9. Certain complex bile acids are found only in seals, walruses and snakes.

10. Nearly identical amino-acid sequences are found in the pig and the ox.

11. Growth hormones of the whale and pig are very similar.

12. Phosphates of the elephant placenta are identical to those of the dog and cat.

All this information makes one think nature is laughing at us and having high jinks with enzymes and secretions without caring what harm she does to our most carefully drawn up taxonomic structures. What do biochemical affinities really mean—relationship by descent from a common ancestor, parallel variation, or are they examples of God's quotation of His previous work?

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A SIMPLIFIED EXPLANATION OF THE FIRST AND SECOND LAWS OF THERMODYNAMICS: THEIR RELATIONSHIP TO SCRIPTURE AND THE THEORY OF EVOLUTION

EMMETT L. WILLIAMS, JR. *

Evolution simply could not have occurred unless both the first and second laws of thermodynamics were violated many times. After explaining thermodynamics in non-mathematical language, relation of the first law to evolution, and relation of the second law to evolution, is given extensive consideration. Three arguments, which are often offered to "defend" the occurrence of evolution in spite of thermodynamics, are studied carefully. It is concluded that the first and second laws of thermodynamics overrule evolution.

Introduction

Many Christians have heard that there are scientific laws derived from the field of thermodynamics, and that these laws are opposed to the theory of evolution. However, many of these Christians do not know exactly what is included in the science of thermodynamics. The purpose of this article is to give a simplified, non-mathematical explanation of the first two laws of thermodynamics, so that Christians may be better equipped to use their knowledge against the tenets of evolution.

In preparing this article, no apology is made for relying heavily on Henry M. Morris' excellent book, *The Twilight of Evolution.*[1] Morris has ably shown that the first two laws of thermodynamics are opposed to the theory of evolution. His book contributes much to an understanding of the subject, but it was not his primary intent to develop the methodology of thermodynamics --which will be undertaken here.

*Emmett L. Williams, Jr., Ph.D., is a member of the Department of Chemistry at Bob Jones University, Greenville, South Carolina 29614.

What is Thermodynamics?

First, consider the word *thermodynamics. Thermo-* is a combining form from the Greek word *therme-* (heat). Dynamic comes from the Greek word *dynamis* (power). Thus, thermodynamics is the study of heat power. The subject of thermodynamics arose historically from the study of heat engines, and the problems involved in converting heat into mechanical work.[2] One may legitimately ask how the study of heat

movement can be related to a biological subject, evolution? This question must and can be answered.

But an even more basic question must be answered first: what is heat? Heat is a form of energy, but more importantly, it is a form of energy in transition—heat flow.[3] The idea of movement is very important, since heat can be detected only if it moves from its source. Therefore, heat is the name for energy *as it is transferred* from one region to another by the thermal processes of conduction, convection, and radiation.[4]

There are other forms of energy besides heat, such as mechanical, electrical, and magnetic energy. These forms of energy are related.

Energy can be transformed by various means. Heat may be transformed into mechanical work, or into electrical energy, and vice versa. James Joule (1818-1889) was the first scientist to show quantitatively the mechanical equivalence of heat. The relation he established may be written mathematically as follows:

$$W = J Q \qquad (1)$$

where W = mechanical work dissipated, Q = quantity of heat produced (by mechanical work), and J = proportionality constant.

The study of thermodynamics is actually broader. It involves the movement of energy, and the conversion of one form of energy into another, and particularly involves relations between heat and work.[5] Thus thermodynamics can serve as a field of unification for all of the exact sciences,[6] since energy is required for all natural processes.

Another question of importance is related to this discussion: what is energy? Energy is the ability to do work. Lord Kelvin gave a more sophisticated definition:

> The energy of a material system is the sum, expressed in mechanical units of work, of all the effects which are produced outside the system when the system is made to pass in any manner from the state in which it happens to be to a certain arbitrarily fixed initial (standard) state.[7]

In the first definition, a system that is more energetic can do more work than another. In the second definition, there is no such quantity as absolute energy, but only relative energy; only energy differences can be measured. (See Darken and Gurry, p. 140)

Relation of Thermodynamics to Evolution

Back to the original question: how can thermodynamics be related to evolution? Consider the definition of evolution given by Sir Julian Huxley, the British biologist:

> Evolution in the extended sense can be defined as a directional and essentially irreversible process occurring in time, which in its course gives rise to an increase of variety and an increasingly high level of organization in its products. Our present knowledge indeed forces us to the view that the whole of reality is evolution—a single process of self-transformation.[8]

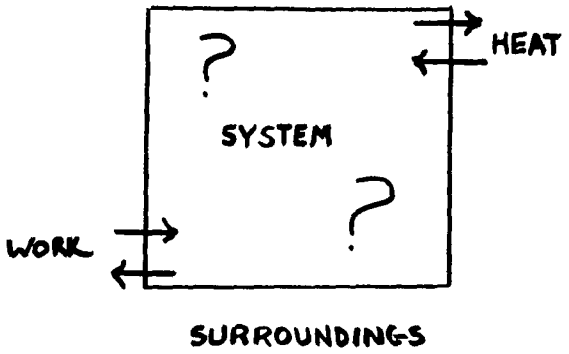

Figure 1. Diagram representing work and heat passing through a system boundary.

