ORIGIN AND DEVELOPMENT OF THE UNIVERSE

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The generalized concept of energy and the law of conservation of energy are developed from a historical point of view. The second law of thermodynamics is presented as a companion law. These two laws are shown to present a paradox to evolutionary theories of the origin and development of the universe. The creation point of view is shown to remove that paradox.

Development of the Law of Conservation of Energy

The most important construct in the whole of physical science and probably of all science is the generalized concept of *energy*.[1] It took a long time for scientists to develop this concept. During the development, energy was first associated with mechanical work. Even today the basic *unit* of energy, the *joule,* is defined as the work done by a force of one newton acting through a distance of one meter.

It was Sir Isaac Newton who first introduced the principle of *conservation of energy*. He applied the principle to a mechanical system in which there was hypothetically no friction.

In such a mechanical system he concluded that *potential energy* (energy acquired because of the object's position, such as the energy acquired by a pendulum at the top of its swing) can change into *kinetic energy* (energy due to its motion), and vice versa, but that the total mechanical energy (potential plus kinetic) remains constant. Hence mechanical energy is conserved. Newton recognized, of course, that no such idealized system can be achieved, but if the friction is greatly reduced the system can be approximated.

Although the concept of a *conservative mechanical system* turned out to be a very fruitful one, it obviously needed to be supplemented. What became of the work done against friction and such non-conservative forces remained obscure for another century.

In 1795 Count Rumford performed his famous experiments on the heat produced while boring metal in the process of making gun barrels. He suggested that by the expenditure of enough mechanical work one could produce an arbitrarily great quantity of heat. Contrary to the belief of his day, the belief that heat was some *caloric* substance that flowed out like a fluid, he suggested that heat is just another form of energy. He introduced the principle that mechanical energy changed into heat energy. The principle of conservation of energy was emerging into the practical domain, taking account of the effect of friction.

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Although we accept Rumford's mechanical theory of heat today without question, in his day the calorists questioned it and had answers that seemed plausible. Because of the tenacity with which reputable physicists clung to the caloric theory, it continued in general use for another half century. In fact it has been stated that no experiment has ever really demonstrated that the caloric theory is false, in the sense that it could not be accommodated to some result by the aid of enough *ad hoc* assumptions.[2]

Joule Established Energy Conservation

James Prescott Joule deserves the most credit for establishment of the principle of conservation of energy on the broad basis on which it has been accepted.[3] In his famous paddle wheel experiment he measured the rise in temperature of the water due to the friction from the moving paddles. From that temperature rise and other data, he computed the *mechanical equivalent of heat.* Hence one is now able to express heat energy in terms of the unit of mechanical energy, namely the joule.

Albert Einstein showed theoretically that mass itself is a form of energy, and that its energy equivalent can be computed from the expression mc^2, where m is the mass and c is the speed of light. Hence mass energy can also be expressed in terms of the unit of mechanical energy, namely the joule (when mass is in kilograms and c is in meters per second).

Research of Enrico Fermi and others has amply demonstrated that mass can be transformed into heat and other forms of radiant energy through nuclear fission or through nuclear fusion. In fact it now seems clear that the sun's radiant energy is produced by nuclear fusion. In this nuclear fusion process, some of the mass of the nuclei of hydrogen goes into radiant energy and some of it ends up in the form of helium nuclei. But, in all these transformations, the sum total energy (mass energy plus radiant energy) remains constant.

We now know that this principle which is conventionally designated as the *law of conservation of energy* includes all forms of energy whether it be mechanical energy, heat energy, chemical energy, electrical energy, or mass energy. This law states that *energy may change from one form to another form but the total amount of energy remains constant.* Hence ac-

cording to this law, *energy cannot be created nor destroyed.* All of the experiments and observations in science show that there is **not one known exception** to this law. It is the most generally accepted principle of all science. Scientists can depend upon the law of conservation of energy.

A Companion Law

The *second law of thermodynamics* is a companion law to the law of conservation of energy, which is sometimes denoted as the *first law of thermodynamics.* Although according to the law of conservation of energy we are assured that the total amount of energy will not decrease, according to the second law of thermodynamics we are assured that the net availability of energy is decreasing. Hence the optimism of the first law is curbed considerably by the stark pessimism of the second law. Due to the second law, many scientists foresee a day of exhausted availability of energy—the so-called *heat death of the universe.*

Because of the important consequences of the second law of thermodynamics we need to consider it further. Initially, we note that energy can be classified as *available energy* and *diffuse energy,* which is not available for doing work.

Awareness of this diffuseness or degradation of energy developed out of attempts to design more efficient heat engines. The mechanical equivalent of heat was known, and it was shown that only a portion of the heat energy is utilized in the heat engines. Then it was shown by Sadi Carnot and Lord Kelvin that it is theoretically impossible to utilize all the heat energy in these engines, even if there were no friction in the engine.

Heat exhausted from the engine is diffuse heat (if exhausted at atmospheric temperature) and it is totally useless even though this energy is still conserved. Hence conservation of energy does not assure continued availability of energy. For example, the total energy of the sun (including that previously given off plus that yet to be emitted) will be conserved, but it will eventually become diffuse and unavailable for use.

Current theories estimate that the sun will cease to generate radiant energy within five billion years. By that time the earth would be without enough available energy to sustain life[4] even though the solar energy would still exist in a diffuse form in the universe.

