Comparative Studies of Law of Conservation of Energy and Law Clusters of Conservation of Generalized Energy —No.3 of Comparative Physics Series Papers

Fu Yuhua

(CNOOC Research Institute, E-mail:fuyh1945@sina.com)

Abstract: As No.3 of comparative physics series papers, this paper mainly discusses the comparative studies between the original law of conservation of energy and the Computer Information Library Clusters; and based on the multiform laws of conservation of energy, the concept of "law clusters of conservation of generalized energy" is presented. In which, any physical quantity can be regarded as "generalized energy", and any physical formula and equation can be transformed into law of conservation, therefore all the physical laws as well as formulas and equations can be classified as "physical law clusters of conservation of generalized energy" (sometimes it can be simplified to "law clusters of conservation of generalized energy"). While in law clusters of conservation of generalized energy, there are some source laws. According to the source law, some related laws as well as formulas and equations can be derived, for example, law of gravity and Newton's second law can be derived with law of conservation of energy; thus "law clusters of conservation of generalized energy" can be simplified to "law clusters of physical source law". As the number of source laws in the law clusters is reduced to some degree, all the laws of physics are able to be written on a T-shirt with the form of "the simplest law clusters of physical source law". In order to deal with the practical problems, "variational principle of the simplest law clusters of physical source law" can be eatablished.

Keywords: Comparative physics, comparative study, law of conservation of energy, generalized energy, law clusters of conservation of generalized energy, law clusters of physical source law, the simplest law clusters of physical source law, variational principle of the simplest law clusters of physical source law

Introduction

In reference [1], the concept of comparative physics is proposed. As No.3 of the series papers of comparative physics, this paper mainly discusses the comparative studies between the original law of conservation of energy and the Computer Information Library Clusters; and based on this, the concepts of generalized energy, law clusters of conservation of generalized energy, law clusters of physical source law, the simplest law clusters of physical source law, variational principle of the simplest law clusters of physical source law, and the like, are presented.

1   The same points of law of conservation of energy and other physical laws as well as formulas and equations

The first same point: they belong to the most important contents in modern physics.

The second same point: they are all widely used in physics.

Moreover, in many cases they are used simultaneously. For example, as determining

the orbit of alpha particle scattering, law of conservation of energy and law of conservation of angular momentum are used simultaneously.

2   The different points of law of conservation of energy and other physical laws as well as formulas and equations

The first different point: the law of conservation of energy is derived by the time translation-invariant, the law of conservation of momentum is derived by the space translation-invariant, and the law of conservation of angular momentum is derived by the space rotation-invariant; similarly, other physical laws as well as formulas and equations are also corresponding to some invariances.

However, it is never questioned that whether or not these invariances can be tenable at the same time.

The second different point: in the fields of natural science, the law of conservation of energy is the most important and the most widely used law, while the other laws as well as formulas and equations are not so important and far-reaching.

In fact, law of conservation of energy has been the cornerstone of all natural sciences. It is widely used in physics, chemistry, biology and other fields.

However, for law of conservation of momentum, law of conservation of angular momentum, and the like, besides the field of physics, they almost cannot be used in other fields.

3   Comparative studies between the original law of conservation of energy and the Computer Information Library Clusters, and the concept of law clusters of conservation of generalized energy

One of the trends of science development is applying the least amount of laws as well as formulas and equations to solve the problems as many as possible. And people have been hoping that, all the laws as well as formulas and equations can be integrated into a unified model.

As the first step, based on creating generalized and hybrid set and library with Neutrosophy and Quad-stage method in reference [2], the concept of Computer Information Library Clusters is presented in reference [3]. There are various ways and means to form Computer Information Library Clusters. For example, Computer Information Library Clusters can be considered as the "total-library", and consists of several "sub-libraries". In which, it is very important to add the operating function into Computer Information Library Clusters, for instance, according to "natural science computer information library clusters", and applying "variation principle of library (or sub-library)", "partial and temporary unified theory of natural science so far" with different degrees can be established.

Similarly, in reference [4], the comparative literature is expanded into Comparative Sciences Clusters (including comparative social sciences clusters, comparative natural sciences clusters, comparative interdisciplinary sciences clusters, and so on). Among them, comparative natural sciences clusters include: comparative mathematics, comparative physics, comparative chemistry, comparative medicine, comparative biology, and so on.

By comparison we can find that, with the same method to establish "Computer Information Library Clusters" and "Comparative Sciences Clusters", the original law of conservation of energy can be expanded into "Law Clusters of Conservation of Generalized Energy". Of course, we can also say that, as the practical application of "Computer Information Library Clusters", "Law Clusters of Conservation of Generalized Energy" can be established.