Obviously evolution involves transformation, and natural transformations require energy. Such a description of evolution as given above would require tremendous quantities of energy and many energy transformations. The process of evolution requires energy in various forms, and thermodynamics is the study of energy movement and transformation. The two fields are clearly related. Scientific laws that govern thermodynamics must also govern evolution.

Thermodynamic Systems

Methods of thermodynamics may be applied to a particular system under investigation. A moving automobile, a working person, a pot of water, a beaker of acid, a piece of metal, or a cylinder of gas may be treated as a thermodynamic system. All chemical reactions, physical processes, and natural operations may be treated as systems under study.

A system is some part of the physical universe "isolated" from its immediate environment so that it can be studied. An imaginary boundary is placed around the system to separate it from its surroundings. For practical purposes, the rest of the universe may be ignored, as being independent of local happenings in the system and its immediate surroundings.[9] (See Figure 1)

The system is a reservoir of energy no matter what it is, or how complicated it is. A moving automobile, a piece of hot or cold metal, a pot of frozen or boiling water, a reacting mixture of chemicals, or a college sophomore may all be considered as reservoirs of energy from the standpoint of thermodynamics. This generality is what makes the application of thermodynamic principles universal. The application of other scientific methods may cause the investigator to become lost in endless details of atomic struc-

ture and mechanistic rationalizations, in which logical difficulties appear, leaving the theory incomplete.

Many unnecessary scientific details may be avoided in investigating thermodynamic systems, when thought of as reservoirs of energy. A scientist need only measure a few easily determined properties (or variables) of a system to determine its relative energy content. Such properties as temperature, pressure, volume, and composition often provide all the information needed to completely define a thermodynamic system. This approach is very simple. Interactions between the system and its immediate surroundings can be followed easily. These interactions include various energy exchanges. (See Crawford, p. 3)

First Law of Thermodynamics

Robert Mayer (1814-1878) was the first scientist to suggest the general principle of energy conservation. Mass and energy can be transformed one to another, but the total energy content of the universe remains the same. There is no destruction or creation of matter or energy now going on in the physical universe. This was considered a bold and speculative idea in 1842.[10] Basically the conservation of energy principle is the first law of thermodynamics. In Mayer's own words, this law is stated:

> I therefore hope that I may reckon on the reader's 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] (Parentheses added)

Such an idea may have been considered quite bold, but the Bible contains many statements of this principle. The Holy Spirit does not call attention to them as the first law of thermodynamics, or as the principle of energy conservation, but many statements can be interpreted as such :

> Thus the heavens and the earth were *finished* and all of the host of them. And on the seventh day God *ended* his work which he *had made.* (Genesis 2:1-2)
>
> But the heavens and earth which are now, . . . are *kept in store.* (II Peter 3:7)

Other verses which indicate that creation is finished and conservation processes are now in operation are Exodus 20:11; Exodus 31:17; Psalm 33:6,9; Nehemiah 9:6 (preserving the creation mentioned here); and Hebrews 4:3,10. Hebrews 1:3 speaks of the Lord Jesus Christ as *upholding* all things, showing His continued maintenance or preservation of the universe.

That the first law has universal application is clear from the assertion of Scripture. There are no known exceptions to this law within the limits of experimental error.

It should be obvious to anyone, who believes in creation by direct acts of God, that only He can create something out of nothing. Man is incapable of such creation. Once God stopped creating, conservation processes began. (One other consideration, degeneration, will be covered later.) Man can only utilize what has been created; he can transform various created quantities, but never create something without using existing material.

If the energy of the universe is conserved, it now becomes the scientist's job to keep up with the energy moving in and out of a system. He can do this very simply because energy transfers usually can be placed into two categories: heat and work.

Equation for First Law

A system can receive or reject heat depending upon the temperature of the immediate surroundings. Temperature is an arbitrary measure of the thermal energy of a system. If the surroundings are hotter (higher temperature) than the system, thermal energy will flow into the system, and if the surroundings are colder (lower temperature) than the system, thermal energy will flow out of the system.

