

# **BUDDHIST PHYSICS**

by

**VEN. (DR) BHIKKHU BODHIPALA**

Published

by

**Dharmavijaya Maha Vihara Trust,**  
(Publication Wing)

T.N. Puram, Samathuvapuram,  
Kutladam Patti - 625 218, India

**Published in 2002**

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Ven.Dr.Bhikkhu Bodhipala  
Aha Bodhi Dhamma Samiti

Designed by  
Sun Horrse Infosys,  
14, Krishnapuram Colony,  
Main Road, Madurai - 625 014,  
Tamilnadu, India  
Ph : 0452 - 641596

**Printed in India by**  
Vignesh Press,  
6-1/53, Viswanathapuram, West Street,  
Madurai - 625 014, Tamilnadu,  
India. Ph : 0452 - 640325

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## **INTRODUCTION**

Which is on par with the other? Buddhism and science or science and Buddhism. It is fit to say that science is trying to be on par with Buddhism. Buddhism is a versatile religion. Because of its versatility it gives room for the people from all walks of life. Since 6th C B -C it has been continuing to be modern for ever as it deals with only mind and matter with realities.

According to Buddhist perspective there are one thousand and one hundred and eleven (1111) sub-atomic particles in an atom. Abidhamma section of Tripitaka is the books of physics, psychology, logic human behaviourism and so on, from which sources for the essays compiled in this book were taken. Some of these essays were published in Sri Lanka time to time. This small book is almost an anthology of essays related to Buddhist Atomism, as such you may come across certain repetitions.

Beside this some other subjects also dealt in this book which were presented in All India Seminars. Abidhamma is an ocean of ideas and theories which ultimately take one to supramundane experience. But Buddhist world still oystering these ideas. As pearls have matured, they should be taken and exposed to modern generation.

In future also such writings shall be coming up.

It is my humble opinion that this kind of approach is a new attempt in the history of Buddhist Studies.

Mr. Nemisiri Muthukimara, the then Associate Editor of "Daily News", Sri Lanka encouraged me to write essays on Buddhism, especially subjects related to Abidhamma.

My due of thanks goes to him for ever. Present editors of the said issue also encourage the writers of this area.

Bhavatu Sabbamangalam.

May all be happy.

Yours in the Dhamma,

Bhikkhu Bodhipala

## ANICCA IN PHYSICS

The Pali term “anicca” is very often, even by Buddhist scholars defined only with respect to “time concept” with reference to day - to - day life, that a thing or a being would, in course of time, one day disappear. Like this, time factor is always taken for defining this term. Thus it is a time based change. This is the general perspective of Anicca, what all the religions of the world define in different terminology. In Hinduism it is defined as “MAYA”, the illusion. This also means as uncertainty of a thing or a being. But Buddhist “anicca” is more than philosophical and imaginative idea of mere disappearance or uncertainty. Anicca, defined by the “Time Scale” is not absolute one, though it is one of the facts of “anicca”. What the Buddha does mean is not mere a philosophical concept but it is a concrete idea, perceptible by our senses, and also scientific. It has vast and sublime meanings. This term may be prefixed with some other area such as “ANICCA IN BIOLOGY” “ANICCA IN CHEMISTRY” “ANICCA IN ASTRONOMY” and so on.

A lay - man by his sincere efforts to throw the idea of anicca in physical point of view, irrespective of time based assumptions, but at the same time in the view of growth, continuity, ageing (not a person) finally impermanence of matter. As such it is here dealt only with physical or elemental anicca i.e. solid things, in Buddhist point of view, earth, “pathavi dhatu”.

The five aggregates are the impermanents, because one of the aggregates RUPA is also an aggregation of four basic elements air, fire, water and earth, which are too basically impermanent matters. As rupa is an aggregation of four basic elements and four sub-elements colour, odour, taste and nutriment, the other aggregates vedana, sanna, sankhara, and vinnana which are followed by Rupa obviously would be impermanent. Hence it is subject to change and pain.

