic bonding forces draw water molecules into an orderly crystalline array when the thermal agitation (or entropy driving force) is made sufficiently small by lowering the temperature. Organic monomers such as amino acids resist combining at all at any temperature, however, much less in some orderly arrangement.”

[C.B. Thaxton, W.L. Bradley, and R.L. Olsen, *The Mystery of Life's Origin: Reassessing Current Theories*, Philosophical Library, New York, 1984, pp. 119-120.]

Steiger's blurring of the distinction between these two phenomena can logically be attributed only to either indefensible ignorance or a willful misrepresentation of the facts.

Later, Steiger declares that:

...a system can go from a more probable state to a less probable state, providing ΔS for the system is negative. In cases where the system interacts with its surroundings, ΔS can be negative *providing* the over-all entropy of the system and its interacting surroundings is positive; the over-all change can be positive if the entropy increase of the surroundings is numerically greater than the entropy decrease of the system.

Don't be alarmed. By way of explanation, “ ΔS ” simply refers to *change in entropy*. A positive change (increase) in entropy is the general, universal tendency as described above (=less order, complexity, available energy, a more random, disorderly, and probable state). A negative change (decrease) in entropy is invariably an isolated and temporary event (=more order, complexity, available energy, a less random, disorderly, and probable state).

This profound statement on Steiger's part, then, is simply stating the obvious—restating the second law in terms of a system's more or less “probable state” as a direct consequence of the respective increase or decrease in entropy. He correctly acknowledges that a less probable state may be reached by a system, only as long as it is an “open” system (i.e., able to interact with its surroundings) and there is an external increase in entropy exceeding the measure of system's internal decrease in entropy.

It is significant that Steiger does not take the time here to consider whether such a phenomenon tends to happen spontaneously, routinely, or with any constancy—without a directing program (e.g., DNA) and a means of energy storage and conversion (e.g., photosynthesis, metabolism) in any living organism ([as described earlier](#)). A declaration that a theoretical decrease in entropy is possible serves little in explaining biological processes and their relationships to energy and organized complexity. Steiger seems to avoid altogether any discussion of *how* biological processes achieve and sustain the very decrease in entropy which he goes to great lengths to demonstrate as mathematically “possible.”

In fairness, it must be said here that the thermodynamicist need not concern himself with the “how” (i.e., the process) of a matter in order to generate the mathematical calculations of entropy change from the beginning to the end of any theorized event. However, we must remember that the ability to calculate this change on paper by no means renders the event likely, or even possible.

Classical Thermodynamics may thus be employed to postulate the alleged entropy change of an event (e.g., spontaneous generation, or a macro-evolutionary event), apart from defining or identifying a

mechanism or means by which the event could conceivably take place. Yet the barrier of the “**generalized 2nd law**” remains firmly in place and applicable to probability of distribution matters in Information Theory (e.g., the increase and preservation of information contained in genetic code), as well as that of statistic entropy and its applicability to systems (e.g., highly complex and integrated biological systems found in all living organisms).

In any case, Steiger goes on to observe that:

...when living things decay after death, the process of decay takes place with an increase in entropy ... a spontaneous change in a system can be reversed, providing the system interacts with its surroundings in such a manner that the entropy increase in the surroundings is more than enough to reverse the system’s original entropy increase.

(One can’t help but wonder whether this paragraph is meant as an attempt to go beyond the myth of spontaneous generation to suggest the notion of spontaneous resurrection!) In any case, Steiger continues:

The application of energy can reverse a spontaneous, thermodynamically “irreversible” reaction. Leaves will spontaneously burn (combine with oxygen) to form water and carbon dioxide. The sun’s energy, through the process of photosynthesis, will produce leaves from water vapor and carbon dioxide, and form oxygen.

Apart from his ostensible intention to portray these two processes as “reversals” of one another, it seems to have escaped Steiger’s notice that the process photosynthesis does not function apart from the complex cellular apparatus inherent in leaves—it does not “produce” leaves, but is an inherent function of them. To postulate photosynthesis as a non-biological, independent “leave-producing” phenomenon is to misrepresent it entirely.

