Why bodies made of matter obey mathematical laws

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Abstract:

Why bodies obey mathematical laws is a longstanding question in physics. Here I put forth a very simple explanation. Matter is made up of fundamental units having finite non inter-convertible properties, and motion is one of that properties. The former implies that the integration of units into a system is adding up; adding up follows mathematical laws. The latter implies that the system remains changing due to motion; motion obeys mathematical laws, and so the changes in the system obey mathematical laws.

Introduction:

From the very beginning humans started observing nature, they came across some regularities like the alternating days and nights and the positions of celestial bodies; it appeared as if these were obeying some rules. They related these to the handiwork of an omnipotent creator. Still they were able to discover the laws behind some of these. By the time of Newton, the knowledge was so overwhelming that Newton put forth his laws of motion and gravity, which are purely mathematical. But he did not address the problem why bodies obey mathematical laws.

As at present, there are different shades of opinion regarding the role of mathematics. For some, it is just a perception; bodies do not actually follow mathematical laws, we just use mathematics for explaining the situation. For them, mathematics is a tool. Some propose a mathematical universe; our universe is just one among the possible mathematical structures. For some, our understanding itself is a myth, and the relations we find are subjective and creations of our mind.

Whatever it may be, bodies are found to follow mathematical laws. Even after 300 years since Newton formulated the laws, we are unable to get the exact answer for why bodies follow mathematical laws. Here we will try to tackle the question from the reverse direction. What are the requirements for a system to be able to follow mathematical laws? If with that minimum set of conditions, a system invariably follows mathematical laws, then the same conditions can be applied to get a model of the universe, and we can verify whether the model agrees with observations. If it agrees, we can be sure that we got the required answer.

A system that follows mathematical laws:

What are the basic requirements for a physical system to follow mathematical laws? If the system does not change with time, then the question 'what laws it follows' is irrelevant. That is, laws have relevance only in systems that change with time. Whatever be the cause, changes can happen only by way of motion. So in such systems, motion has to be one of the basic properties. Motion is a space- time relation that strictly follows mathematical laws.

In a physical system, integration/disintegration of units also happen, in addition to changes in position, size, shape, etc. caused by motion. Integration is a process of adding up of units and their properties. Both adding up and splitting back follow mathematical laws. However, if any of the properties is infinite, varying or inter-convertible, the result of adding up will be unclear. But, if the fundamental units have finite, non-varying and non inter-convertible properties, these will definitely follow mathematical laws during integration.

If there are many types of fundamental units each having different properties, then it becomes complex, and we will not be able to add up the properties easily. The simplest system that obeys mathematical laws is the one having just a single type of fundamental units having the above mentioned properties. Adding up their properties is like adding up whole numbers, which always yields a finite number. Even if the addition goes on infinitely, at any given time, the result will be finite. That is, the system formed by such units will always be finite.

Thus we get the conditions required to get a simple system that obeys mathematical laws: it should be made up of just one kind of fundamental units having finite, non-varying and non inter-convertible properties, one of that properties being motion. The integration may lead to different types of intermediate units creating a multilevel system. Between the intermediate units the basic properties may be transferred and new properties may emerge, making interactions complex, and predictions difficult. But still the system will be following mathematical laws at all levels, and everything will be finite.

Universe as a system that obeys mathematical laws:

Now we shall incorporate the above conditions in the present picture of the universe to get a model that obeys mathematical laws. Then the universe should be a system made up of a single type of fundamental particles. We know that bodies remain moving, and have mass and volume. So the fundamental particle should have these three properties, and these should be finite, non-varying and non inter-convertible. That is, it should have a finite mass, finite volume and finite speed (motion), and these should be nontransferable to another particle.

Here, motion is a finite property, and the most probable value for speed is 'c', the unique speed of light. Again we know that bodies have force and energy. Both are related to motion. Here, intuition gives a new insight: energy can be motion, and force, reaction to motion. So both energy and force of the fundamental particle are finite and equal to $mc^2/2$. A balance between these two gives stability to structures formed by fundamental particles. A universe made up of such fundamental particles will obey mathematical laws, and will be finite.

Thus at the fundamental level, there are only four properties. These properties add up during integration, and the formation of heavier particles should depend entirely on mathematical feasibility. Here, stability matters, and that involves symmetry and force- energy balance; the symmetry involved being spherical, the mathematical constant π has a major role. With just one type of particles, the model building becomes easy – a simple model that visualizes the formation of electron-positron pairs has been put forth in a previous paper.

As per that model, electron-positron pairs are the building blocks of all large-scale structures. Both energy and force splits equally at that level; the former into speed and internal-energy, and the latter into gravity and electromagnetism. So at higher levels, these act as two independent forces. Electron-positron pairs integrate into neutrons and neutrons change into hydrogen atoms. Heavier atoms are formed from hydrogen. As there are nearly 120 different elements, further integration into molecules is highly complex.

Thus, here on Earth, there are millions of different molecules each having its own emergent properties. The existence of life and our machines becomes possible due to this diversity. The number of players being very large, predictions are rather difficult at this level. But this diversity has no effect on the interaction between Earth and other large objects. In such interactions, the mass only counts, and so the number of players get reduced at higher levels.

At the cosmic level, bodies have different masses and move at different speeds and gravity is the only force present. There are no other emergent properties. So the situation is similar to that of the fundamental level, and model building becomes easy. A model that has already been put forth visualizes a pulsating universe, where the accelerating expansion is due to internal-energy of 'the individual units of the universe' (super-clusters like Laniakea) changing into their speeds. The reverse process causes contraction.

The above model of the universe is in overall agreement with observational evidences. For the past few centuries, through observations and experiments, we have been able to arrive at the laws the universe follows, and the laws are found to be purely mathematical. Why does the universe follow mathematical laws? The answer is clear: it is made up of fundamental particles having finite, non-varying and non inter-convertible properties, motion being one of that properties.

Conclusion:

A physical system made up of a single type of fundamental units having finite, non-variable and non inter-convertible properties and having motion as one of those properties will be finite and, and will obey mathematical laws. Changes in it will be following mathematical laws and these laws can be deduced from observations conducted inside the system.

Bodies in the universe are found to obey mathematical laws and the relevant laws have been deduced from observations and experiments conducted here. This implies that there is the possibility that the universe is a finite system made up of fundamental particles having finite, non-varying and non inter-convertible properties. Mass, volume, and motion are that properties; energy is motion and force, reaction to motion, the finite motion being at speed 'c'.

The resultant model is a pulsating universe, expansion and contraction being thermodynamic changes of internal-energy changing into speed and back. The individual speeds keep the bodies at different levels in the system. Speed and density make them different; some are stars and some are planets containing complex structures like life, the diversity at the atomic and molecular level making these possible. The model is simple and it is expected that everything is explainable based on the fundamental properties and the model.

Thus the long-standing question why bodies in the universe follow mathematical laws remains answered. The crucial difference between the existing model and the proposed model is the way in which motion is viewed; here motion is basic property of matter, and force is reaction to this motion. This new concept solves many of the problems confronted by present-day physics.