The physical anicca indirectly causes in a being which is an aggregation of mind and matter or five aggregates. So, it is a change, modification, formation, deformation, combination, dissolution, thus making again aggregation ultimately making varieties of impermanent matters. In this universe, according to buddhist perspective, if we take Rupa as a whole, or as one package, the first aggregation of "TOTAL BEING" including organic and inorganic would be material universe. Even in the material universe, as already explained, there is an aggregation of four basic elements and four sub-elements such as colour, odour, taste and nutriment. According to scientific interpretations or a periodic table (table about elements with their atomic numbers) these four basic elements make varieties of matter and its multifariousness i.e. metals, salts, chemicals, gases, acids etc., etc., right from hydrogen to Uranium by way of permutation combination. Besides this, in modern days scientists make new elements and metals in the laboratories.

However, whether it is a natural element or an artificial one, it is nothing but participation of four basic and four sub-elements with different intensities or capacities thus making qualitative and quantitative change.

So the intensity of the elements makes material quality instead of proportion of basic elements as there is always equal proportion of four basic elements in all matter. They maintain their own character in a particular aggregation to make a particular "matter" or "elements" for a particular length of moment appropriated to them until a work causes on them. Here, the length of moment means not for a fixed time but for the unchanging nature of state i.e. a particular matter or element. E.g. if water is frozen to 0°C, though there is equal proportion of basic four "dhatus", due to reduction of intensity or capacity of "fire element" that particular aggregation of four basic elements, the dhatus, changes to "extension" i.e. solid (ity), resistance etc. which we just call "ICE BAR". But by the next moment, in course of gaining heat, the same "ICE BAR" would resume its original (?) quality, water. On the other hand, if the intensity of fire element is still increased beyond 100°C, water from its original quality turns as steam i.e. gaseous. So, physical "anicca" takes place in every material existent in the intervals of time right from a micro second to aeons. the same theory may be applied to "Anicca in chemistry". Take for

an example, a glittering diamond is mere condensed form of carbon, pressure of the surface of the earth changed its quality, first, becomes coal, then carbon ultimately, in an interval of millions of millions year the same wooden materials mature as “DIAMONDS”.

But the process of carbon becoming of diamond takes place at every moment though maturing of diamond has taken a long time.

So, it is understood tht it is not only the five aggregation is subject to change but also one of the elements, participating in rupa khandha, is also subject to change. Thus from rupa to vinnana all are in the nature of “impermanence” resulting in “dukkha” or pain. There re only two things in the universe, Nibbana and Space which are not subject to change as oth are not caused either by kamma or reason or season.

Here, we may rise a question that whether a rock boulder is subject to “anicca” or not? Apparently or superficially, we think that a strong thing like stone and iron remain always unchanging for ever. It is due to “sakay ditthi”. Like wooden materials maturing into diamonds, strong things like rock boulders are too subject to change in course of time due to changes in nature, sun light, rain, moisture in air etc.

Buddhaghosa in Visuddhi magga has rightly said “Impermanence of matter has the characteristic of complete breaking up. Its function is to make material instnces subside”. (VIS : XIV : VS 68).

In Visuddhi Magga Buddaghosa says that it has the characteristic of complete breaking up. A rock boulder may be subjected to “breaking up” either by natural course as said above or by any artificial means. Such boulders which are not subject to breaking up, in due course by any way, may be subjected to be solved in rain water or due to moisture in air. These may induce the boulder to break up by means of chemical process. So, the term employed by Buddhaghosa “breaking up” should not be literally taken mere as “breaking up into pieces”. Here Buddhaghos means only “anicca”. Through such “breaking up” volume, weight, colour and other physical character may change. So, it may be a decrease or increase, by such events there may be improvement in

the quality irrespective of “TIME FACTOR” that had its role in the breaking up. As already explained “becoming of diamond” takes place at every moment, though maturing ends for long time.

