

# Albert Einstein and the Great Paradox of Modern Science.

## How he fought against "the Dice playing God" of Physics.

by K. N. Dastoor

(15th March 1979, was the 100th birthday of Einstein. 18th April 1979 was his 24th death anniversary. In this article, the author gives you a faint idea of what Einstein found... and where and why he failed. To state the moral of the story first, it is just not possible for modern science to understand nature, which extends far beyond our limited senses and sciences.)

A hundred years back, in a German town on the left bank of the river Danube, Pauline, the wife of Hermann Einstein, gave birth to a son, who was destined to revolutionise Physics of the 20th Century. The date was 15th March 1879, the name of the town was Ulm, and the boy was named Albert.

76 years thereafter, at 1.25 a.m. on 18th April 1955, in a hospital at Princeton, U.S.A. Albert Einstein, now a legendary figure of the Century, muttered several words in German, which the midnight Nurse Alberta Rozsel, the only one present, did not understand. Nobody knows what were those last words. A great human genius was gone.

Of the fact that Einstein had become a legend in his own life time, there can be no better proof than a letter received by him from a British Colum-

bia school girl, "I am writing to you to find out whether you really exist", the letter stated. (1)

And yet what did he think about himself? Once a tactless visitor asked him, "How on your death bed would you answer the question whether your life was successful or in vain?"

"I would not be interested in such a question either on my death bed or at any other time. **After all I am only a tiny particle of nature.**" That was Einstein's reply! (1)

That is Humility at its spiritual height... the virtue, the "havrashta", of Spenta Armaiti....

And when in 1916, he was seriously ill, Mrs. Born (the wife of his famous scientist friend Max Born) found him in such a detached and tranquil mood on the sick bed that she was emboldened to ask him whether he feared death.

"No," came a serene and sincere reply, **"I feel myself so much a part of everything living, that I am not in the least concerned with the beginning or termination of the concrete existence of any person in this eternal flow."** (1)

Was this a scientist speaking, or a Saint?

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**Some Glimpses from Einstein's Theories.**

To common people some of Einstein's discoveries in Physics are now well known. His first Nobel Prize winning theory was based on the proposition that the physical light, which we experience, consists not of waves but of bundles of energy. His special theory of relativity declared that the velocity of that light was constant and unchangable in any part of the universe. No material body can travel with a speed greater than that of light. If you travel in a space ship with a speed approaching that of light, and somebody can observe you standing on the earth, he would find that the foot rule in your ship appears smaller than the one in his hand and your watch runs slower than the one on his wrist; time would pass more slowly than on the earth and if you return to earth say after 5 years, the period that passed on earth would be 10 years. (2) If you travel like this for still longer times, you may on arrival on the earth find yourself younger than your grand-daughter! (3)

Any piece of matter is convertible to energy and the conversion has something to do with the speed of light.  $E = m \times c \times c$  is the famous equation of Einstein. It means, the amount of energy contained in a piece of matter having a mass of  $m$  grams is equal to  $m$  multiplied by the square of the velocity of light (symbolised as  $c$ .) Velocity of light is 30,000,000,000 centi metres per second and its square is 900,000,000,000,000,000,000; that figure with 9 followed by 20 zeros shows the amount of energy in one gram of matter! And it also indicates how an atom bomb of the size of a golf ball dropped on Hiro-

shima at 8-15 on the morning of 6th August 1945 could destroy an area of 4.7 square mile, annihilate or burn away 62,000 houses out of 75,000, kill 78,150 human beings, render 13,983 missing, injure 37,424 and otherwise afflict 2,35,656. (4) But before the mother earth experienced this gigantic killing of man by man, many bewildering events had occurred in the field of physics on the one hand and in the great mind and heart of Einstein on the other.

The startling discoveries and theories outlined above were presented by Einstein before he was 30!

In 1913-16 Einstein came forward with his **general theory of relativity**. We live in a universe which seems to extend in three dimensions of SPACE namely length, breadth and height. But TIME is also an essential ingredient of our experience. Our universe is therefore a four dimensional, space-time continuum. Gravitation was not due to any force of attraction exerted by two material bodies on each other as Newton theorised. It was due to a **curvature** caused in the space-time continuum by the presence of matter... It was a field....