Secondly, a system can do work or have work done on it. For instance, an enclosed gas system can expand (it does work on its immediate surroundings), or be compressed (surroundings do work on the gas). The work done on or by the system can be mechanical, electrical, magnetic, etc.

A simple mathematical statement of the first law to account for all of these changes for a given system is:

$$d E = d Q + d W \qquad (2)$$

where d is a mathematical term which can be interpreted as "the change in" or "difference in"; E represents the energy of a system, normally expressed as internal energy; Q = heat content of system; and W = work done on or by system.

In this equation the change in internal energy of a system (dE) is equal to the change in heat content of a system (dQ) plus the work done on or by the system (dW). If the system gains heat energy, dQ is positive; if it loses heat, dQ is negative. For work done on the system, dW is positive, and for work done by the system on its surroundings, dW is negative. Only energy differences can be measured.

An interesting comment on internal energy is made by King:

> No simple monosyllabic word exists as a name for the energy which we have represented by E. Perhaps the Anglo-Saxon word *sawl,* meaning the spirit or essence of a substance is suitable. Then *sawl,* like work and heat, is one form of energy during its transfer between a system and the near-surround.[12]

Hebrews 1:2 states that the Lord is "upholding all things *by the word of his power."* How is the creation being conserved, or what is the source of this energy? Morris,[13] on the authority of this verse, states that it is the Creator Himself.

The First Law and Evolution

The Bible and the first law of thermodynamics indicate that creation is finished.[14,15] Only processes of conservation, preservation, and maintenance are scientifically possible.

Refer again to Huxley's definition of evolution. Evolution is irreversible in time and still continuing. Evolution gives rise to new products. In other words, creation processes are supposed to be still in progress. Obviously the Bible, the first law of thermodynamics, and evolution cannot all be true. If the Bible and the first law are correct, then evolution is false, or vice versa.

It is to be hoped that the Scripture itself will convince a Christian that evolution could not be true. However, suppose we face a man who claims to believe both the Bible **and** evolution. Such position seems intellectually impossible without compromising one of the two extremes, and usually such persons do not believe the Biblical account of creation literally. Morris argues:

> It is thus absolutely impossible to believe in the Bible as the complete and literal Word of God and to believe in the theory of evolution.[16]

The theistic evolutionist usually believes the theory of evolution **more** than he believes the Bible. If he will not heed Scriptural teaching, he still must face the first law.

What is the "best" science, the first law or evolution? The first law is primarily an empirical law. Equation 2, given above, was developed through experimentation. Granted, Mayer suggested the principle of energy conservation *a priori,* as far as modern science is concerned, and Helmholtz presented the precise mathematical formulation in 1847. Yet, the first law is backed solidly by experience and experimentation. Direct observation of the way matter behaves demonstrates that the first law is true.

What about the validity of the theory of evolution? The very use of the term "theory" should suggest that it is not scientific law. Is evolution backed by experience and experimentation? Is it directly observable? No! Neither Huxley, nor any other scientist can *prove* that the process which he defines has taken place or is taking place. The obvious conclusion is that the first **law** of thermodynamics is science, and the **theory** of evolution is not.

Someone may wish to side-step the direct confrontation of the first law of thermodynamics and the theory of evolution (again it is assumed that he refuses to accept Biblical instruction). Someone may reason that the first law simply says that energy and matter are not being created or destroyed at this time, However, could not the existing energy and matter be used to develop new products, greater variety, and more organization? Suppose that new matter and energy are **not** being created; they are only being **used** in an evolutionary process.

To answer this hypothesis, we must understand the direction of natural processes. As natural processes occur, which way do they tend to go-–toward evolutionary development, in an opposite direction, or in neither direction? The second law of thermodynamics gives the answer to this question.

Second Law of Thermodynamics

When men began work with heat engines in the last century, the second law of thermodynamics was formulated. Most modern industries obtain power from heat engines. For instance, coal or oil is burned to produce steam which produces electrical power which in turn is used by machines in industrial plants to produce mechanical work. Basically, heat energy is converted into mechanical work.

Heat transfer is of prime importance for such operations. The first thing that can be noted in heat transfer is that heat will flow only one way. Heat will flow only from a body of higher temperature to a body of lower temperature.

For example, if a hot iron ball is placed beside a cold iron ball, no heat energy will be transferred from the cold ball to the hot ball, resulting in a decrease of temperature of the cold ball while the hot ball increases in temperature. What happens is that the hot ball begins to lose heat energy, whereas the cold ball receives this heat energy until both balls come to the same temperature.