Now we come to some of Steiger’s best material. Still emphasizing the possibility of reversibility, he tells us:

If we unplug a refrigerator, heat will flow to the interior from the surroundings; the entropy increase inside the refrigerator will be greater than the entropy decrease in the surroundings, and the net entropy change is positive. If we plug it in, this spontaneous “irreversible” change is reversed. Due to the input of electrical energy to the compressor, the heat transferred to the surroundings from the condenser coils is greater than the heat extracted from the refrigerator, and the entropy increase of the surroundings is greater than the entropy decrease of the interior, in spite of the fact that the surroundings are at a higher temperature. Here again, the net entropy change is positive, as would be expected for any spontaneous process.

While serving as an excellent model of thermodynamics in action, Steiger’s refrigerator does still more in that it demonstrates the need for an *energy conversion mechanism* before a deliberate, sustained decrease in entropy is possible. Furthermore, the starting and stopping of the machine’s compressor can hardly be described as “spontaneous” events—they are the planned, willful, and deliberate actions of intelligent agents, executed with a view to accomplishing specific end results.

As if this splendid refrigerator weren’t enough, Steiger also shares the following model (popular among evolutionists) with his readers:

If a water wheel is connected by shafts, belts, pulleys, etc. to a pump, the pump can raise water from the downstream side of the water wheel to an elevation even higher than that of the upstream reservoir. *Some* of the water would spontaneously raise itself to an elevation even higher than original, but the rest of it would end up below the water wheel on the downstream side.

While it is not possible for *all* of the water to raise itself to an elevation higher than its initial elevation, it is possible for *some* of the water to spontaneously raise itself to an

elevation higher than initial.

Once again we are looking at a carefully designed and implemented mechanism for creating and sustaining an apparent decrease in entropy. One is compelled to wonder why Mr. Steiger must rely only on man-made mechanisms to illustrate his claim that “spontaneous entropy decreases can, and do, occur all the time”—ostensibly requiring neither design, plan nor storage or conversion of energy!

But wait! There’s more! Not only are we invited to pretend along with Mr. Steiger that he has demonstrated spontaneous generation to be thermodynamically possible—even probable, but we are quickly assured that we need not concern ourselves with the details of “how”:

The fact that the water wheel and pump are man-built contraptions has no bearing on the case: thermodynamics does not concern itself with the detailed description of a system...

Here Steiger blithely excuses himself from facing a most profound fact: Spontaneous, sustained decreases in entropy do not occur in nature apart from the presence of a design or plan and a means of storing and/or converting energy. To declare that this “has no bearing on the case” is to betray (or feign) an utter ignorance of the roles played in biological processes by energy and the work that produces organized complexity—matters that most certainly involve thermodynamic relationships (particularly involving the “**generalized 2nd law**” and informational, as well as statistical entropy, as discussed above).

Complexity Simplified(?)

Now Steiger takes on the task of redefining complexity so that his readers will find the improbable at least believable—if not inevitable:

A favorite argument of creationists is that the probability of evolution occurring is about the same as the probability that a tornado blowing through a junkyard could form an airplane...

...A simpler analogy to the airplane/junkyard scenario would be the stacking of three blocks neatly on top of each other. To do this, intelligent design is required, but stacking does not violate the laws of thermodynamics ... all that is required is the energy to pick them up and place them one on top of the other...

What Steiger fails to tell his readers is that the airplane/junkyard scenario stands up to probability analysis, as indicated by his need to substitute a block-stacking illustration, completely side-stepping the thermodynamic improbability of evolution. Having briefly alluded to the problem, he quickly and effectively ignores it by changing the subject!

In concluding his “Probability” essay, Steiger asserts that:

...The creationist position would *necessarily discard the entire mathematical framework* of thermodynamics and would provide no basis for the engineering design of turbines, refrigeration units, industrial pumps, etc. It would do away with the well-developed mathematical relationships of physical chemistry, including the effect of temperature and pressure on equilibrium constants and phase changes.

This accusation finds no support in the balance of his essay, so one wonders on what basis Steiger feels qualified to register it. This writer knows of no “creationist position” concerning thermodynamics other than the classic understanding. That creationists point out the conflict between thermodynamics and evolutionist doctrine is no more a questionable “position” than if on a similar basis they were to say that boulders are unlikely to [spontaneously levitate](#).

Steiger’s own distortion of the facts of thermodynamics and biological process seems to indicate that it is in fact his “position” that challenges reality, for if he were right, such things as turbines, refrigeration units, industrial pumps, etc., would require no design at all, and would function satisfactorily with no

energy storage or conversion devices!