One important element of Einstein's theory was verified and confirmed by certain astronomical observations in 1919. That made him a legend in his own life time.

### **But... The tragedy!**

But during the very period his fame reached its zenith, and by the very method of thinking he introduced in physics, a tragedy was taking shape. That was not the well known tragedy

of Einstein's equation  $E = mc^2$  leading to the atom bomb. It was something quite different. Not much is known about it amongst people outside the field of science. It was an intellectual tragedy for Einstein and the last warning to the humans on this earth that it was not possible for their science to understand nature. I'll now tell you how this happened.

When Einstein proved that light consisted of bundles (or bullets or quanta) of energy, physics was baffled. There were convincing experiments to show that light consisted of waves; but some other experiments showed, equally convincing that light was made up of particles of energy. How can one thing be a particle and a wave? A wave spreads out, like the waves generated when you throw a stone in a calm pond of water. It is a continuous spread out. But a stream of particles is a discontinuous flow. Bullets are fired out one after the other and each is separated from the other. What sort of thing this light is which behaves like a continuous and discontinuous entity both? A real dilemma — let us call it wave particle dilemma!

### The Dual Dilemma.

But something more startling was yet to come. You may have a vague notion that in the inside of any atom some elementary particles are whirling. They are known as electrons, protons, neutrons. Electrons is very very small. If you want to write its diameter in cms you will have to write about 15 zeros after the decimal point. But then what does it matter? Just as a golf ball has a sizable diameter and

our earth has a fat diameter, electron can be a tiny tiny goody goody particle, round and solid, with a very very small diameter. No difficulty in imagining it. But there was a catch somewhere. A brilliant young French physicist Louis De Broglie came out with the theory that **electron has wave properties!**

Now! Now! Once again that wave-particle dilemma? This time it is particle-wave dilemma! Here is a thing well conceived as a tiny particle suddenly behaving like a wave!

Science set out to find a solution, an explanation, of this continuously discontinuous behaviour of light and discontinuously continuous behaviour of electron. It was a highly intellectual and imaginative journey. It is not possible for a non-physicist to understand and appreciate the journey. But I shall give you some hazy idea.

Let us have a thought—experiment. The only apparatus required are your brain, (assuming that it is the brain which thinks), some imagination (if you know what that means), some time (to set and think—you can even stand or lie down) and perhaps aspirin at the end.

Let us imagine that the tiny particle electron is somewhere in a dark box and you want to see it. Now how do you see a thing? Only by throwing light on it. But what is light? A wave and a particle both! But let us imagine that for our experiment it is behaving as a particle of energy. So you throw a particle of light on the electron to see it. But electron is very very light; it is about 200 times lighter than the lightest atom (that of hydrogen); and the

energy-particle of light has enough energy to displace the electron.

This means that no sooner you throw a particle of light on the electron to see what it is doing or how does it look like, it is pushed away! You push it away in your very act of trying to see it! That means you will never be able to 'see' the electron fully and completely. The push of the light-quantum makes it hazy and disturbed. **That is why perhaps the electron is seen to behave like a wave!**

But such 'perhaps' won't do in science. What does all this mean? Solution! Solution! I want a solution, cries physics. And scientists made themselves busy in writing out mathematics to follow up the wave particle dilemma and the disturbance an electron suffered in the very act of observation. They did arrive at a 'solution', if you can call it one.

#### **Solution worse than the Problem!**

What was it? It declared pompously that there was only one conclusion that can explain the dilemma. If the universe as we see and experience with our senses is the only and the whole universe and there are in it no mystic regions defying our observation, direct or indirect, then the behaviour of an electron reveals that **there is nothing like cause and effect in nature!!**

What is that?.....That is modern physics! You may think that every event (or effect) has a cause. Nothing can happen without a cause behind it. What is science after all? Knowledge of causes behind the observed events! And now this very material science of

matter, namely physics, in spite of its a-bombs and h-bombs, tells us that there is no cause for anything!! Then why do events happen? Why do things exist? Why? And 'why' means "I demand a cause."

You are right! Very right in asking these questions.' But physics answers grimly: sorry! no cause! An event happens not because it has a cause, but because it is very **probable** that it should happen! Or it is highly **improbable** that it should **not** happen! A thing exists because the **statistical probability** of its existence is larger than its non-existence! (You can use your aspirin here).