Why will heat not go from a cold body to a hot body? It is simply because of the character of the physical universe. This direction of heat flow has always been observed. This is the direction of a particular natural process (heat flow). One statement of the second law is that heat cannot pass spontaneously from a body of lower temperature to a body of higher temperature.[17] (The conventional second law of thermodynamics was introduced by Clausius (1850) and Kelvin (1851), independently. Carnot (1824) actually discovered the essence of the second law before it was stated in this form.[18])

Interestingly, all natural processes tend to go spontaneously **only** one way. King says:

> This "onewayness" appears to be a very fundamental characteristic of natural processes. The second law of thermodynamics epitomizes our experiences with respect to the direction taken by thermophysical processes.[19]

In the definition of the second law, *spontane-*

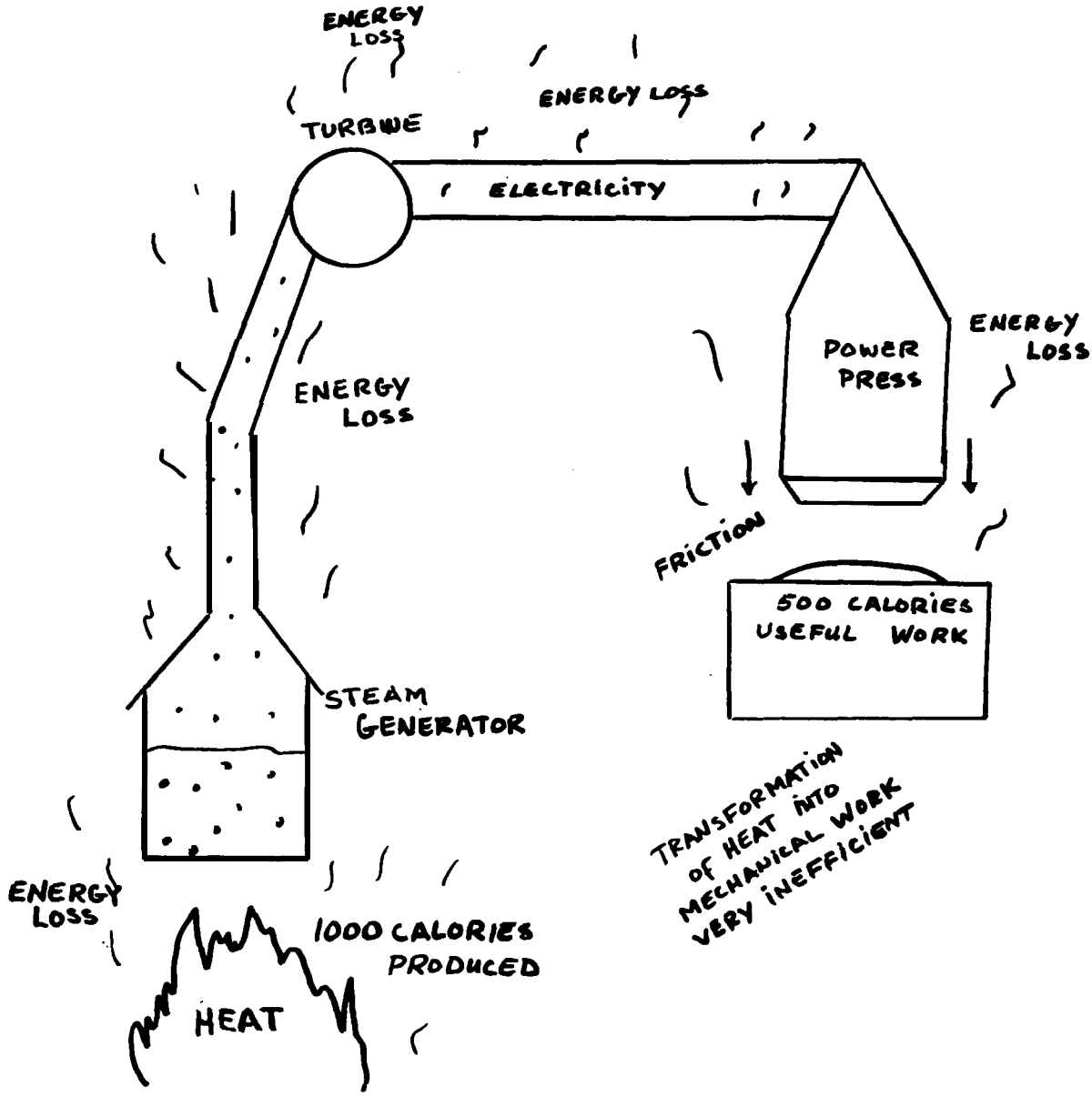

Figure 2. Illustration of degeneration of 1000 calories into only 500 calories of useful work.

ous refers to the process as unrestrained. In other words, the process is allowed to proceed naturally without any external restraints. Any natural process is a spontaneously occurring one.