Buddhaghosa has rightly said it i.e. impermanence has breaking character, which does not mean only the negative results but positive improvements also. In our day to day life we concern anicca only with negative aspect of life that if a rich man turns poor it is anicca, like wise, death, lamentation and so on. As said by Buddhaghosa breaking nature in matter should be viewed in all respect. When a boulder is broken certainly its utility is increased in several ways. Buddhaghosa gives good example. If a potter makes a saucer, the clay turns as saucer, which is again put in fire for maturing. So every step in the process of “saucer making” is every phase of anicca; when the finished saucer falls down and breaks into pieces this is next phase of anicca.

In this sequential events, clay, saucer, pieces etc “a saucer” apparently seems to be a permanent entity” as far as its shape is concerned. Because of our wrong view and attachment, the things which are in “good shape” are considered as permanent things.

But in right view, samma ditthi those things which are in good shape are “impermanent” not only mere on the “Time Speculation” that one day it would break into pieces, but on the other four physical laws or reasons that all the things are in a sequential process of rise, temporariness, fall and finally change even the rise or “good shape” may be maintained or endures for a spell of an aeon. So in the example, the moment that saucer existed in a “good shape” denotes only temporariness irrespective of a time scale. When it breaks into pieces it means not only impermanence but also further rise from fall, because it may rise to further higher state having more utility than a saucer. So, Buddhaghosa is correct in his view that impermanence is a sequential event, of rise, temporariness, fall and change again begins with rise, temporariness etc etc. For making the concept of “Impermanence”, in the given sequential either all character may participate or even one is enough. Because in the case of carbon becoming of diamond, in the beginning, middle

and end only “change’ and “rise” work until it becomes a matured diamond. That is final “rise up”. This is actually physical or material anicca. In this essay the “Impermanence” in solid and non-living things is only analyzed not philosophically but scientifically.

So, Physical or Aniccal in physics is a continuous process which is a permanent character even in a hard substance like rock boulders i.e. solid things.

Anicca in physics has the following factors and truths. It is non-philosophical, non-speculative on the basis of time, non-continuous, temporary, limited by rise and fall, disintegrating, either improves or decreases the quality or quantity, fickle, perishable, unenduring in shape and rise, coreless, under a due to be deformed etc. whether the so called solid matter is a sub-atomic particle or gigantic mass upto the size of Maha Meru.

## BUDDHISM AND SUB - ATOMIC PHYSICS

Whether it is an analysis of matter or mind, buddhism motivates or concerns with such things only for supra-mundane purpose. A vein of ethics and moral values would always run in the Buddhist perspectives, whether it is the teachings of philosophy, metaphysics, moral code or any other similar analysis. Thus, the analysis of matter is also motivated to Nibbana, the summum bonum of life. Because buddhism, thus analysing all material phenomena eventually takes us to the formation of human body and its functions ending up in the Nibbana.

So, here I would like to display the fact that how far Buddhism has pictured the sub-atomic area of a matter. In acute sense or in more correct way, Buddhist analysis of an atom concerns with reduction of matter rather than dividing it. So it will be very appropriate, if we use the term 'irreducible' rather than 'indivisible' to denote the ultimate entity of a matter. Accordingly, an atom of an element is nothing but an 'irreducible' ultimate particle'. If physical science says, "It is one Electron" that precisely means 'one' can be subjected to divide or split which can be made into two halves. As such the term irreducible accordingly means it is the ultimate entity of an atom limiting the further reduction. However Buddhism while analysing the matter or atom, starts right from sub-atomic particles to the level of magnified universe.