'**Statistical**', you said? Universe is statistics merely? Like you toss a coin and 'king' or 'scale' falls by **chance**, or you toss a dice and it falls on any figure from 1 to 6 by chance! Is that the universe we live in?

Physics again says, apologetically and even sorrowfully, "Yes, that is our universe, with everything being there or going there by chance, probability, statistics. . . . There is no cause, no 'objective existence' . . . . ."

Are your religious instincts in thunderous revolt against this "discovery" of physics? Then you are not alone. Here is somebody else speaking to that physics.

**"You believe in the dice playing God and I in the perfect rule of law in a world of something objectively existing." (5)**

That's right! Who said it?  
Albert Einstein!!

But the tragedy was that his was a voice in wilderness! Physics said that

this statistical interpretation of nature was inevitable. You simply can't avoid it. There is no rule of law in nature. "I'll find it out" thought Einstein and employed the best part of his life to find it out...but failed. And that was the tragedy. And it was intensified by the fact that in the final analysis it was Einstein's own theory that led to these bewildering conclusions! That bullet of energy was his own discovery.

When Einstein refused to believe in this **hazy** interpretation of nature, it was pointed out to him that he, a revolutionary in science, was now becoming a fanatic orthodox. (These seem to be Parsi terminologies),

"The fashion you speak of was invented by you in 1905," somebody told him.

"A good joke should not be repeated too often", Einstein replied. (6)

He wrote to Solovine, his friend, in 1950:

"From the point of view of **direct experience** exact determinism does not exist. On this we are in complete accord. The question is whether or not a description of nature **should be deterministic**. There is also the particular question of whether it is possible to form a conceptual image of individual objects which would in principle **exclude statistical interpretation.**" (1)

By determinism, he means cause and effect. There is none, if we go by our **direct experience**. This means, if the universe we experience is the **only and whole** universe, then physics has

proved that there is no cause and effect! But if we are aware of the great Truth taught by all Religions that there are unknown and unknowable components in nature, then wait till the Inner Light Shines and you will find the creator of all causes and effects. That Inner Light will not disturb nature in the act of observation. But Einstein was a scientist and not a mystic. He wanted to find out the inner law by the methods of science and that is why he found himself a lonely figure thrown out of the mainstream of science.

**"I can imagine that God created a world without any laws of nature. A chaos, in short. But the notion that statistical laws are final and that God draws lots is highly unsympathetic to me." (1)**

But science did not care for his lack of sympathy. And the soul of this greatest mathematician struggled for decades to find out the ultimate law behind the universe, and failed.

And in his failure lies the failure of modern science to understand nature.

Why have Einstein and Science failed? The reason is obvious. The universe they studied was not the

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### THY MUSIC!

The light of thy music illumines the world. The life breath of thy music runs from sky to sky. The holy stream of thy music breaks through all stony obstacles and rushes on.

My heart longs to join in thy song, but vainly struggles for a voice.

— Tagore.

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### HOPE TO SEE MY PILOT

Twilight and evening bell  
And after that the dark!  
And may there be no sadness or  
farewell

When I embark :  
For tho' from out our bourne of Time  
and place

The flood may bear me far,  
I hope to see my Pilot face to face  
When I have crost the bar.

— Tennyson

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whole! There are regions beyond the experience of ordinary humans. Prophets came to declare this Truth. But science ignored it. And see the plight! On the one hand, it found out a dice playing universe, and on the other hand, it conferred on man of this earth tremendous power to annihilate himself and all life within 30 minutes!

#### References :

(1) All quotations marked (1) are from "Einstein" by B. Kuzentsov — Progress publishers, Moscow (1965).

(2) For a non-Technical exposition of Einstein's theories, I recommend two books: "Universe and Dr. Einstein" by Lincon Barnett (a journalist) and "A B C of Relativity" by Bertrand Russel (the famous philosopher). (Signet)

(3) This idea is beautifully developed by George Gamow in his "Mr. Tempkins in Wonderland" Cambridge 1957.

(4) "Nuclear Explosions" — Publication Division Govt. of India (1956—1958).

(5) From Einstein's letter to Max Born (1944).

(6) Conversation with Philip Frank in Berlin (1932).