Consider again heat transfer: the flow goes from a reservoir of high temperature to a reservoir of low temperature. As the heat energy moves from the hot reservoir to the cold reservoir, there is a heat loss to the surroundings. The process of heat transfer is not 100% efficient. The first law of thermodynamics has been obeyed. The energy that is lost to the surroundings is not destroyed; it simply becomes unavailable to do any useful work.

Suppose heat energy is being used to produce mechanical work. If 1000 calories of heat energy are generated at the source, after the energy conversion is accomplished, the final machine may be able to produce only 500 calories of mechanical work. (See Figure 2) Thus there is an unavoidable waste of heat.

Clausius in 1865 introduced the concept of *entropy* in connection with this heat waste.[20] High entropy heat would have considerable waste, whereas low entropy heat would have very little waste. Low entropy heat is more valuable than high entropy heat. In fact, the entropy

of the heat is more important than the amount of the heat.[21]

It is not only of interest to provide heat to produce mechanical work, but also the temperature at which the heat is produced becomes important in determining how much of the heat can be utilized later for mechanical work. Heat produced at one temperature will have a different entropy (usability) value than heat produced at another temperature.

Another Statement of Second Law

This inefficiency of thermal operations led to another statement of the second law. It is impossible to build an engine which would extract beat from a given source and transform it into mechanical energy without bringing about some additional changes in the systems taking part.[22] This statement eliminates the possibility of any perpetual-motion engine.

Although this statement refers to thermal processes, it has been found through observation and experimentation that the second law applies to all natural processes. Natural processes are inefficient. There is a waste of energy in any natural process. All energy being utilized has an entropy value or has the property of entropy. As more and more energy is utilized, more energy is wasted, and the entropy of the universe increases.

Clausius summarized the two laws of thermodynamics by saying that the total energy of the universe is a constant, and the total entropy content of the universe increases.[23] This means that the energy wasted can never be utilized again. It becomes unavailable, but it has not been destroyed.

All natural processes occur in a direction such that there is an increase in entropy. The second law shows the direction of natural processes. Consider the example of the hot and cold iron balls. The hot one cools and the cold one heats up until they reach a common temperature. If this new temperature is greater or lower than the room in which the balls are located, then the temperature of the balls will change until it equals the room temperature. The balls gain or lose heat energy until they reach the temperature of their environment.

It is known from thermodynamics that all isolated systems proceed toward a state of equilibrium; i.e., a system changes its state toward one in which the physical properties of the system are as uniform throughout as possible under the prevailing conditions.[24] If the system is exposed to its surroundings, both the system and surroundings will approach a state of equilibrium with each other. If natural processes proceed so that entropy increases and proceed toward a state of equilibrium, the state of maximum entropy is the equilibrium state.

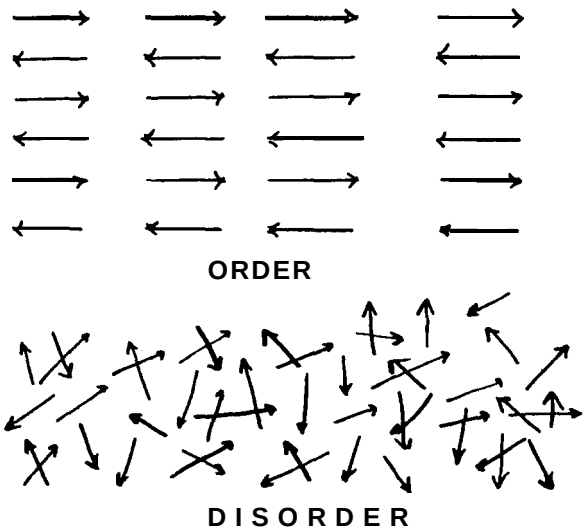

Figure 3. Illustration of order versus disorder.

Natural Processes Occur Spontaneously

All natural processes occur spontaneously. It is possible to force some processes in a reverse direction; however, once the system is released from this force, it will proceed spontaneously in the natural direction toward equilibrium.

For instance, a beaker of alcohol and water will mix spontaneously. As long as the mixture stays in a beaker it will not tend to unmix spontaneously. By subjecting the mixture to thermal or chemical operations the two could be separated, but never will they separate by themselves. The mixture of alcohol and water is a disordered arrangement of alcohol and water molecules. The two separate beakers of alcohol and water are not as disordered as the mixture. Thus, natural processes tend toward a state of higher entropy (a state of higher disorder). (See Figure 3)

The equilibrium state of a system is the state of maximum disorder. Therefore entropy is associated with disorder. To explore fully the concept of entropy and disorder, statistical mechanics must be introduced and this is beyond the scope of this discussion. For a more complete discussion of entropy and disorder, see reference 25.