Size of ultimate irreducible (Atom or Electron) of a matter according to Buddhist perspectives :

Buddhism without the help of modern physical science and its devices, tables, ready-reckoners etc., has assessed the size of a 'Para-manu' i.e., sub-atomic particle of an atom. According to the tabulation of Varahamir, I hope the term paramanu would be the synonym for an electron, the size of a paramanu is derived at by a formula which would reduce one cubic inch of a matter for  $36 \times 36 \times 36 \times 36 \times 7 \times 7 \times 7$  times. Thus, if one cubic inch of a matter e.g. golden bar were successively reduced by applying the above formula the ultimate irreducible entity of the golden bar would be the electron of Element Gold. So shortly speaking if one inch of i.e. cubic inch of particular matter of element

is reduced for 57,61,08,288 times the irreducible entity would be a paramanu, the electron. But modern physical science defines the electron as the energy having negative impulses (Charges), thus proton positive and neutron has nothi of such sorts (impulses) buddhist analysis as explained above employs the term “ultimate irreducible particle possesses all the characters of the matter quantitative as well as qualitative aspects or physical and chemical properties.

Characteristic of an Atom :

If Rupadhamma is irreducible factor of a matter as such it should have all the characters of the matter from which it has been reduced into irreducible partice. The definition according to up to date physical science that an electron is a negative charged entity as well as the proton is positive charged entity is not tenable.

The reduction may make a change in the size or volume or weight of particular matter which is nothing but a crowd of ultimate “irreducible” particle. The physical science not only reduces the mater but also changes characters of the ultimate or according to prevailing law ‘invisible’ particle or smallest matter etc. that would be either negative charged particle or positive charged particle or particles.

According to Buddhist analysis, an atom (anu) or a sub-atomic entity (Paramanu) or one of the group (Kalapa) or Rupadhammas is mere aggregation of four fundmental “Mahabhutas”. But science fails to establish how these so caled negative and positive charged entities resume both physical and chemical characters when mere number of particular indivisible entities increased.

Buddhism interprets that an ‘irreducible’ entity of an atom i.e. Kalapa which forms an atom by aggregation always possesses basic nature of a matter form, colour, taste, smell, tangibility as there is alway equal participation of all mahabhutas whether it is in the size of mountain or in the size ofKalapa. Unforunately a scientist viewing an atom through an Electronic Microscope is not aware of the fact that his physical eye is very frail to see the real factors. At the same time if an eagle views through the same atom through the same

electronic apparatus it would observe even tiniest entities existing in an atom even beyond smaller size of a Kalapa. So whether modern man uses so called sophisticated devices it never helps to see the entire universe precisely “as it is” that our human naked eye can only see a very narrow strip of the universe. The human eyes are so frail or blind to see infrared waves or ultra-violet waves and beyond. So modern devices just magnify the things as it is but not divulging the secrets prevailing behind them even though devices are so sensible. The capacity of sight power defectively endowed in the eyes curtains certain revelations. So whether human eye view through device or with naked nature its capacity narrows the sight either the view is focused on this universe or on Sub-Atomic area.

buddhism defines atom and molecule as follows Dravyaparamanu (unitary) electron and the Sanghata-paramanu (aggregate) respectively.

The Dravya-Paramanu is the smallest or ultimate irreducible particle of a matter and also it is very subtle (Sarvasuksma) and also it is ‘part-less’ (Niravayavat) whereas the Sanghata-Paramanu, the aggregate atom possesses all sub-atomic entities. Buddhism also stresses in the view of Visuddhimaggatika that a paramanu (Electron) would be observed only through Divine Eye (Dibba-Chaku). Hence Buddhism classifies the eyes into five categories according to its capacity and ranges namely, the physical eye, subtle eye, wisdom eye, Dharma eye and finally Buddha Eye. The highly sensitive eyes are as far as this world is concerned that of Eagle and Owl. On the other hand as far as this universe is concerned “Buddha Eye” which is “The Divine Eye” and which would reveal whatever it may be “as it is”.