It should be noted that, in "Computer Information Library Clusters", the concept of "library" is expanded from the concepts of "set" and the like. To compare with and refer to this way, in the scope of physics, the law of conservation of energy can be expanded in two directions.

The first direction: the concept of "energy" can be expanded into "generalized energy".

In reference [5], taking into account that the mass and the electric charge can be converted into energy, therefore the three concepts of energy, mass and electric charge can be summed up as "Multiform Energy" taking energy as the core, in order to co-ordinate the three basic conservation laws in modern chemistry: law of conservation of mass, law of conservation of energy, and law of conservation of electric charge.

Similarly, any physical quantity can be regarded as "generalized energy", therefore the concept of "energy" can be expanded into the concept of "generalized energy" taking energy as the core.

The second direction: all the physical laws of conservation can be written as the form that right side of the expression is equal to zero, then all the physical formulas and equations can be also converted to the laws of conservation that right side is equal to zero.

In reference [5], law of conservation of energy can be written as the following form that right side of the expression is equal to zero

$$F_1 = 0 \qquad\qquad\qquad (1)$$

where： $F_1 = E - const$

Similarly, all the physical laws of conservation can be written as the form of Eq.(1).

And all the physical formulas and equations can be also converted to the laws of conservation that right side is equal to zero with the form of Eq.(1).

For example, in reference [6], with the help of the equation derived by Prof. Hu Ning according to general relativity, and Binet's formula, we derived the following improved Newton's formula of universal gravitation

$$F = -\frac{GMm}{r^2} - \frac{3G^2M^2mp}{c^2r^4} \qquad\qquad (2)$$

where: G is gravitational constant, M and m are the masses of the two objects, r is the distance between the two objects, c is the speed of light, p is the half normal chord for the object m moving around the object M along with a curve, and the value of p is given by: $p = a$ **(1-e^2)** (for ellipse), $p = a$ **(e^2-1)** (for hyperbola), p **= y^2/2x** (for parabola).

This formula can give the same results as given by general relativity for the problem

of planetary advance of perihelion and the problem of gravitational defection of a photon orbit around the Sun.

It can be written as the following form

$$F_2 = 0 \qquad\qquad\qquad\qquad (3)$$

where： $F_2 = F + \dfrac{GMm}{r^2} + \dfrac{3G^2M^2mp}{c^2r^4}$

Accordingly, all the physical laws as well as formulas and equations can be converted to the laws of conservation that right side is equal to zero, and classified as "physical law clusters of conservation of generalized energy" (sometimes it can be simplified to "law clusters of conservation of generalized energy").

However, in such "law clusters of conservation of generalized energy", there are too many laws of conservation (namely laws as well as formulas and equations). So we must try to reduce the number of laws of conservation in "law clusters of conservation of generalized energy". By comparison we can find that, in the law clusters, there are some source laws, and according to the source law, some related laws as well as formulas and equations can be derived, for example, in references [7,8], law of gravity and Newton's second law can be derived with law of conservation of energy; thus, "law of conservation of energy" should be considered as a source law, and law of gravity and Newton's second law should be withdrew form "law clusters of conservation of generalized energy" and put into the sub-library of law of conservation of energy; in this way, "law clusters of conservation of generalized energy" can be simplified to "law clusters of physical source law". As the number of source laws in the law clusters is reduced to some degree, all the laws of physics are able to be written on a T-shirt with the form of "the simplest law clusters of physical source law".

By extension, in the whole sphere of natural science, we can treat any natural science quantity as "generalized energy", and all laws as well as formulas and equations of natural science can be converted to the laws of conservation that right side is equal to zero, and form "natural science law clusters of conservation of generalized energy". Similarly, in order to reduce the number of the laws of conservation in the clusters, we can find some source laws, and put the related laws as well as formulas and equations into the sub-library of the source law; and form "law clusters of natural science source law". As the number of source laws in the law clusters is reduced to some degree, all the laws of natural science are able to be written on a T-shirt with the form of "the simplest law clusters of natural science source law".

4   Variational principle of the simplest law clusters of physical source law

To compare with and refer to "partial and temporary unified variational principle of natural science so far" proposed in reference [9], the following "variational principle of the simplest law clusters of natural science source law" can be presented

$$\Pi_{\mathrm{NATURE}} = \sum_{1}^{n} W_i \int_{\Omega_i} F_i^2 d\Omega_i + \sum_{1}^{m} W_j' S_j^2 = \min_0 \qquad\qquad (5)$$

where: the subscript NATURE denotes that the suitable scope is all of the problems of

natural science, all of the equations $F_i = 0$ denote so far discovered (derived) all of the equations related to natural science, all of the equations $S_i = 0$ denote so far discovered (derived) all of the solitary equations related to natural science (its meaning can be found in reference [9]), W_i and $W_j{}'$ are suitable positive weighted constants, and $\min_0$ denotes minimum and its value should be equal to zero.