The principle of increasing entropy in thermodynamics is true of an isolated system. This principle is of extremely general application because all material, that is in any way affected by a process, may be included within a single isolated system.[26]

Caratheodory established in 1909 a rigorous mathematical basis for the concept of entropy. Since he deduced the existence of entropy as a

solution function for a particular differential equation, he showed that entropy must be due to some very special character of the world in which we live.[27] The character of the world and universe can be found in Scripture.

The principle of increase of entropy or the increase in disorder is set forth in Scripture:

> Of old hast thou laid the foundation of the earth; and the heavens are the work of thy hands. They shall perish, and thou shah endure. Yea all of them *shall wax old* like a garment; as a vesture shalt thou change them, and they shall be changed. (Psalm 102:25-26)
>
> All go into one place; all are of the dust and all turn to dust again. (Ecclesiastes 3:20)

See also Isaiah 51:6; Remans 8:20, 22; and I Peter 1:24.

The Bible sets forth a process of aging and "wearing out" of the heavens and earth. This growing old and "wearing out" is toward a state of increasing entropy. A state of maximum entropy in the universe would be one of uniform temperature. This could only be attained when all of the high energy sources have dissipated their energy.

As bodies, such as the sun, dissipate their energy, there is a tremendous waste of energy. The high energy (high temperature) bodies cannot receive energy from the lower energy (low temperature) bodies to replenish their supply, so they are wearing out (even though the process is very slow). The universe is "running down" from a standpoint of available energy for natural processes. If such a state of uniform temperature ever occurred, it would be a state of maximum disorder and maximum entropy.

All aging or wearing out processes are toward a state of maximum entropy. Consider an article of clothing. As it is worn, it fades and becomes threadbare. The original garment represents a state of low entropy compared to the final worn-out garment. Much energy was expended to take the cotton or wool from its original form until it was formed into a completed garment. As this energy was utilized, much energy waste occurred, increasing the entropy of the universe. The cotton or wool fibers did not spontaneously form a dress; they were mechanically formed and chemically treated and forced into the article of clothing.

As the garment deteriorates, it is increasing in entropy. No matter how the garment is cleaned and restored, it never can maintain its "newness ." The cleaning and restoration processes are inefficient and no amount of energy output will keep the garment in its original state. Eventually the garment will reach a state of maximum entropy when it has degenerated into dust (a state of high disorder).

The same reasoning applies to the human body. Death causes the body to return to dust, or in other words, the body has now come into equilibrium with its surroundings. Ecclesiastes 3:20 has been satisfied; death is a manifestation of the second law of thermodynamics.[28]

The Second Law and Evolution

The second law of thermodynamics is an empirical law, directly observable in nature and in experimentation. Yet, it has its basis in Scripture. This law implies that the direction of all natural processes is toward states of disorder. From the standpoint of statistics, natural operations proceed in a direction of greatest probability.[29] The most probable state for any natural system is one of disorder. All natural systems degenerate when left to themselves.

What about evolution and the second law? Huxley states that evolution is an irreversible process which leads to greater variety, to more *complex, higher degrees of organization.* His assertion contradicts the prediction of the direction of natural processes called for by the second law! Either evolution has occurred in spite of the second law, or evolution has not occurred at all.

There can be no question about the correctness and universality of the second law. How could evolution occur in spite of it? Many scientists would claim that most experiments conducted to verify this law are performed in closed systems. Biological systems are open systems (a system whose boundary is crossed by matter,[30] such as food intake and waste output), and it is theoretically possible for entropy to decrease in open systems.

Refuge Sought in Open Systems

Therefore, it is claimed that it is possible for evolution to occur in these open systems, since they may be immune to the effects of the second law. Such reasoning is not very convincing.

Most scientific theory and law has been developed in the way Kestin states:

> In fact, in any branch of physics, the analysis of a phenomenon or process in terms of the relevant physical laws must begin by mentally isolating a collection of bodies from the rest.[31]

Normally, laboratory experiments are closed systems. The results obtained from such experiments usually are accepted by scientists without so much "fuss" about closed systems.

It would be possible to consider our solar system a closed system and observe the effects in this closed system. An analysis designed to obtain quantitative data is scientifically impossible; however, from general observations there is much qualitative data available. There is certainly a trend toward death, decay, and disorder, and no observable trend toward evolutionary develop-

ment. There is obviously change and adaptation, but no evolution as called for by Huxley.