# BUDDHIST EYE

BUDDHIST EYE DOES NOT SEE AN OBJECT, THE FORM AND COLOUR, BUT IT HEARS ONLY THE SOUND. HERE IS THE EXPLANATION

According to modern psychology 85% of external information are passing through or perceived by the sense-organ called 'THE EYE', in Pali Cakku. This sense instrument eye, which is also a modified combination of basic elements, like other sense-organs is a matter. It observes all the external matters or objects, form, shape, colour shortly Rupa. In mahayana tradition it is called Pratyaksha i.e., perceptible knowledge, obtained through 'Eye'.

Normally eye keeps atleast one foot distance way from the immediate external objects, which is out of the body i.e. out of eye and upto a maximum distance that of where the stars twinkling that may be several crores of K.M.

Actually, this different lengths of light waves (rays) while reaching the sense-organ eye make three dimensional effect, thus making 'shape', in Buddhist point of view colour and shape. Not like scientific interpretation, Buddhist Abhidamma precisely explains tht 'cakku', eye would receive the colour and the shape or Rupa. Otherwise it may be defined as colour and three dimensional effect that an object possesses. If we further confine this description, we can say that eye perceives light beams in different lengths from one foot as well from a distance of stars, which ultimately make colour and shape.

But the problem is, due to our habit from our childhood we wrongly presumes that eye erceives an object or its material quality itself, when justseeing an object. It is a wrong view, according to the buddha. In normal course of life, as we are acquainted with the material 'wel known' we do not take risk to confirm all the characters of an object that we see every time. This is due to 'sankhara', the memory.

So, Buddhist 'Eye' should not do any such wrong thing in order to avert wrong view, only on the moment of 'just seeing' a shape or colour, because for an absolute or complete perception, Buddhism insists to fulfill the process or the event of 'phassa' the contact of sense organ with the object being observed and the same should be followed by the other factors such as 'Vedana' (sensation) 'sanna' (perception) sankhara, (memory) 'vinnana' (conscious) and finalised by javana and tadaramana, cognition and memorised experience respectively.

When eye opens its eye-lids, immediately it is ready for receiving the light beams in different lengths from different directions, right from the gap of one foot to the maximum distance, that of during day time upto sun and in night upto to a tiny star.

The process of Caku-Vinnana, visual conscious is a peculiar phenomena in Buddhist interpretation. No philosophy of the world and metaphysics has analysed extensively like Buddhism. The objects form or colour or three dimensional effect, shortly rupa perceived through 'eye' are converted as 'sadda matra' sound impulses, i.e., name or Nama, when process of perception encounters 'sankhara', memory. Whenever an object, in Buddhist point of view, form or shape or RUPA is contacted with eye, 'sankhara' memory converts such impressions into appropriate 'sound impulse' in mental realm to cognize the object being perceived. Otherwise, the process of perception would be either incomplete or not at all taking place. Because without changing the form into appropriate 'sadda matra' the cognition would not take place and thus 'nothing is perceived though there is an impression or striking of object or contact or 'phassa' with sense organ 'eye'.

The following exercise would enlighten this explanation.

This exercise shall enlighten the readers how 'sanna' the perception of a form is converted into 'sound' by 'sankhara' to finalise the cognition.

Sit in a chair. Close your eyes. Begin with a preliminary exercise of watching the breath. After watching of 10 complete breaths i.e., in-hale and out-hale, open your eye lids slowly and completely. Quickly notice the objects whatever existing or placed before you and again quickly shift your visualisation

one to another as much as quick you can, if you are so minute and highly sensitive you can listen to 'pronouncement' of name of the object i.e. 'Sadda Matra' e.g. chir, cup, fan, pilow, book, pen etc. Such pronouncement would be in your own "Vocal Tone" either in Sinhalese or English or in any other language in which your thinking faculty is working.

## From Space To Nibbana

### (FROM SPACE TO ENLIGHTENMENT)

Are there anything in this universeuncaused? The answer to this question is affirmative: Yes, there are two things uncausedinthis universe, space and nibbana. Other things existig in this universe are caused through kamma or reason or season. If, Both the Space and Nibbana are caused by anything they cannot be so, but they would be mereeither matter or mind.

