

Three Great Geniuses in the Field of Physics

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Introduction:

There are many great stalwarts in Physics, their contribution to the development of Physics and hence to the well-being and progress of mankind is enormous. Mankind shall ever be grateful to the works of these great Physicists for all times. But this paper examines the best three among them. For a moment if we assume these three great giants were non-existent we would still be living in medieval times in this age of the 21st Century.

These three giants are:

1. Galileo Galilei (1564-1642)
2. Sir Isaac Newton (1642-1721)
3. Sir Albert Einstein (1879-1955)

I am talking of a time span of 400 years, each was born in a different environment and with different settings of discoveries at their point of time, where they had to start their work. It is no doubt that as we go down the ladder in time; the latter was at a greater advantage than its predecessor. But the wonders created by each surpassed these advantages and hence each is considered as a genius in his own way.

Galileo Galilei

He was born in Pisa, Italy in 1564. He was the key figure in the scientific revolution in Europe. He advocated the *Heliocentric* Theory of the Solar system proposed by Copernicus. He said that “size matters”. He advocated the concept of “free fall” and discovered the law of inertia.

Size Matters:

It is awesome to see how in nature’s scaling of area and volume has tremendous impact on the physical characteristics and behaviour of

physical objects (includes very much living beings). Imagine Alice in Wonderland when her size reduces from a few inches to nine feet, how her physical qualities change. When small in dimension she can walk on water, jump many times her height, . As a giant of nine feet she is unable to do the same things. It is all about scaling up or down and bingo you change your physical characteristics from one species to another. Alice of three inches can jump from the Eiffel tower and would still be laughing when she reached the bottom and what about Alice nine feet tall, boom disaster for her! Chances of survival in odd conditions has dramatically changed.

Take a simple formula:

Strength \propto Area and Weight \propto Volume

$$\frac{\text{Strength}}{\text{Volume}} \propto \frac{1}{\text{Length}}$$

This explains it all.

If in the future we could invent a machine (which is quite possible) which will change our size from minimal (to infinitum) to maximal and vice- versa we will be able to understand bacteria and viruses and then learn how to deal with them. The day this happens man may become free from diseases and may be immortality which has been his dream since he came into creation!!! A wild thought but Physics is that way, it predicts and people of the time laugh and call you insane but generations later, they are regarded as a genius. No wonder Galileo Galilei has received unparalleled recognition in the present century than during his time.

Sir Isaac Newton

He was born in England in the year 1642. It was the day Galileo died in Italy, He gave us the “ Laws of Motion, Impulse, Momentum. Feeling of Weightlessness” He is regarded as the “Father of Gravity” His Law of Gravitation: $f = g (m_1 \times m_2 / r^2)$

Nature, and Nature's Laws lay hid in Night.
God said, Let Newton be, and all was Light

Alexander Pope

Law of Gravitation:

Strange but true when one genius died in the same year another genius was born. It was nature at its best when it gave Newton to us. I consider Newton as reincarnation of Galileo, for the works that Galileo could not complete Newton did. Astronomy shall ever be grateful to this great son of mankind. Tomorrow if you can afford and are among the lucky to go to Mars, thank Newton. It is not about an apple falling, it had not fallen for the first time, it had been falling for ages before Newton and even today after Newton, but it fell for it to be eaten. Not that Newton might not have eaten the apple, he surely must have done that though no Scientific Journal talks about that and may be my wildest imagination says he might have thought of 'gravity' only after he had eaten the apple.

Take a simple formula:

$$F = G (M_1 \times M_2 / r^2)$$

The letter 'G' is very important; it is called the Universal Gravitational constant. That is the beauty of Newton, from a simple explanation to why objects on earth fall towards the center of the earth, he universalized the concept and said that the heavenly bodies (Planets, Satellites,) are all bound by Gravitational forces and it is this Gravitational force which keeps them in their desired orbit. Fantastic!!! Two key points he highlighted - Gravitational force exists between two uncharged bodies and it is always an attractive force in the entire universe. The concept of a "black hole" discovered almost 200 years after Newton is a fantastic tribute to this great giant. A black hole is an entity (body) such that anything inside it never escapes not even light, so when you look inside a black hole (if at all that is possible) we cannot see any events occurring inside the black hole since even light

cannot escape from a black hole. Things away from the black hole are as normal. If the Sun collapsed to form a black hole, the orbits of the planets would be unaffected. Can earth ever become a black hole?

