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THE KNOWN FORCES OF NATURE AND THE CONCEPT OF GOD

THE MEANING OF NATURE

The term 'Nature' signifies the Universe with all its phenomena and, more precisely, it is the sum-total of the forces at work throughout the Universe—known and unknown. The word 'nature' may also mean the power underlying all phenomena in the material world. Science has helped us to investigate and penetrate into the vast realms of the Universe. Scientific knowledge has contributed a lot to the understanding of Nature and all the phenomena occurring in it, such as awful thundering of clouds, terrifying lightning in the sky, sudden eruptions of volcanos, catastrophic earthquakes, severe blowing of winds, storms and hurricanes, fierce devastating floods,, raging streams with their proud swelling waves, cruelty of storms in the sea, changes in the weather and drifting of continents etc. Today-scientists are of the opinion that all such phenomena are controlled by forces of nature.

Before the days of science the primitive man must have been impressed by what we have called the forces of nature and it is impossible for us to imagine what primitive man thought of these forces. He called them the 'intentions' of some powers or called them the work of spirits or demons. He was afraid of these powers, therefore he started praising and worshipping them. When he entered his spiritual kingdom, he recognized only one power, that is God and stopped worshipping various powers of the world. When as he got the vision of God, in the light of this he looked on nature with

great appreciation—sometimes full of joy and delight. Nature spoke to him and the echo in his heart was that of God. He had passed beyond being afraid of noises. “God is in His Heaven, all is right with the world.” He found a sort of relief and contentment in his belief in God and praised Him as is given in the following verses of a Salm:

God letteth us see His wonders;
Great things beyond knowledge He doeth
For He saith to the snow, ‘Fall earthwards;
Likewise to His strong rushing rain.

By the breath of God ice is given,
The broad waters lie in constraint.
Yes, He ladeth the thick cloud with hail,
And the cloud doth scatter His lightning.
This way and that way it darteth,
Turning about by His guidance.
Doing whate’er He commands it
Over the face of His world,
Whether for curse and correction
Or in mercy He sendeth it forth

The heavens declare the glory of God,
The earth showeth forth His handiwork,
Day unto day welletth forth speech,
Night unto night breatheth out knowledge.
There is no speech, and there are no words,
But their voice reverberates thourgh all the earth.

Before I embark upon the discussion relating to the concept of God, I would like to introduce the concept of Force to the readers.

MEANING OF FORCE:

All our actions and life processes are related to, and governed by, forces, whether we are directly aware of this or not. Whether we sit down, rise from a chair, walk across the room, raise our arms or wink our eyes,

we are exerting forces on something or having forces exerted on us. Many internal bodily function, flow of blood, breathing, digestion are also caused by forces although under ordinary conditions we are not aware of them.

Science defines force as push or pull exerted by one body or collection of bodies on another. Forces give rise to structures such as: galaxies, stars, solar systems, planets, mountains, rocks, molecules, atoms and nuclei etc. Forces exist between these structures and have also arranged them in this vast universe. The existence of forces, therefore, means the existence of structures and vice-versa.

The great variety of structures that are everywhere present might be thought to imply that there are many different forces present in nature. Before Prof. Abdus Salam's unified theory' there were FOUR known forces of nature. governing all the phenomena of the universe; gravity, electromagnetism, nuclear force and the weak force or weak interactions. In this article, keeping the interest of general readers, weak force will also be discussed, but Prof. Abdus Salam succeeded in his researches and put forwarded the unified theory in 1967 that the weak force and electromagnetism can be explained as two aspects of the same force. He has been awarded Nobel Prize for 1979 for his work in the 'unified theory'.

"What are these natural forces which govern the universe" and what is the significance and implication of these forces, I understand scientists especially physicists are aware of the full meanings of these natural forces or natural laws. However, attempt has been made here to give a clear concept of the known forces of nature. so that a layman can also understand them.

THE KNOWN FORCES OF NATURE

1. GRAVITY

Isaac Newton (1642—1727) — an astronomer, mathematician and a self-styled philosopher, whose only rival in science is Albert Einstein, was the first scientist to surmise that every particle of matter in the universe interacts with every other particle via the force of gravity. He discovered that not only the motion of a falling apple but also the motions of all the planets around the Sun can be understood in terms of this force. Newton's great achievement was his discovery of the physical characteristics of the force of gravity which he formulated as a mathematical law for two particles pulling upon each other. The law of gravity is that force between two particles depends directly on the product of the masses of the particles and inversely as the square of the distance between them. So this law involves mass and distance, which are both physical quantities. Newton showed that distance between two particles reduces the gravitational force by a factor of 4, tripling the distance reduces the force by a factor of 9, quadrupling the distance reduces the force by a factor of 16 and so on.