What is Space?

Though Theravadatadition accepts space asan elementsome of the schools of thought do not recognise the space as one among the 'Mahabhuta' air, fire,water, earth. Because space is a non-corporeal entity, which is, free from all sensual realms or which cannot be perceived either by eye or nose or ear or tongue or ski (body). The arealimited between two corporeal things wouldbe the space; even such perception is conceived by understanding and not by direct contact of even any one of the five senses. As such though Buddhism accepts the akasa (space) asa Mahabhuta it is not included in the group of either rupa or rupadhamma.

All corporeal things outline the space but which cannot exclude the space as the interim gap between two corporeal entities is practically called space.

Chines thought defines that space as that "lacks of rupa or interstices between rupa". Theravad tradition on the other hand further defines that space or akasa means cavities, holes, apertures and interstices. Hence the space is a non-corporeal thig generally understood with (Anuplathi Pramana) existing rupas (matters) asbounded or delimited space. Buddhist definition of space is that omnipresent (Sarvagata), eternal (nitya) non-obstruction (anavarane-svabhava) does not obstruct (avmoti)not is it obstructed (avriyate). The limitatio of space or the measurement of space startsfrom as much the cavity between three paramanu (Atom-Electron) and interstices between two milky ways.

Acharya Nagasena portrays the space in a practical manner suiting to modern physical science. According to him, space cannot be grasped (sabaso apayho) no limitations (sarvagata) thus it inspires terror (sntasaniyo) it is infinite (ananto) boundless (appamano) immeasurable (apariyneyyo) not clinging to (alaggo) not attached to (asatto) standing on nothing (apeetihit) not obstructed (aplibuddho) Nagasena being a practical man travels between sub-atomic space to Astro space.

Nagasena further explains Menander (King Milinda) in his debate with him (Milinda Panha) that space and nibbana are uncaused by Kamma (akammaja) by reason (ahetuja) and by season (anutuja). Nagasena's definitions are more informative, updated, clear and scientific. He has attempted to bring the space on par with Nibbana defining them as analogues. At the same time he is very clear about what is Space? And what is Nibbana? He never contradicts the traditional teachings but he has improvised the traditional teachings, taking them as hypothesis, found in Abidhamma.

Thus according to either traditional interpretation or Nagasena's, the space is mere panathi (understood by Anuplathi), it is neither Sankhata nor asankhata.

Obviously a question arises, if Nagasena employs these two terms space and nibbana as analogues, whether space and nibbana are same things? or do they synonym each other? No. but there is subtle difference between space and nibbana.

What Nibbana?

Again the same formula of Nagasena follows that Nibbana is uncaused. But it is a cessation of craving, clinging, becoming and so on. Nibbana, is un-constructed, either it has arisen? as such no past, present and future and beyond the cognition of eye, ear, nose, tongue and skin (body) The readers have to remember one thing here that space also is beyond the cognition of five senses but it is panathi (i.e. understood with help of Anuplathi pramana) but at the same time both space and Nibbana do exist but not co-exist. Nibbana is beyond the size, shape and duration like space. And like space not manifested,

neither arises nor ceases, invisible, not attached to anything, it is unobstructed and it is infinite.

How to discriminate the Space from Nibbana?

We, both the insentient and sentient entities do co-exist in between two walls of Space and Nibbana. As far as physical aspect is concerned both space and Nibbana are same. But in between them there are corporeal things and Nama i.e., from Mahabhutas, Rupa, Rupadhammas, five senses, perceptions, male, female, kamma, Citta, Cetasika - nibbana. If the sentient beings descend towards left side (space) it would be annihilation and if ascend towards right side it would be Nibbana.

