THERMODYNAMICS: A TOOL FOR CREATIONISTS (REVIEW OF RECENT LITERATURE)

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I. Introduction

Thermodynamics is a course that causes many an undergraduate to shudder mentally. The use of odd cycles and strange systems may lead many students to feel that they are exploring an Alice-in-Wonderland world.

To add to these difficulties the approaches to thermodynamics are myriad. One can plunge into the thermodynamics of equilibrium, non-equilibrium, steady state, reversible, irreversible, isolated, closed, or open system processes to name a few.

New books on thermodynamics usually offer fresh approaches to the subject showing the science to be in a state of flux. Also scientists are critically evaluating the science at the present time.[1-3] This may lead to even more novel thermodynamic interpretations.

Regardless of the present turmoil, principles of immense scientific importance have been developed in this discipline. That these principles are of tremendous generality and affect all other sciences is obvious from the forementioned varied approaches to and applications of thermodynamics.

Thermodynamics deals with the "mystical" quantity called energy, particularly its possible transformations. Every natural process uses this quantity since it "appears" to be what enables nature to operate. Energy can be defined as the ability to do work without resorting to any mathematics. For further study on the energy concept see references 4-8.

Historically, thermodynamics developed from the study of heat engines and the problems involved in converting heat into mechanical work, which is the basis of most of our modern industrial operations.

The first principle or law of thermodynamics is the conservation of energy. Energy can be neither created nor destroyed: it is transferred from one place to another, or changed into various forms. Some other ways to express this idea are as follows: The loss of energy anywhere is always compensated by an equal gain of energy somewhere else.[9] If any system is carried through a cycle (the final state being precisely the same as the initial state), then the summation of the work delivered to the surroundings is proportional to the summation of the heat taken from the surroundings.[10] In Robert Mayer's own words,

> I therefore hope that I may reckon on the readers' assent when I lay down as an axiomatic truth that, just as in the case of matter so also in the case of force [the then current term for energy], only a transformation but never a creation takes place.[11]

Or simply, the energy of an isolated system always remains constant.

The second principle or law of thermodynamics is more subtle. There are several different statements of this idea. Each reveals a new aspect of this concept:

Carnot: Given an engine that is reversible and that operates between two fixed temperatures, then no other engine operating between these same temperatures can exceed this engine in efficiency.[12]

Planck: It is impossible to construct any cyclic device that can extract heat from a reservoir and produce no other thermal effects whatever.[13]

Kelvin: It is impossible to construct any cyclic device that can extract useful work from an isothermal system.[14]

Clausius: Heat cannot pass spontaneously from a body of lower temperature to a body of higher temperature.[15]

Caratheodory: In the neighborhood of any given state of any closed system there exist states which are inaccessible from it along any reversible, adiabatic paths.[16]

The entropy in an isolated system is a monotonically increasing function of the time.[17]

It is obvious from reading these statements that certain processes are impossible in "nature" and certain natural processes are unidirectional. Thus the second law of thermodynamics, ". . . epitomizes our experiences with respect to direction taken by thermophysical processes."[18]

Actually natural processes tend to go in a direction that leads to degeneration of the system involved.[19] Living and non-living systems tend to wear out, age, break down, or decrease in complexity.

Briefly then, it can be said that conservative and degenerative processes operate in nature.

Looking over the various statements of each principle, one may wonder how these are related to the process of "evolution." First, evolution is taken to be thermophysical process. The sun is supposed to be the driving force for evolution on the earth. It is a process that is active now (i.e. evolution is assumed to be a continual upward process).[20] An evolutionist, Sidney Fox, states, "Evolution, however, has put together the small-

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est components; it has proceeded from the simple to the complex."[21]

Evolution is presumably a "creative" process, not conservative or degenerative. Proponents consider molecules-to-man evolution as a building, bettering process. Evolutionists would claim that once something is evolved it can evolve into something better supposedly because of environmental "pressures." Although evolved inorganic and organic entities can be conserved and are subject to degeneration, the prevailing "spirit" of nature is one of evolutionary development.

Thus observable conservation and degeneration (science) conflict with necessary evolutionary betterment (philosophy). It is this conflict that creationists have explored to show the fallaciousness of the molecules-to-man concept as a natural occurrence in a *real* world.