Daily experience shows that the gravitational force between two ordinary bodies, even if they are very close to each other is extremely weak. The human body experiences no gravitational pull toward the most massive buildings even when it passes very close to them, but we detect this gravitational force exerted on us by the Earth, because the Earth is so very massive. The mass of the Earth is found to be 5000 million million million tons. This force exerted on us by the Earth is referred to as weight and may be calculated in pounds. One pound is the force that the muscles exert when one lifts up about four apples of average size. In

calculations involving forces, scientists use a unit of force called "the dyne", which is about 450,000 times smaller than the pound. Although the gravitational pull between the ordinary object surrounding man is extremely small— sometimes negligible — it is enormous between massive bodies like the Sun and the planets. involving forces, scientists use a unit of force called "the dyne", which is about 450, 000 times smaller than the pound. Although the gravitational pull between the ordinary objects surrounding man is extremely small — sometimes negligible — it is enormous between massive bodies like the Sun and the planets. Earth is 93 million miles away from the Sun, but the gravitational pull of the Sun on the Earth is about 6 billion trillion pounds. During space flights astronauts experienced "weightlessness", does not mean that there is no force of gravity acting on them in their spacecraft. It simply means that astronaut is free fall under the force of gravity. All the objects in a spacecraft become weightless when the spacecraft is falling freely in a vacuum, because everything in the spacecraft falls as the craft does. The great importance of this phenomenon was not realised until the German theoretical physicist Albert Einstein (1879 — 1955) made it the basis of his general theory of relativity.

The outstanding feature of the force of gravity is that nothing can be shielded against it. In other words, there is no anti-gravity material. It also acts on energy (light and radiation). Force of gravity acts on matter and it affects space and time; time slows down as a result of gravitational force and space is warped, which means that the geometry which describes it is non-Euclidean.

Gravitational force is present in the universe not because it is strong but because it is quite weak force; but it is all-pervasive because it had to organize the original chaotic matter of the universe into such vast

structures as stars, planets, solar systems, galaxies long before other forces could come into play. It means weak forces give rise to large or massive structures and strong forces to small structures.

2. ELECTROMAGNETISM.

Gravitational force is always present between any two bodies, but electromagnetic force is produced when there is an electric charge present on a body and, therefore, is present between two bodies only when both bodies are electrically charged. Under normal circumstances the objects that we live with are electrically neutral or uncharged so that there are no electrical forces between them. From our school physics, we know two bodies can be charged electrically by rubbing the soles of our shoes across a rug so that when we touch the metallic knob of our door, for example, the electric charge leaves us very quickly in the form of a spark. Similarly, on a stormy day, clouds, by rubbing each other, become electrically charged and when they discharge themselves to the Earth, lightning is produced. All such phenomena are the results of electromagnetic force.

There are two types of charge present in nature — the negative charge and the positive charge. These two charges will attract or repel each other depending on whether they are like or unlike charges. Equal quantities of positive and negative charges on a body make it electrically neutral. When a piece of amber is rubbed with some fur, some of the negative charge is rubbed off the fur on to the amber leaving a slight excess of negative charge on the amber and an equal excess of positive charge on the fur. This excess charge on the amber attracts objects like small pieces of paper to it. An electric current is obtained when one end of a metal is negatively charged and the other end is positively charged. The positive charged pulls the

negative charge, thus creating a flow of electric charge which we call an electric current. The electric batteries in our cars are devices that separate positive and negative charges chemically and concentrate these charges on two different metallic terminals called the positive and negative poles. When an electric current is flowing in a coil of wire, magnetic field is produced. It simply means when charges are in motion, magnetic field is produced. And when a magnet is moved past a coil of wire, the electric charges move in the coil, so that a current is produced. To sum up this discussion, when electric charges are in motion, magnetic field is produced so that electric and magnetic fields of forces exist at the same time and hence the term "the electromagnetic force", which means, electricity and magnetism are intimately related to each other. To make it more simple for our readers we can say electricity plus motion gives magnetism and magnetism plus motion gives electricity and this is the basis of Electromagnetic Technology. Names of well-known Danish Physicist Hans Christian Oersted (1777—1851) and British Physicist Michael Faraday (1791—1867) are associated with such interesting discoveries.