Sir Albert Einstein

He gave us the concept of the fourth dimension. Mass is relative, as an object moves it becomes heavy. Light has no weight, it is not continuous, and it is made up of photons. Photons are never at rest. They have no mass, only energy. **The highest speed in the universe is the speed of light.** Newton **could not** explain the concept of Gravity, it was explained by Einstein. He also gave us the concept of the 'black hole'.

Concept of Gravity and Light

It is true that Sir Isaac Newton discovered gravity but could not explain how gravity works. For almost 200 years scientists did not dare question Newton about how gravity works because they were mesmerized by his discoveries, but Newton knew one thing and that was, he did not know how gravity works. Imagine one fine day if the Sun evaporates, Newton believed that the planets would instantly move away from their orbits and wander in space. Albert Einstein at the age of 26, was working on properties of light and came to the conclusion that the highest speed in the Universe is the speed of light. Nothing in the Universe can travel faster than the speed of light. It takes 8 minutes for sunlight to reach the earth's surface covering a distance of approximately 150 million km. So there is no question that gravity would disappear instantaneously as thought by Newton, because gravity cannot travel faster than light.

So Einstein laid the foundation of the 'space time' concept, where space is three dimensional and time being the fourth dimension. When the heavenly bodies did not exist the 'space time' geometry was like that of a surface, straight with no curvature. When we bring in the Sun, it creates a curvature in the network of space time and then due

to this curvature heavenly bodies (like planets) starts moving along the curvature and follows their path in orbit. This is gravity. So when one fine day when the Sun will evaporate completely this curvature will slowly unfold just like ripples on the surface of water in a pond when a small pebble is dropped in it. This ripple travels with the speed of light and when it reaches the earth after 8 minutes after the Sun has evaporated the earth will then move away from its orbit and wanders in space. This is indeed a mark of supreme genius.

Mass is not constant and time slows with speed

Einstein showed that mass is not a constant but increases with speed of the body; a striking contradiction to Newton's concept who thought that mass was always constant. Another brilliance of Einstein was his concept of time. He said time is not constant, it slows with speed. Scientists of different countries have proved this fact by the use of atomic clocks, one situated on earth and the other in an aircraft taken over different places. He found that the clock in motion runs slower as compared to the one at rest, relative to the earth.

This conclusively led to Einstein to formulate his theory that, "***Time is an Illusion: Past, Present and Future all exist together***".

Finally time is assumed to be unidirectional and it appears to be flowing like a river always forward. We talk about "Time's arrow". But is it true? Can we go back in time? According to Physics there is no reason why time should not go back. All equations suggest so. Even Einstein equations about time say so. It is possible to go into the future, nature allows it. Why is it that the same nature does not allow us to go back? For this we have to go to the beginning of time - the BIG BANG!!! That is the starting of time, before that nothing existed. At the BIG BANG everything was ordered and there existed an absolute perfect order of things. After the BIG BANG everything blew up and became chaotic and random. With passage of time this randomness is ever increasing, that is entropy is ever increasing, it simply means that the Universe is expanding and disintegrating, adding

to randomness. That is nature is moving towards expansion and disorientation and going back means adding order to randomness which nature will not allow at any cost. So time cannot be reversed? Presently yes, but if we can force a tunnel between two time events then as predicted by Einstein's Theory of Relativity we can move behind in time and may meet and enjoy with our forefathers. Till that time comes we will move forward in time and look to the future and not to the past, for the elders say you cannot change your past but you can change your future, although Einstein and I don't fully agree with that!!!

Conclusion:

In this presentation I have put scientific facts before you, theoretically suggested and experimentally proven. I have also demonstrated certain concepts related with gravity, the black hole and time. The three great giants of Physics Galileo Galilei, Sir Isaac Newton and Sir Albert Einstein have revealed many secrets of nature and have shown that laws of nature can not only be known, but can be used to predict the future if complete information was available about the present state of light and matter.

I conclude the presentation with an open-ended question:

No Physicist has ever "seen" an electron, yet all Physicists believe in the existence of electrons.

An intelligent but superstitious man advances his analogy to argue that 'ghosts' exist even though no one has seen one.

How would you refute his argument?

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