II. Creationist Interpretations of First Law

Since conservation processes operate in nature, creation is finished.[22-23] Thus evolution, as a creative process, is impossible. This has been the basic thrust of creationist arguments spearheaded by the writings of H. M. Morris.[23-25] He has provided an excellent Scriptural basis for the First Law of Thermodynamics.[24-25] A philosophical consequence of the First Law of Thermodynamics, pointed out by writers,[26-28] is that the universe has, either always been in existence in its present state, or was brought to this state by processes not operating now or by direct acts of creation. Conservation processes can only preserve what is already present. Such processes cannot be used to explain the origin of anything.[28-29]

The uniformitarian hypothesis that the present is the key to the past can be viewed in light of conservation principles.[29] Since all present geological processes are not creative, then extrapolation of these processes into the past is a self-contradiction according to Morris. Again conservation process cannot be used to explain origins.

In the realm of astronomy and cosmology the steady state and continuous creation ideas of Hoyle violate the First Law.[30-31] Faith in the continuing creation of matter out of nothing by natural processes has never been observed, but thermodynamic concepts for the evolutionist have never stood in the way of evolutionary necessity!

A plot of energy vs. time for a finite universe according to the First Law is shown in Figure 1.[31] Barnes[32] suggests that this principle came into operation after the origin of mass and energy.

Some members of the Creation Research Society engaged in a brief and unique discussion of the relationship of conservation principles in the physical sciences and "after its kind" biological

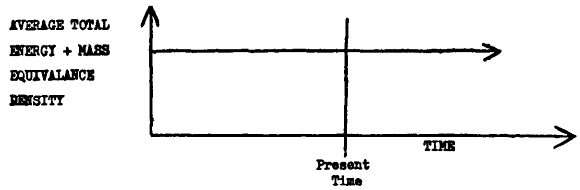

Figure 1. Average energy density versus time. In a finite universe there is the same amount of energy today as there was 1000 years ago and as there will be 1000 years from today, according to the first law of thermodynamics.

conservation. The purpose of the correspondence was to unify the two concepts into a single conservation hypothesis. This reviewer initially asked for comments.[33] Harold Armstrong wrote a brief analysis of the conservation principles from physics.[34] Armstrong and Williams[35] discussed the need to specify what is meant by order. This may be the key to developing concept. Lammerts[36] suggested the following:

> Except for degenerative changes and losses (as extinct species) the total number of species determining DNA units now existing is the same as the number originally created. The law of conservation of energy essentially states that the total energy content of the universe remains constant, both inorganically as regards atomic reactions and biologically as regards the inheritance of an original total number of species determining DNA units.

McDowell,[37] using information theory concepts, postulated that

> The total information implicit in all the bodies (including the total information upon the genes which they carry) of all creatures which are alive upon our planet at any given instant cannot exceed the total information coded upon all the genes which they carry.

Or similarly,

> The total information implicit in all of the bodies (including the total information coded upon the genes which they carry) of all creatures which have lived since the original creation, live now; or ever will live upon our planet cannot exceed the total information coded upon all the genes of all of the creatures which came into being at the original creation.

This discussion is still open for comment from others.

Williams approached conservation processes in biology from a qualitative thermodynamic viewpoint.[38] Initial-final state methodology was used to illustrate conservation of kinds in living organisms. Figure 2 shows this idea in a simplified manner. This methodology offers possibilities as a way to analyze living systems thermodynamically. The use of this method eliminates

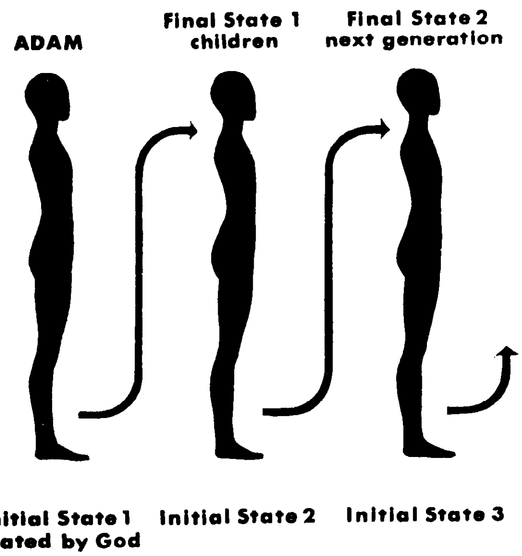

Figure 2. Schematic diagram of reproduction and growth of succeeding generations from initial created state.

the need of evolutionary contrivances to explain the order of living systems in a world of increasing disorder. The creationist approach shows that order can be conserved, although the original order must have appeared by miraculous means.