From the discoveries of Oersted and Faraday, the great Scottish mathematical Physicist James Clerk Maxwell (1831—1879) proved mathematically that electromagnetic field can be made to move out into space with the speed of light 1,86,000 miles per second in the form of a wave consisting of a rapidly oscillating electric field and a rapidly oscillating magnetic field. Such a moving electromagnetic force field will cause any electric charges or magnets that it encounters to oscillate in unison with the original oscillating charge that sets up the electromagnetic wave. When a radio or television set is turned on the electric circuitry in the set is arranged to oscillate electric charges in the radio or television stations. Whenever we see an object on the

television, the electric charges on the retinas of our eyes respond to the electromagnetic force fields that are generated by the oscillating charges in that object. The complexity of the electromagnetic force field gives to a wonderful variety of phenomena. All life processes thinking, digestion, muscular responses, growth, sexual responses all chemical and all optical phenomena arise from this force. The force that is responsible for the structure of atom is the electromagnetic force which is enormously stronger than the gravitational force between the electrons and the nucleus of the atom.

3. NUCLEAR FORCE

We are all familiar now that an atom consists of three basic particles, protons (positive charges) and neutrons (neutral charges) concentrated in the nucleus and electrons (negative charges) revolving around the nucleus like the planets around the Sun. The electromagnetic force, discussed above, keeps an atom together in the sense that it keeps the electrons revolving around the nucleus of the atom, but it is the nuclear force that keeps the nucleus together. The protons in the nucleus are very close to each other, and all being positively charged, would be blown apart by the mutual repulsion of these protons if there were not some other extremely strong attractive force holding them together.

The early atomic bombs got their explosive power due to the electric repulsion of the protons present in the uranium nucleus. From 1911 to 1932 one of the most challenging questions, that faced physicists was 'what keeps the nucleus of an atom exploding?' The answer came in 1932 with the discovery of neutron, an electrically neutral particle, heavier than proton and residing inside the nucleus of an atom. The experiments conducted in this connection demonstrated existence of a very strong force present between all nuclear particles

and many times stronger than the force of repulsion between the protons in the nucleus. The range of this force is very small as compared to the ranges of the two forces discussed above.

Due to the extremely short range of the nuclear force, the nuclei of atoms are not affected unless they come very close to each other. Only when nuclei of atoms get very close to each other they attract each other and coalesce to form heavier nuclei, Matter is ordinarily extremely stable, but this stability is upset by free neutrons, that is those not bound in the nucleus. A neutron can thus get very close to a nucleus and be dragged into it by the nuclear force; thus the equilibrium inside the nucleus is disturbed and it may become radio-active (emit charged particles) or may change into another nucleus. When a free neutron enters a uranium or plutonium nucleus, fission (splitting) of the nucleus takes place to produce an atomic bomb. Fortunately for life on earth, free neutrons are quite rare, because they are unstable and if left free are changed into a proton, an electron or neutrino (another particle) in about half an hour, thus accumulation of free neutrons is not possible. If this were not so, vast number of neutrons would surround man and would alter the chemical elements present in his body by entering the nuclei of his atoms. The resultant radioactivity of these nuclei would then destroy his body cells. That is why a neutron bomb (an atom bomb) is very very dangerous to all living things. Neutrons are quite mysterious, electrically neutral particles and travel at the speed of light and are present every where in the universe. Because they are neutral, they can easily pass through the earth, the planets and the stars.

4. WEAK FORCE (WEAK INTERACTIONS)

Before the discovery of Prof. Abdus Salam's unified theory and the researches of two Americans, who shared Nobel Prize with him, weak force was considered the fourth force of nature. This was a more mysterious force for the physicists than the other forces of nature. The weak force is known to be operative between protons, electrons and neutrons and is considered responsible for those very rare situations in which a proton, an electron and a neutrino come together to form a neutron.

For many years theorists have tried to unify these forces—that is, they have tried to describe the forces with a single mathematical law. As discussed before, a century ago James Clerk Maxwell showed that the electric force and magnetic force were really the same effect, and now we count them as a single electromagnetic force. About 20 years ago theorists succeeded in identifying the electromagnetic force and the weak force in what they called the electroweak force, effective only for processes at very high energy. At lower energies, the electromagnetic force and the weak force behave differently. The theorists have found ways of unifying the electroweak force and the strong force at even higher energies. Now it has been demonstrated that electromagnetic force and this weak force (electroweak) are the facets of the same phenomena and thus the puzzling mystery of this force has been solved and as a result of it the four known forces are reduced to three only. These new theories are called Grand Unified Theories or GUTs.

