Errors in Nobel Prize for Physics (4)

——There is no Strict Symmetry in Nature

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Abstract: In 1963, 1980 and 2008, the Nobel Prize for physics is related to symmetry principle, violation of symmetry, and broken symmetry respectively. These facts show the following viewpoint: In nature, not only symmetry principles exist, but also violations of symmetry and broken symmetries exist. While this paper presents the following viewpoint: There is no strict symmetry in nature, only approximate symmetry and partial and temporary symmetry can exixt; and for any symmetry, we can find the example of violation of symmetry or broken symmetry. For example, one case for violation of principle of general covariance is the fractal rule, because the fractal distribution is a straight line only in the double logarithmic coordinates. Theoretically, any equation in natural sciences and social sciences is corresponding to a symmetry and the related conserved quantity, and this conserved quantity can be equal to an arbitrary constant. The contradiction and incompatibility between symmetries are also discussed. For example, the incompatibility is existed between the symmetry for law of gravity and the symmetry for general relativity; and the law of conservation of energy generated by time translation symmetry is contradicted with the law of conservation of momentum generated by space translation symmetry and the law of conservation of angular momentum generated by space rotation symmetry. Although the symmetry for law of conservation of energy is only approximately correct, theoretically it could be considered as the unique symmetry in physics that is strictly correct. For other symmetries, they are correct only in the cases that they are not contradicted with this unique symmetry or they can be derived by this unique symmetry.
Key words: Symmetry, violation of symmetry, broken symmetry, symmetry for law of gravity, symmetry for general relativity, contradiction, incompatibility, law of conservation of energy, the only symmetry

Introduction

In 1963, Nobel Prize for physics was awarded partly because "for his contributions to the theory of the atomic nucleus and the elementary particles, particularly through the discovery and application of fundamental symmetry principles." In 1980, the winning topic of Nobel Prize for physics was "for the discovery of violations of fundamental symmetry principles in the decay of neutral K-mesons." In 2008, the reasons for Nobel Prize for physics were "for the discovery of the origin of the broken symmetry which predicts the existence of at least three families of quarks in nature" and "for the discovery of the mechanism of spontaneous broken symmetry in subatomic physics".

These facts show the following viewpoint: In nature, not only symmetry principles exist, but also violations of symmetry and broken symmetries exist. While this paper presents the following viewpoint: There is no strict symmetry in nature, only approximate symmetry and partial and temporary symmetry can exixt; and for any symmetry, we can find the example of violation of symmetry or broken symmetry.

1 Violation of any symmetry

Symmetry for the law of physics means the invariance of the law under the certain condition of transformation. From this invariance, one kind of invariant quantity will be obtained, and it can be named conserved quantity.

According to this definition, for any symmetry, we can find the example of violation of symmetry or broken symmetry.

For establishing general relativity, Einstein proposed that "*All coordinate systems are essentially equivalent for the formulation of the general laws of nature*". This is the so-called principle of general covariance, or principle of general relativity.

There are a lot of counterexamples for principle of general covariance, or principle of general relativity. For example, in reference [1] we presented the following discussion on this issue.

As for the question of principle of relativity (the principle of general covariance), it does not need us to point out, Einstein himself already revised his original viewpoint. In other words, to withdraw a stride from his originally proposed principle of relativity (the principle of general covariance).

In reference [2] Einstein pointed out that, the following statement corresponds to the fundamental idea of the general principle of relativity: *"All Gaussian coordinate systems are essentially equivalent for the formulation of the general laws of nature."*

Here, Einstein already has obviously drawn back a step, from "*All coordinate systems are essentially equivalent for the formulation of the general laws of nature*", drew back to be restricted in "all Gaussian coordinate systems" only.

As for the reason to draw back this step, we cannot find the explanation.

A logical explanation is that the general principle of relativity has encountered the problem.

Moreover, it also has another question: Why has to draw back to "all Gaussian coordinate systems"? We cannot find the explanation also. A logical explanation is that, because the general theory of relativity used the Gaussian coordinate systems, therefore it could not draw back further.

It is difficult to understand that, Einstein already discarded the general principle of relativity, i.e., "*All coordinate systems are essentially equivalent for the formulation of the general laws of nature*" (or similar statement), but at present it still be used in many textbooks!

Here we present an example to show that *all coordinate systems are not essentially equivalent for the formulation of the general laws of nature*.