III. Creationist Interpretations of the Second Law

A. General

The major creationist effort has been in developing applications of the Second Law of thermodynamics. Degenerative processes in nature are opposed to imagined molecules-to-man evolution. This contradiction was first explored by Clark.[39] He termed universal natural disordering as the law of morpholysis (to lose form). Morris[40-42] developed the concept further and also provided a Scriptural basis for the Second Law.

B. Degenerating Universe

Since the order of the universe appears to be decreasing, it must have been a state of high order at some past time. The analogy used is the unwinding of a clock as it runs down. Some creationists[43-46] interpret this as evidence of a definite creation in the past, the winding up. Also others[47-48] have used the phenomenon of increasing disorder to state that the universe is not eternal, for if it were, it would have already run down to complete disorder.

Clark[49] has an excellent discussion of the application of the Second Law to a finite or infinite universe. The argument is essentially that, if the Second Law applies to all isolated parts of the universe, it will apply also to the whole.

Clark and Williams[50] in separate treatises have noted how cautious evolutionary scientists are when prescribing the dictates of the Second Law to the universe, yet proceed with "reckless abandon" when developing an evolutionary origin for the same universe! Williams postulated that the universe can be treated as an isolated system based on Biblical evidence, and not on scientific information.

Mulfinger[51-52] has applied the Second Law to existing processes in the universe and to supposed evolutionary processes. He claims,[52] "Every star is a dynamic system undergoing *degenerative* changes." This is based on observational data and runs counter to the evolutionary "propaganda" about the birth of stars. Mulfinger shows thermodynamically that star formation by condensation is impossible; and notes that all known processes in the universe are degenerative.

C. Degenerating Man

Creationists[53-54] claim that man has been degenerating since Adam. One can arrive at this conclusion by conistent application of the Second Law. It should be remembered however that the effects of decay processes have not overridden the stabilizing influence of conservation processes.[54]

Mutations are biological examples of degenerative changes in biological systems. Although mutations are used as a possible mechanism for imagined upward evolution, this claim cannot be substantiated. Reasoning according to the Second Law necessitates that mutations are harmful, and creationists[55-61] have used this idea effectively. Observational data are on the creationist side in this dispute.

Williams[62] qualitatively viewed living organisms from a thermodynamic standpoint assuming degenerative processes. Such an approach is possible and dispenses with evolutionary reasoning to circumvent the Second Law where life is concerned. It is interesting to note that scientific facts are fitted easily into a creationist framework.

D. "Chemical Evolution"

One of the required steps in "evolutionary history" is that of chemical upgrading. Smaller atoms "evolve" into larger atoms and molecules. Simpler molecules change into more complicated ones, and finally life spontaneously generates on the proper molecules in a suitable place.

These speculative stages of molecules-to-man evolution are on extremely weak ground scientifically. Here is where normal disordering processes unquestionably "rule" the inorganic and organic worlds. Clark[63] recognized that evolution is basically a chemical problem. The experiment done by Miller and Urey[64] have offered evolutionists their greatest hopes. Scientists[65-69] including creationists have been quick to point out the defects of this approach from thermodynamic considerations.

Debate at this level involves the question of open and closed systems. Why do evolutionists insist on open systems? Definite advantages are gained by using open systems. Mass and energy can flow through the boundaries of such a system. When a step is necessary in evolutionary change, an open system can be *imagined* so that an excess of reactants can be added to cause the chemical reaction to proceed drastically to the product side by the well-known LeChatelier principle.

Suppose a reversible reaction, $A + B \rightleftharpoons C$, is possible, but from thermodynamic considerations very little C forms. Assume C is more complex than A or B and is needed in an evolutionary sequence. It can be fabricated in an open system by forcing the reaction to the right by adding an excess of A or B.

But the "evolutionary game" is not finished yet. The product C can be selectively removed from the reaction site, and evolutionists may claim that, in a natural situation, C could diffuse away from the site. More C can form from the reaction than would be expected thermodynamically and huge quantities of the complex compound can be made available.

Thus C is ready for further evolutionary processing thanks to an open system—and *intelligent planning.* Forcing chemical reactions in a preferred direction is one of the latest fads of evolutionists,[70-71] but the possibility of such a process existing naturally is almost nil.