To more accurately restate one of Steiger's parting shots in the essay:

evolutionism (in the guise of "scientific fact") doesn't have to be consistent with the laws of thermodynamics.

Attributing (More) False Attributes to Thermodynamics

Although much of what is said in Steiger's second essay ("Attributing False Attributes to Thermodynamics") has already been dealt with above, some of his claims deserve special treatment.

Briefly, in the "False Attributes" essay Steiger repeats the error of blurring the distinction between the high-energy growth process of living organisms ("seeds growing into trees, eggs developing into chicks") and low-energy formation molecular crystals ("crystalline salts form when a solution evaporates, and crystalline snowflakes form from randomly moving water vapor molecules").

In this essay, however, he goes a step further, claiming falsely that creationists insist that for *both* of these phenomena "there must be a programmed energy conversion mechanism to direct the application of the energy needed to bring about the change." Thus, having confused two very different processes for his readers by describing them as similar, he falsely accuses creationists of a sweeping generalization which they do not make—effectively setting up for his personal refutation a straw-man postulate.

Next, attempting to relegate "changes requiring human thought and effort" to a place outside the realm of thermodynamic analysis, Steiger attempts to ridicule the prospect that systems concerned with "constructing a building, manufacturing an airplane, making a bed... etc.," involve thermodynamics, implying that the changes in entropy inherent in the associated systems and processes are *not* covered by the science of thermodynamics. (Apparently Steiger does not believe the laws of thermodynamics to be universal.)

Among the claims attributed to creationists, Steiger says the "energy conversion mechanism" required for biological life ([as described above](#)) "comes from God." Note that neither Steiger, nor any evolutionist, has produced a plausible naturalistic explanation for the origin of such a complex and essential biological process as an energy conversion mechanism (e.g., photosynthesis in plants, metabolism in animals).

[These (and a host of other no less complex, highly integrated, biological systems and structures) bear every indication of functional, purpose-oriented design. But this completely escapes the notice of the likes of Steiger, whose apparent commitment to defining "science" as the application of only naturalistic philosophy to the study of the natural world forbids them from seriously considering the logical implication of the evidence.]

Another claim of Steiger is that "*The ICR chapter* [chapter 3 of "Scientific Creationism," edited by Henry Morris of the Institute for Creation Research] *states flatly that entropy can never decrease.*" This is an outright falsehood. Whether deliberate or not, it is an indefensible misrepresentation of the publication cited, the author of the publication, and creationists in general. (Noteworthy is the fact that Steiger's essay conveniently "neglects" to cite the page on which Morris supposedly "states flatly" that "entropy can never decrease"—most likely due to there not actually being such a page in Morris' book.)

Again refusing to face reality, Steiger claims that:

There is no need to postulate an energy conversion mechanism. Thermodynamics correlates, with mathematical equations, information relating to the interaction of heat and work. It does not speculate as to the mechanisms involved... Although it is reasonable to assume that complex energy conversion mechanisms actually exist, the manner in which these may operate is outside the scope of thermodynamics. Assigning an energy conversion mechanism to thermodynamics is simply a ploy to distort and pervert the true nature of thermodynamics.

First we are told that no energy conversion mechanism need be accounted for. Then it is inferred (again) that the changes in (and relationships between) heat and work within biological processes are somehow outside the realm of thermodynamics. Next comes a concession that, okay, it is “reasonable to assume” that such conversion mechanisms “actually exist” (whew!), yet we are now firmly assured that the changes in (and relationships between) heat and work within biological processes are surely “outside the scope of thermodynamics”—and to disagree with Steiger here is to “distort and pervert the true nature of thermodynamics”!

What’s wrong with this picture? Since when do the changes in (and relationships between) heat and work within biological processes (e.g., photosynthesis and metabolism) fall “outside the scope” of thermodynamics? Under what branch of scientific analysis are these thermodynamic relationships to be understood if not that of thermodynamics? By what natural laws are they governed, if not those of thermodynamics?

It seems that it is not the creationists who “distort and pervert the true nature of thermodynamics.” At least they recognize the universal application of thermodynamic principles to *all* processes involving heat, work, and the relationships between the two—both on paper (i.e., mathematically defined) *and* in every real-world process in which they are found.