Open biological systems are subject to the second law. The entropy content of open systems may not increase as rapidly as that of closed systems, but it does increase *as evidenced by decay and death.*

What about local decreases in entropy even though the entropy of the universe increases? Supposing millions and billions of years of local decreases in entropy, there would be countless exceptions to the second law in evolutionary development. Thus, some evolutionists reason that the second law would be overthrown so many times that it could not be considered law. Therefore, evolutionary development does not call for an occasional violation of the second law but for continual violations.

From the above pattern of ideas, one might deduce that the second law is really not scientific law; however, such a statement is preposterous! None of these violations is observed today, and it can only be postulated that they occurred in the past. The burden of proof rests on the man who makes such claims, and no satisfactory evidence can be given to support such an hypothesis. On the other hand the Christian can say that evolution has not occurred, because such a process is neither Scriptural, nor scientific.

Another Argument: System Coupling

Another argument often presented and similar to the open system objection is that a system can be coupled to another. One system decreases in entropy while the system coupled to it increases greatly in entropy and the total for both systems is an entropy increase. Thus one system has decreased in entropy, but the second law has been obeyed.

An example of such a coupling may be observed when a person pulls a metal weight into the air by means of a pulley. The metal weight cannot spontaneously lift itself, but a person might lift it with a pulley, decreasing the entropy of the block. The energy waste in such an operation would cause a total entropy increase. To maintain the weight at this low entropy position, the person must continually pull the rope.

Eventually the person will get tired. Even if he is fed, he will finally weaken so that he must release the rope. (See Figure 4) The weight returns to the high entropy position. A constant restraint such as the one illustrated could cause a local entropy decrease. However, the coupling or restraint must be continually maintained. If the system is left alone or the force on it relaxed, the system will return to its most probable state.

Are there any such couplings or restraints now operating to "aid" the process of evolution? If

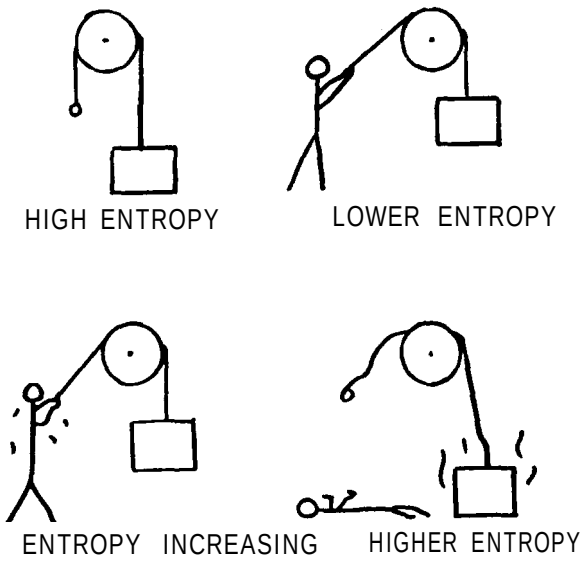

Figure 4. Cartoon to illustrate that coupling is not effective to lower entropy of a system.

they operated in the past, they must be operating now to hold the systems in a lower entropy state. Evolution requires natural causation and random changes. Such couplings or restraints must be beyond random processes because they must operate continually, and the process becomes controlled.

The couplings and restraints observed on biological systems do not cause any evolutionary development as stated by Huxley. Changes that do occur in biological systems are in most cases harmful.[32] No evolutionary development can be perceived. No satisfactory evidence can be presented to show that such coupling or restraining forces have forced any type of evolutionary process counter to the second law of thermodynamics. Again the burden of proof rests on those who claim it could have. To prove such a statement is an entirely different matter. Even as an organism grows, it is wearing out and will eventually die.[33]

Final Objection: Theistic Evolution

The final objection comes from those who claim that God has directed the process of evolution (theistic evolution). The reasoning may go something like this: God chose the process of evolution to create (?) the universe and bring everything into being. At crucial points in the evolutionary development God intervened to cause continuation of the process. Then evolution could occur in opposition to the second law.

Henson[34] states that the term theistic evolution is antithetical. The process of evolution needs no creator or director. It is completely materialistic. Consider another comment of Huxley's:

> Darwinism removed the whole idea of God

> as the creator of organisms from the sphere of rational discussion. Darwin pointed out that no supernatural designer was needed; since natural selection could account for any known form of life, there was no room for a supernatural agency in its evolution. . . . There was no sudden moment during evolutionary history when "spirit" was instilled into life any more than there was a single moment when it was instilled into you. . . . I think we can dismiss entirely all idea of a supernatural overriding mind being responsible for the evolutionary process.[35]

The view of theistic evolution normally is held by Christians who want to put God into a completely atheistic system. By moving to this point of compromise they feel they are able to profess to believe in a creator or initiator, and also to agree with modern evolutionary thinking. Actually such a position does not satisfy a true creationist or a true evolutionist. The creation account in the Bible does not allow for such reasoning; and, when a person takes the position of theistic evolution, the Scripture must be warped completely away from its true meaning or simply ignored as a factual account.