It is essential to note that brute natural processes do not act this way. Rather natural processes follow the Second Law, which requires that a natural, non-living system drive toward equilibrium, not toward increasing complexity. As Rusch[72] noted, directed experimentation is all good "clean fun" in a chemistry laboratory or in the mind of the evolutionist, but the laboratory is where it ends.

Another way to avoid Second Law consequences is by imagining a catastrophic event that drives a system far from equilibrium (similar to an explosion). Fluctuations develop that cause the disturbed system to move to a state more ordered than the explosion (metastable state).[73-74] Evolution, then, proceeds supposedly from the new "ordered" state. Again the probability of such happening in a natural situation is slight if not impossible.

Also the order referred to in the new state is questionable. The system must be closely controlled to insure that the proper state rather than total chaos is developed from the transition. Unguided natural processes are not this selective, and as predicted by the Second Law a disordered state will more likely result.

One stands in awe of the unnatural means evolutionists resort to in order to get their processes to "work in the right way." If something is needed for further evolution, schemes are concocted to provide the necessary material. If evolution needs to follow a particular path, then evolutionists say it does so. Evolution does not thrive on straight science; it needs blessed events.[75] Scientific miracles are necessary. Why? Simply so evolution can be made to avoid observable degeneration. Evolution from molecules-to-man is more miraculous than creation.

E. Intelligence and Degeneration

The only way to work around natural disordering is to use intelligence. Creationists[76-78] have pointed this out, but evolutionists will not be deterred by the realization that natural events will not work like a controlled experiment, or that "evolutionary processes" cannot select their properties or paths as intelligent men can.

F. Evolution and Probability

Probability can be related[79-80] to the Second Law by the Boltzmann formulation,

$$S = k \ln w \tag{1}$$

$$\text{or,} \quad dS = k \ln \left(\frac{w_2}{w_1}\right) \tag{2}$$

where S is the entropy of a given state, k is Boltzmann's constant, and w is the possible number of microstates of the given state.

Consider a natural transformation between state 1 and 2 with total possible microstates of w_1 and w_2 respectively. If $w_1 > w_2$, then state 1 has a greater probability of formation than state 2 by the Second Law (because of its higher entropy). If the system goes from state 1 to state 2, then $\left(\frac{w_2}{w_1}\right) < 1$ and entropy decreases (the improbable happens).

Thus every time the improbable occurs the Second Law is violated. The big problem that exists in trying to apply this idea is that it is almost impossible to determine the possible microstates for complicated systems.

Scores of creationists have shown how improbable evolution is. One would expect the probable to happen in nature.[81] If the improbable continually occurs, it would not be considered improbable but probable. To say that evolutionary events are improbable is to say that the chance of their happening is slight. The problem does not end here. Evolution, by its very nature, would have to proceed in a sequence of improbable steps.

For sake of argument, assume the probability of an evolutionary step is 1 in 10^{20} possibilities.

The next evolutionary step necessary to continue the ordering operations would have a probability of 1 in $(10^{20}) \cdot (10^{20})$ or 1 in 10^{40} if both steps have equal probabilities. Connected sequential steps would become phenomenally improbable the further the process goes. An ordering step must be followed by another ordering step, etc. Actually the system would proceed towards disorder (probable occurrence).

This unbelievable sequence of improbable steps may lead a person to ask just how probable is the improbable? The word never is appropriate. Evolution is so improbable that it will never occur; the idea is that if you wait long enough for any event with a finite probability, it will occur. "Long enough" may be never.[82] A quote of Boltzmann (1898) will help illustrate this.

> One should not imagine that two gases, in a 0.1 liter container, initially unmixed, will mix, then again after a few days separate, then mix again, and so forth. On the contrary, one finds . . . that not until a time enormously long compared to $10^{(10^{10})}$ years will there be any noticeable unmixing of the gases. One may recognize that this is practically equivalent to never.[83]

There is a finite probability that gases can unmix; however it is meaningless because it is so low. Kittel,[84] has another excellent example of the meaning of never.