Tired as it is, Steiger’s effort to define molecular biological processes as “outside the scope” of thermodynamics is renewed in his claim that:

The use and application of thermodynamics is strictly limited by the mathematical treatment of the basic equations... There is no provision ... for any mechanism that would overcome the laws of thermodynamics... Thermodynamics is limited by the equations and mathematics... If it can’t be expressed mathematically, it isn’t thermodynamics!

It seems fair to say at this point that Frank Steiger hasn’t done the math (or his biology homework)—and this seems to be his sole basis for these declarations, designed to evade entirely the perennial issue of life’s ability to thrive in apparent contradiction to thermodynamic law.

Finally, Steiger concludes by erroneously claiming that “Creationism would replace mathematics with metaphors... Creationists have created a ‘voodoo’ thermodynamics ... in order to convince those not familiar with real thermodynamics that their sectarian religious views have scientific validity.”

Let the reader be the judge. If the laws of thermodynamics are universally applicable to all processes and systems (and according to respected science authorities they are), by what right does Frank Steiger selectively label as mere “metaphors” those highly complex processes and systems which produce and sustain the even more highly complex, integrated machinery of biological life?

Both Cannot be Correct

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That someone is practicing “voodoo” thermodynamics is not at issue here. The question is who? The following statements—complete with metaphors(!)—from respected (evolutionist) scientists don’t seem to reflect Steiger’s perspective, effectively indicating that it is he who has resorted to distorting and perverting the true nature of thermodynamics in order to convince his readers that his naturalistic religious views have scientific validity:

“The thermodynamicist immediately clarifies the latter question by pointing out that ... biological systems are open, and exchange both energy and matter. The explanation, however, is not completely satisfying, because it still leaves open the problem of how or

why the ordering process has arisen (an apparent lowering of the entropy), and a number of scientists have wrestled with this issue. Bertalanffy (1968) called the relation between irreversible thermodynamics and information theory one of the most fundamental unsolved problems in biology.”

[C. J. Smith, *Biosystems* 1:259 (1975)]

“We have repeatedly emphasized the fundamental problems posed for the biologist by the fact of life’s complex organization. We have seen that organization requires work for its maintenance and that the universal quest for food is in part to provide the energy needed for this work. But the simple expenditure of energy is not sufficient to develop and maintain order. A bull in a china shop performs work but he neither creates nor maintains organization. The work needed is particular work; it must follow specifications; it requires information on how to proceed.”

[G.G. Simpson and W.S. Beck, *Life: An Introduction to Biology*, Harcourt, Brace, and World, New York, 1965, p. 465]

“Closely related to the apparent ‘paradox’ of ongoing uphill processes in nonliving systems is the apparent ‘paradox’ of spontaneous self-organization in nature. It is one thing for an internally organized, open system to foster uphill processes by tapping downhill ones, but how did the required internal organization come about in the first place? Indeed the so-called dissipative structures that produce uphill processes are highly organized (low entropy) molecular ensembles, especially when compared to the dispersed arrays from which they assembled. Hence, the question of how they could originate by natural processes has proved a challenging one.”

[J.W. Patterson, *Scientists Confront Creationism*, L.R. Godfrey, Ed., W.W. Norton & Company, New York, 1983, p. 110]

We are faced with a choice between accepting the universal applicability of the laws of thermodynamics as generally understood, or believing that the likes of Frank Steiger are justified in their efforts to drive a wedge of semantic confusion between those laws and the postulates of evolutionism.

We have seen that (contrary to Steiger’s false accusations) the principles of thermodynamics are neither ignored nor altered by those creationists who describe them as universally applicable, demonstrating their relationships with biological processes.

We have seen how Steiger has repeatedly attempted to blur the distinction between dramatically different processes; has denied the applicability of thermodynamics to heat and work relationships within biological processes; has ignored the applicability of informational entropy and statistical entropy to the biological processes and properties of all living organisms; has falsely attributed obviously erroneous statements to creationist publications; and has generally turned a blind eye to the challenge posed to evolutionism by the realities of thermodynamic principles.

It must be emphasized that Frank Steiger is not alone. The above practices are not uncommon among many hard-core evolutionists. Whether theirs is at all a reasonable, rational faith seems clear in the methodologies they employ in its defence. The plain facts of science will remain neither ignored nor hidden in the long run, however, and many respectable evolutionist authorities resort to neither tactic, preferring to acknowledge such problems as those raised by the science of thermodynamics.

Unfortunately for *all* evolutionists, such problems show no intention of going away.