As well-known, the fractal distribution reads

$$N = \frac{C}{r^D}$$

The fractal distribution is a straight line only in the double logarithmic coordinates. Therefore, if some law of nature conforms to the fractal distribution rule, then the law that "the change of this natural phenomenon conforms to the linear rule" is only correct in the double logarithmic coordinates.

Why does any symmetry will be violated? The essential reason is that there is no absolute truth. Any physical law is only partially and temporarily correct.

2 Symmetry given by Noether's theorem

Noether's theorem states that each continuous symmetry of a physical system implies that some physical property of that system is conserved. Conversely, each conserved quantity has a corresponding symmetry.

Accordingly, we can say that theoretically, any equation in natural sciences and social sciences is corresponding to a symmetry and the related conserved quantity, and this conserved quantity can be equal to an arbitrary constant.

For example, the law of gravity reads

$$F = \frac{GMm}{r^2} \quad (1)$$

It can be written as the form that the conserved quantity is equal to 0

$$f_0(M, m, r) = F - \frac{GMm}{r^2} = 0 \quad (2)$$

Or the form that the conserved quantity is equal to 1

$$f_1(M, m, r) = F - \frac{GMm}{r^2} + 1 = 1 \quad (3)$$

And the form that the conserved quantity is equal to an arbitrary constant A

$$f_A(M, m, r) = F - \frac{GMm}{r^2} + A = A \quad (4)$$

Here, $f_A(M, m, r)$ is the symmetry transformation for law of gravity, the corresponding symmetry is the symmetry for law of gravity, and the related conserved quantity is equal to an arbitrary constant A.

However, generally for the sake of convenience, the arbitrary constant A could be equal to 0, namely the form of Eq.(2) will be applied.

Similarly, we can establish the symmetry transformation for the field equations of general relativity, and the corresponding symmetry is the symmetry for general relativity.

Theoretically, for any equation (or equations) in natural sciences and social sciences, we can do the same operation.

3 Contradiction and incompatibility between symmetries

Now we will present the examples to show the contradiction and incompatibility between symmetries.

For example, the incompatibility is existed between the symmetry for law of gravity and the symmetry for general relativity; this is obvious, because the former does not comply with the principle of general relativity, and the latter complies with the principle of general relativity.

Another example is that the law of conservation of energy generated by time translation symmetry is contradicted with the law of conservation of momentum generated by space translation symmetry and the law of conservation of angular momentum generated by space rotation symmetry.

For this problem, see the discussion in references [3].

4 Theoretically the unique symmetry in physics that is strictly correct

As already noted, there is no strict symmetry in nature, therefore the symmetry for law of conservation of energy cannot be the exception.

The prerequisite of law of conservation of energy is the existance of a closed system, but the strictly closed system does not exist, there are only approximately closed systems. Therefore, the symmetry for law of conservation is only approximately correct.

Although the symmetry for law of conservation of energy is only approximately correct, theoretically it could be considered as the unique symmetry in physics that is strictly correct. For other symmetries, they are correct only in the cases that they are not contradicted with this unique symmetry or they can be derived by this unique symmetry.

In reference [3], the examples deriving the improved Newton's second law and improved law of gravity according to law of conservation of energy are discussed. Namely deriving the symmetry for improved Newton's second law and symmetry for improved law of gravity according to the symmetry for law of conservation of energy.

5 Conclusions

Symmetry is an important concept in physics. this paper presents the following viewpoint: There is no strict symmetry in nature, only approximate symmetry and partial and temporary symmetry can exixt; and for any symmetry, we can find the example of violation of symmetry or broken symmetry. The contradiction and incompatibility between symmetries are also discussed. Finally we point out that, although the symmetry for law of conservation of energy is only approximately correct, theoretically it could be considered as the unique symmetry in physics that is strictly correct. For other symmetries, they are correct only in the cases that they are not contradicted with this unique symmetry or they can be derived by this unique symmetry. Furthermore, for the symmetry for law of conservation of energy, there are many problems to be discussed. These show the great potentiality of the symmetry for law of conservation of energy, and giving full play to the role of the symmetry for law of conservation of energy will completely change the situation of physics. In addition, in a more wide range, the symmetry for law of conservation of energy can be used to deal with all the problems related to energy in physics, astronomy, mechanics, engineering, chemistry, biology, and the like with a unified way.

References

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