> It has been said[85] that "six monkeys, set to strum unintelligently on typewriters for millions of millions of years, would be bound in time to write all the books in the British Museum." This statement is misleading nonsense, for it gives a misleading conclusion about very, very large numbers. Could all the monkeys in the world have typed out a single specified book in the age of the universe?
>
> Suppose that 10^{10} monkeys have been seated at typewriters throughout the age of the universe, 10^{18}sec. This number of monkeys is about three times greater than the present human population of the earth. We suppose that a monkey can hit 10 typewriter keys per second. A typewriter may have 44 keys; we accept lower case letters in place of capital letters. Assuming that Shakespear's *Hamlet* has 10^5 characters, will the monkeys hit upon *Hamlet*?
>
> The probability that any given sequence of 10^5 characters typed at random will come out in the correct sequence (the sequence of *Hamlet*) is
>
> $$\left(\frac{1}{44}\right)^{100{,}000} = 10^{-164{,}345}$$
>
> Where we have used log $44 = 1.64345$. . . . The probability that a *monkey-Hamlet* will be typed in the age of the universe is approximately $10^{-164{,}316}$. The probability of *Hamlet* is therefore zero in any operational sense of an event, so that the original statement at the beginning of the problem is nonsense: one book, much less a library, will never occur in the total literary production of the monkeys.
>
> What happens . . . if we do not specify the title of the book, but agree to accept any known book? There may be about 30×10^6 distinct titles of books: the largest library, the Library of Congress, contains about 15×10^6 books and pamphlets. Note that the total production of the monkeys is equivalent to 10^{24} short volumes of 10^5 characters each, but you will find that none of these duplicate any existing book.

Evolution is statistically as hopeless the the situation just illustrated. When dealing with large numbers nothing but this is to be expected. There is a finite probability that I could stand in Greenville, South Carolina, and throw a baseball to the moon. But, how many evolutionists would wager a month's salary that I would accomplish the feat? Yet the same people will spend a lifetime defending the same degree of probability concerning evolution.

Clark notes[86] anyone invoking such unusual chance undermines the very basis of science. Science is based on probable occurrences and once chance is admitted as a "mechanism," everything becomes indeterminate. A scientist could never rule out chance in any of his studies and scientific work would be impossible to perform.

The high odds against the formation of complex organic compounds such as DNA and proteins by chance have been discussed.[87-92] The chance that "nature" could organize anything is slight.[93-98] Probability is just one of the many mathematical arguments against evolution. Evolutionists themselves have shown little faith in present evolutionary theories from a mathematical standpoint.[100]

G. Origin of the Second Law

Barnes states[101] that the Second Law came into operation after the universe was created completely. Morris suggests[102] that the origin of the Second Law was connected with the Fall.

IV. Conclusions

Creationists have utilized thermodynamic reasoning effectively in their opposition to evolutionary speculation. It is one of the most fertile areas of creationist thought. Not all of the creationist ideas can be explored in such a brief review. Interested students should study the references and all past issues of the *Creation*

Research Society Quarterly for a better knowledge of the subject.

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CREATIONISM IN THE TWENTIETH CENTURY

William J. Tinkle*

It may be of value for one who has lived to this point of time in the twentieth century to recount his own experiences and observations along with certain notable discoveries during his lifetime.

At the beginning of the twentieth century this author was a school boy. Evolution, in the United States, was a subject for university professors and theologians; very few others. It was very useful to "infidels" as atheists were then called, and there were vociferous ones. The doctrine, then 41 years old, counting from Darwin's *Origin of Species,* had not yet appealed to the common man.

School books did not discuss the origin of the earth, or the origin of living things. The authors did not mention divine creation or materialistic theories of beginnings, but ignored both of them, taking an agnostic position. The McGuffey readers which my father read were no longer adopted in Indiana, and the readers which replaced them were quite eclectic. They included stories taken directly from the Bible along with selections from literature and history. Geography and history books were mute about beginnings.

Yet as I now look back I am convinced that the net "evidence" for chance beginnings and mechanical development was stronger then than now, because the difficulties had not yet been discovered.

Ideas Held Over

Coming now to the beliefs of scientists at the turn of the century, we note certain beliefs of the nineteenth century which still were in vogue. Among these were the inheritance of acquired characters, and recapitulation in embryos.

Characters of living things acquired through the environment, or use or disuse, are recognized now but they are not transmitted to the following generation.[1] This is now recognized even in Russia, where a few decades ago a group with political backing held out for the theory. As for embryos going through the stages of their supposed ancestors, the idea has been dropped by both creationists and evolutionists.[2] The demise of inheritance of acquired characters and recapitulation has made evolution much harder to believe.

Hero Worship

However, evolution, the doctrine that life arose by chance and became more complex by material forces, is not science but a type of natural philosophy. Science consists of facts but natural philosophy persists in spite of facts, if it satisfies the desires of people about the nature of the world.

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