If He had wanted to do so, God could have used a process of evolution to create and fashion the physical universe and all life in it. However, if He did, why did He not say this in His Word? The Genesis account of creation is a series of quickly-consummated acts, not of processes of millions and billions of years of slow transformation. The process of evolution limits God. It is cruel and involves trial and error.[36] Did God need natural selection (trial and error) to design? If God knows the end from the beginning, why should He use such a process? Evolution does not fit the character of God as revealed in the Bible.

Evolution is completely unscriptural. I do not see how anyone can comfortably claim to be a born-again Christian and be an evolutionist. To believe in evolution requires that eventually much of the Bible must be explained away. For instance, the Bible says that death came into the creation when Adam sinned. To be an evolutionist, one must admit that death had occurred millions of times before Adam. The position of theistic evolution is not Biblically or scientifically tenable. It seems strange that someone would invoke God's direction in an atheistic process to overcome a scientific objection such as the second law.

It is impossible to cover all the objections that have been given by those attempting to refute the position that the second law of thermodynamics opposes the theory of evolution. Open systems, steady states, coupled systems, occasional violations, and directed evolution could all be claimed as means of avoiding the consequences of the second law. Yet none of these could ever be shown to be true, and they will be mere fancy or imaginative guesswork.

Men are going to believe what pleases them. Neither evolution nor creation can ever be proven scientifically. But the Christian is in a better position, for he has God's written relegation of what happened and scientific law for his case; however, the evolutionist has only hypothesis derived from logical thought processes. Evolutionists can fit experimental data and natural observations into an evolutionary framework, but the same material can be fitted into a creation and universal flood framework. Men must choose the system which they wish to believe.

Origin of the Second Law

Morris[37] suggests that the second law of thermodynamics originated when God cursed the creation because of Adam's sin. At that point death entered the physical universe. Disordering and decay processes began in all natural operations (Romans 8:20, 22).

Uniformitarian scientists would object to this. They claim scientific processes now operating have always been in existence. Evolution would have to occur with both the first and second laws of thermodynamics in operation. This is not possible. If an evolutionist accepts this framework (death only after Adam sinned), then the survival of the fittest and other evolutionary arguments are needless.

Millions and billions of years of evolutionary change, with no death, would be unthinkable in considering over-population of all species! Evolution cannot be comfortable with or without the second law! It needs the second law (death) to explain the driving force for evolution (survival of the fittest), but the second law operates against evolutionary processes,

Conclusions

It seems more reasonable to believe that the existing order and complexity in the physical universe was created into it by God. Present scientific processes simply maintain that order and complexity. No new variety or more complex structure is coming into being. Only existing organisms are being modified. This view is consistent with the first law of thermodynamics.

The universal trend toward disorder and decay was invoked when God cursed the creation because of Adam's sin. The present complexity and order of the universe is decreasing. The rate of this degeneration is not a problem for thermodynamics. Rate processes are the concern of the field of kinetics. In the relatively new science of nonequilibrium thermodynamics, the rate of

entropy production is a variable, but entropy always increases at a perceivable rate.[38,39]

The second law of thermodynamics is a scientific statement of the Scriptural principle of disorder and death. This law is diametrically opposed to the theory of evolution. Many scientists, besides those in the Creation Research Society, are beginning to realize that there is something seriously wrong with the theory of evolution, and some of their work has appeared in print.[40,41] However, whether the majority of men will accept creation or not is another matter.

Scientific laws overrule the process of evolution. The two laws discussed in this paper call for conservative and degenerative processes operating together. Evolution is not a conservative or degenerative process. Therefore it is concluded that evolution could not have occurred, since the first and second laws of thermodynamics would prevent any process that consistently produces greater order and complexity in the physical universe.

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(Continued from Page 132)

cal studies in the region. It seems that the real significance of this coal skull is still an open question.

As a matter of interest, though admittedly without documentation, a coal miner in West Virginia, obviously both competent and honest, told me recently that his party had excavated in a mine some years previously a perfectly formed coal-ized human leg. He said a government man had come and taken it off and he had no idea where it was now.

Another man has prepared a statement that deep in another coal mine, his father's party had unearthed, many years ago, a well-constructed concrete building, the news of which was quickly suppressed. Whether there is solid truth to such reports or not, there do seem to be many such rumors.

In any case we have ample other justification, both Biblical and scientific, for continuing to reject evolutionary geology and its chronological framework.

HENRY M. MORRIS
President