Paradoxical State of the Universe

The origin and development of the universe is a paradox in science. There is **no way** that the first and second laws of thermodynamics can be used to achieve a scientifically consistent explanation of the origin of the universe and its transition to the present state. This is a paradox in science *per se.*

The first law of thermodynamics *forbids creation* of mass and all other forms of energy, but mass and other forms of energy do exist. Hence from the first law one would have to conclude that these constituents of universe have been in existence forever. If that were the case, one would then have to conclude from the second law of thermodynamics that the universe has already run down. Forever is long enough for all of the original energy to have reached the diffused state—the heat death of the universe. Obviously that is not the present state of the universe. Hence the paradox.

Since there are no creative nor self-winding processes known to scientists, one cannot escape this paradox unless he resorts to emendations that tend to overload his theory with *ad hoc* assumptions, as did the adherents to the caloric theory of heat. If one admits the indeterminancy of science in the domain of origins, and postulates the creation and winding up of the universe by God through means that lie totally outside the realm of these laws of science, he has no such paradox.

Evolutionists Seek to Escape Paradox

There are, however, those scientists of an evolutionary persuasion, who seek to achieve a scientific theory for the origin and transition of the universe to its present state. One of their most favored theories of the origin of the universe is the so-called “big-bang” theory.

According to this theory the universe began with all of the energy concentrated into a single primeval atom, which abruptly disintegrated flinging energy and resultant atomic constituents out into space and causing the whole universe to be in an expanding state. This expanding universe concept gives a plausible explanation for the *red shift* observed in the spectral lines of some of the stars.

The red shift could, of course, be produced by the Doppler effect of a source moving away from the observer. This theory was developed to lie within the framework of Einstein’s general theory of relativity and embodies his concept of curved space.

The point which should be emphasized here is that the big-bang theory *does not resolve the question of origins.* Even if that theory were correct, it leaves unresolved the question of origin of the energy in the primeval atom. The first law of thermodynamics lays down the constraint that energy can not be created, leaving as the only alternatives-eternal existence of all the energy or divine creation. According to the second law of thermodynamics, the energy would have run down into a diffused state of useless

energy if it had already been in prior eternal existence. It would not have been in the assumed original state of the primeval atom.

It is interesting to note what A. C. B. Lovell has to say about the dilemma associated with the primaeval atom theory of the origin of the universe:

> It would, of course, be wrong of me to suggest that this view of the origin of the universe demands necessarily the possibility of creation of matter by a divine act. On the contrary, those who reject God adopt a strictly materialistic attitude to the problem of the creation of the primeval atom. They would argue that the creation of the primeval material had no explanation within the framework of contemporary scientific knowledge, but would escape from the dilemma by reserving the possibility that science would, if given the opportunity of studying these initial conditions, find a satisfactory solution. Or they would evade the problem of a beginning altogether by following a further line of thought due to Gamow, that the primeval atom was not the beginning but merely a state of maximum contraction of a universe which had previously existed for an eternity of time.[5]

One cannot help but note that there is more rhetoric than true scientific thought in this attempt to escape the dilemma thrust upon anyone who attempts to use the laws of science to explain the origin of the universe.

Some have attempted to evade the constraints imposed by the first and second laws of thermodynamics by assuming that the universe is an open system. The essence of that argument is that energy may be supplied to our universe from some outside source. The questions remain as to how that "extra-universal" source could have originated, or why it has not run down if it had been in existence forever. Thus the logic leads back to the same basic interminancy.

Hence the solution to the origin of the universe is clearly beyond the scope of science. However, if one accepts the creation point of view, the problem of origin and development (or degeneration) of the universe to its present state is not paradoxical.

According to the creation point of view, the universe began by divine act as a fully wound up system, and the time of creation is not so remote but that the present state of the universe still has great potential.

References

[1]Lindsay, Robert Bruce. 1968. The nature of physics. Brown University Press, Providence, R.I., p. 34.

[2]*Ibid.,* pp. 33 and 34.

[3]Encyclopaedia Britannica. 1947. Vol. 8, p. 439.

[4]Gamow, George. 1963. The private life of the stars (in) Exploring the universe. McGraw-Hill Book Co., New York, p. 317.

[5]Lovell, A. B. C. 1963. Two theories of the origin of the universe (in) Exploring the universe. McGraw-Hill Book Co., New York, p. 281.

CARBON-14 AND THE "AGE" OF THE ATMOSPHERE

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Formation of Carbon-14 (C^{14}) in the earth's atmosphere exceeds the known rate of decay for C^{14} by a significant amount. The author of the radiocarbon method, Dr. Willard Libby, has attempted to explain this discrepancy by assuming that some of the C^{14} is continually and irretrievably deposited in sediments.

The present paper shows that Libby's explanation leads to preposterous conclusions and is no "explanation" at all. The discrepancy continues to exist, it is real, and it is evidence that may be used to defend the Biblical, not the geologic time scale.

Comments on Creation

The popular position of some scientists on the origin of the earth places its beginning about 4.5 billion years ago. But *historically* Adam and Eve left the Garden of Eden, as the first of mortality—man or beast—only about six thousand years ago. "Earth," i.e., the dry land which the Lord called "earth," appeared at the beginning of the third *day* of creation.

Though most geologists generally assume a rigidly authoritative stance concerning the antiquity of the earth, as a matter of fact, no sound scientific evidence exists to support a 4.5 billion year old earth. Instead, the best evidence still supports an age only about a millionth as great, an age that is in accord with Bible history. After extensive studies of the available information on this matter, it is my opinion that *actually nothing* exists in the way of sound scientific evidence even to permit scientists to go back in history

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