In variational principle Eq.(5), if changing the subscript NATURE into PHYSICS, changing $F_i = 0$ into so far discovered (derived) all of the simplest physical source laws, and changing $S_i = 0$ into so far discovered (derived) all of the solitary equations related to the simplest physical source laws, thus it gives "variational principle of the simplest law clusters of physical source law".

Similarly, if the discussing fields are limited within chemistry, biology, and the like, then we can present "variational principle of the simplest law clusters of chemistry source law", "variational principle of the simplest law clusters of biology source law", and the like.

As for the application of "variational principle of the simplest law clusters of physical source law" and the like, please refer to references [7-9].

5   Conclusions

In comparative physics, with comparative method, we can discuss the comparative studies between the original law of conservation of energy and the Computer Information Library Clusters; and based on the multiform laws of conservation of energy, the concept of "law clusters of conservation of generalized energy" is presented. In which, any physical quantity can be regarded as "generalized energy", and any physical formula and equation can be transformed into law of conservation, therefore all the physical laws as well as formulas and equations can be classified as "physical law clusters of conservation of generalized energy" (sometimes it can be simplified to "law clusters of conservation of generalized energy"). In order to reduce the number of laws of conservation in the clusters, we can find several source laws, according to the source law, some related laws as well as formulas and equations can be derived, for example, law of gravity and Newton's second law can be derived with law of conservation of energy; thus, "law of conservation of energy" should be considered as a source law, and law of gravity and Newton's second law should be withdrew form "law clusters of conservation of generalized energy" and put into the sub-library of law of conservation of energy; in this way, "law clusters of conservation of generalized energy" can be simplified to "law clusters of physical source law". As the number of source laws in the law clusters is reduced to some degree, all the laws of physics are able to be written on a T-shirt with the form of "the simplest law clusters of physical source law". By extension, we can create "natural science law clusters of conservation of generalized energy", "law clusters of natural science source law", "the simplest law clusters of natural science source law", and so on. In order to facilitate dealing with practical problems, to compare with and refer to "partial and temporary

unified variational principle of natural science so far" proposed in reference [9], the so-called "variational principle of the simplest law clusters of natural science source law" can be presented. If the discussing fields are limited within physics, chemistry, biology, and the like, then we can present "variational principle of the simplest law clusters of physics source law", "variational principle of the simplest law clusters of chemistry source law", "variational principle of the simplest law clusters of biology source law", and the like.

References

1 Fu Yuhua. Expanding Comparative Literature into Comparative Sciences Clusters with Neutrosophy and Quad-stage Method, Neutrosophic Sets and Systems, Vol. 12, 2016, 118~121

2 Fu Yuhua, Creating Generalized and Hybrid Set and Library with Neutrosophy and Quad-stage Method, Chapter 15, Handbook of Research on Generalized and Hybrid Set Structures and Applications for Soft Computing, Sunil Jacob John, IGI Global, 2016, 308~320

3 Fu Yuhua. Computer Information Library Clusters, to be published.

4 Fu Yuhua. Expanding Comparative Literature into Comparative Sciences Clusters with Neutrosophy and Quad-stage Method, Neutrosophic Sets and Systems, Vol. 12, 2016, 118~121

5 Fu Yuhua. Comparative Studies of Laws of Conservation of Mass, Energy, and Electric Charge, and Multiform Laws of Conservation of Energy and the like — No.2 of Comparative Chemistry Series Papers, viXra number: 1612.0327, 2016-12-23

6 Fu Yuhua, Improved Newton's formula of universal gravitation, Ziranzazhi (Nature Journal), 2001(1), 58-59

7 Fu Yuhua, New Newton Mechanics Taking Law of Conservation of Energy as Unique Source Law, Science Journal of Physics, Volume 2015, Article ID sjp-130, 12 Pages, 2015, doi: 10.7237/sjp/130

8 Fu Yuhua. New Newton Mechanics and Related Problems, LAP LAMBERT Academic Publishing, 2016

9 Fu Yuhua. Unified Theory of Natural Science so far and FTL Problems, Proceedings of the First International Conference on Superluminal and Instantaneous Physics, Editor: Florentin Smarandache. Education Publisher, 2014, 58~82