AN EXAMPLE

Studies of GUTs suggest that the universe expanded and cooled until about 10^{-35} seconds after the Big Bang at which time it became so cool that the

forces of nature began to separate from each other. This released tremendous amounts of energy, which suddenly inflated the universe by a factor between 10^{20} and 10^{30} . At that time the part of the universe that we can see now, the entire observable universe, was no larger than the volume of an atom but it suddenly inflated to the volume of a cherry pit and then continued its slower expansion to its present extent. (Remember that we are speaking of the observable universe which is finite and not the entire universe which may be infinite). When the universe was very young and hot the four forces of nature were indistinguishable. As the universe began to expand and cool, these forces were separated and triggered a sudden inflation in the size of the universe.

Scientists are further trying hard to reduce all these forces to one UNIVERSAL FORCE only, which they call an eventual UNITY, governing all the phenomena occurring in nature.

From the foregoing discussion it is clear that each of these forces is dominant in a different domain. The nuclear force dominates the nucleus of an atom, but plays hardly any role in the structure of the outer part of the atom or in the structure of the solar systems; the electromagnetic force is dominant between the nucleus and electrons of atoms and between atoms in a molecule, but is relatively unimportant in the nuclei of atoms or in the motions of the planets; the gravitational force governs the motions of planets and stars, but appears quite unimportant inside the atom or in the nucleus.

THE CONCEPT OF GOD

The Scientific View:

Is God synthesis of these forces? 'If physicists are successful to reduce all the forces of nature into ONE universal force (or universal law), Will that be our God

or Allah to Whom mankind has been worshipping since time immemorial is the question, which has created doubts and misunderstanding in the religious mind. The answer is No. These forces or scientific laws simply help us to understand nature. The relation of God to His world is plainly far beyond man's apprehension. It seems on the wrong road to think of God as a synthesis of all the world forces. These forces are created by God and are the work of His hands and they are not left unfinished. The investigations of science lead us to recognise an immanent order in the world or the universe, that there is unity, continuity and a kind of progressiveness.

The attributes of a force are that it is blind, dumb, deaf and brutal and devoid of mind or intellect. On the other hand there are many attributes of God, as we know from the Holy Quran, and some of these attributes are that God is the knower of the unseen and the visible. He is not blind, dumb and deaf. He is the All-merciful, the All-compassionate, the All-holy, the All-peaceable, the All-faithful, the All-reserver, the All-mighty, the All-compeller, the All-sublime. He is the Beneficial. He is the Creator, the Maker and the Shaper. He is Omnipotent, Omniscient and Omnipresent. He is the All-wise. How then a physical force can possess these attributes unless the scientists define it in terms of these attributes, which at present is a remote possibility. The Quran has clearly referred to His attributes (beautiful names) in Surah-al-Araf ayat 180. The translation is given below.

The most beautiful names
 belong to Allah
 So call on Him by them;
 But shun such men as
 use profanity in His names;
 For what they do, they will
 soon be required. (7:180)

As we contemplate Allah's nature, we can use the most beautiful names we can think of to express His attributes. There are hundreds of such attributes. In the opening surah of the Quran, we have these indicated in a few comprehensive words, such as Rehman (most Gracious), Rahim (most Merciful), Rabb-al-amin (Cherisher and Sustainer of the worlds), Our bringing such names to remembrance is part of our Prayer and Praise. But we must not associate with people who use Allah's names profanely, so as to suggest anything derogatory to His dignity or His unit. Again in surah al-Isra, ayat 110, there is reference of His beautiful names. The translation is given below:-

Say: Call upon Allah or
 Call upon Rehman:
 By whatever name ye call
 Upon Him (it is will):
 For to Him belong
 The Most Beautiful Names.
 Neither speak it in a low tone
 But seek a middle course
 between (17:110)

These beautiful names of Allah are many. The hadith related by Tirmidhi accepted by some as authentic, mentions 99 names (attributes) of Allah.

Limitations of Science

The forces of nature discussed above are expressed as laws, which are shorthand descriptive formulae, summing up the routine of our experience. These laws of nature are regarded as sufficient in themselves to govern the universe but, they may err in the interpretations of certain things. Science seeks to give a full account of things, but that is, in many cases, impossible. For example, these laws have disappointed the scientific mind about the concept of God; that is they

tell nothing about God. The data of science cannot furnish a basis for the metaphysical evidence that there is a God. They may however, suggest the belief and strengthen it. If God exists at all, He is the God of all nature and of every natural law. There are not gaps in His Activity. Nature is an activity of His and every natural law is a principle of that activity.

God is not the sum-total of the forces of the Universe. These are only physical forces and measurable. The sum-total of all the physical forces in the Universe is still only a physical Force — a measurable force not an infinite God. It is believed that the various forms under which the forces of nature are made have one common origin. The creation is the work of His hands. Universe may be finite but there cannot be Finite God. God is "the source and home of the whole order of the world" but we see no particular value in the idea of a God, who is the sum-total of the forces of the universe. The relation of God to the universe must be far beyond our comprehension—we cannot even think clearly of the relation between our mind and our body.

Science is the torch for the modern man and illuminates his mind and may strengthen his belief or may be an aid to his belief in religion. But we cannot, by scientific searching, find out God. Science is impersonal and unemotional. We cannot draw a transcendent inference from concrete data in regard to nature. It is not possible for science to make us proceed from nature to the God of nature.

Science has disappointed the scientific mind regarding the concept of God but its investigations lead us to recognise an immanent order in the world. There is unity, simplicity, continuity and kind of progressiveness. The scientific picture of things as they are, becomes

more and more congruent with our conception of God and may even enhance it.

The highest religious concept is that of God -- the Creator of the universe and the creative source of all evolutions, the Divine Spirit that animates all. This thought has been revealed to us by religion. Even the most modern scientific theories as such have nothing to say above this highest of all concepts. The idea of God is simply outside the scientific universe of discourse.

In Islam, Quran is the book of religious guidance for living our daily lives in accordance with the will of God but it also serves to induct us into the belief in God by inviting us to observe and to contemplate over the various phenomena occurring in the Universe — the handiwork of God. That is, Quran guides us to understand the Creator by studying the wonders of His Creation. In surah ali-Imran (3) ayat 191, this guidance is given:

Men who celebrate
 The praises of Allah
 Standing, sitting and lying down on their sides,
 And contemplate
 The (Wonders of) creation
 In the heavens and the earth,
 (with the thought),
 "Our Lord! not for naught
 Has thou created (all) this!
 Glory to Thee! Give us
 Salvation from the Penalty
 of the Fire". (3:19)

There are two worlds 'Seen' and 'Unseen' (Ghayb) as mentioned in the Quran. The unseen world includes God, the life hereafter, angles, jinnat, revelation etc. These concepts are a part of the study of

metaphysics in Philosophy. Quran declares that the unseen world cannot be known by human beings except through revelation and meditation only. The Quran has mentioned in many verses that men can see the Invisible World through their heart (Qalb). As an example, the translation of ayat 28 of surah al-Ra'd (13) is reproduced:

Those who believe, and whose hearts
Find satisfaction in the remembrance
of Allah for without doubt
In the remembrance of Allah
Do hearts find satisfaction (13:28)

The sign or Miracle is not something external: it is something internal, something in your mind, heart and soul. It depends on your inner spiritual experience. If you turn to Allah, that experience will come. If you do not, Allah will not force you. As another example the translation of ayat 46 of surah Al-Hajj (22) is reproduced.

Do they not travel
Through the Land, so that
Their hearts (and minds)
May thus learn wisdom
And their ears may
Thus learn to hear?
Truly it is not their eyes
that are blind, but their
Hearts which are
In their breasts.

The word for 'heart' (Qalb) in Arabic speech means both the seat of intelligent faculties and understanding as well as the seat of affections and emotions. Those who reject Allah's message may have their physical eyes and ears open but their hearts are blind and deaf. If their faculties of understanding were

active, would they not see the sign of Allah's providence and Allah's wrath around them and in the cities and the ruins if they travel intelligently?

CONCLUSION:

From the foregoing discussion it may be concluded that a PHYSICAL FORCE cannot acquire the attributes of God and it is not possible to see God through the eyes of science. It is only through their hearts that men can see the Invisible World and the signs of Allah's providence. The motto of science is "seeing is believing" and the motto of religion is "believing is seeing. Anything beyond science is considered religion, but science and religion are only different routes to reach the same Absolute Reality or God (Allah) and let us see which one of them reaches first.