Space is nothing but empty whereas Nibbana is nothingness endowed with bliss. By annihilation we can reach the space. But Nibbana does not indicate mere annihilation it goes even beyond space and enter into another mode of existence.

Space cannot understand the presence of either Space or Nibbana whereas Nibbana could observe the presence of space and experience Nibbana. Hence Nibbana is spiritual event that takes place in cessation but not like physical event annihilation. Further Nibbana is an unmanifest, imperishable always already there. This is the realm of immortality with bliss which cannot be spatially located but it is rather transcending in its nature, supra-mundane and only reachable in the ultimatum of mystical experience in the path of meditative life.

Here is the simple formula to assess what is Space and Nibbana.

Nothing minus sentient experience is equal to space.

Nothingness plus sentient experiences is equal to Nibbana.

Therefore:

Space = Nothing + Corporeal Outline - Sentient Experience.

Nibbana = Nothingness - Corporeal Outline - Sentient Experience.

## BUDDHIST EAR

Buddhist ear doesnot hear the sound but sees the form or colour and shape. Here is the explanation.

Human auditory organ ear receives the sound impulses from the outer world through which a man acquires 10% of the external information, whereas eye brings about 85%. But for a new born child the function of touching sense and auditory ability have already deveoped i.e. even from when it is in mother's womb. The child in the womb begins to listen to the heart beats of its mother and day by day, even conversation of its mother. Westerners converse with their child which still growing in the womb with an instrument which is similar to the stetho-scope. It is called pre-natal talk.

But remaining, senses of the child nose, tongue and eye perhaps would start to work even several days after its birth.

So right from our womb days 'phassa' the contact of sound object with ear is always happening, even while we fall as sleep. Right from the humming sound of small beetles to the sound of thunder bolt from our nearest surrounding to a distance of clouds there always sound impulses come up. But due to our inborn inattentive nature or according to the Buddha due to ignorance we are not listening to such sound impulses. Some Buddhist scholarsemploy the termundisturbed conscious. As such, modern science has assessed that in a surrounding of atleast one K.M., there always happen 1000 varieties to 'sound making' both natural and artificial. Practically speaking, we do live in an ocean of 'SOUND'. The mediators, after closing their eyes, experience that the most disturbing element is "The Sound" though the auditory function has started from 'WOMB DAYS' comparing it with eye,it is bit a weakinstrument. Becauseear gives only 10% of external informations that means only 10% of disturbances.

Buddhist interpretation of Sound :

According to Buddhist concept soundis RUPA, i.e. matter, but it is without form or colour and shape. It is grosserthan light but subtle than

odour and taste. So sound is a matter because it is perceived by one of our sense-organs, it is limited by space and time. Buddhaghosa gives the example of Washerman. When washerman strikes the cloth on the stone sound is immediately produced. But a person who is seeing the action of Washerman from a long distance hears the sound later after seeing the action of striking the cloth on the stone. Buddhaghosa proved that sound travels slowly than light somewhat 15 centuries ago.

Buddhism further explains that being a matter, sound makes a relationship between the individual and the world, so it can be objectively cognized. The sound is a matter because it comes into three realms of sense-organ, sense-object and sensory awareness. Finally sound is a matter because the object (sound) itself travelling from its originating place and strikes the sense organ ear.

Thus ear perceives different frequencies of sound waves, defining it as natural or artificial, sweet or rough and so on.

In Buddhist assumptions, the process of auditory consciousness is a peculiar phenomena, because the sound impulses i.e., 'Sadda matra' perceived by ear are converted into form (colour and shape) when the perception of 'hearing' passes through the phase of 'shankara' in mental realm. Whenever a sound impulse 'sadda matra' is presented to the sense organ ear, during the continuity of perception memory (shankara) converts the sound impulses into an appropriate form in order to cognize the 'hearing' or sound object. Without changing the 'sound' into form in the mental realm, cognition is impossible and nothing is heard though there is 'phassa' the contact of sound with its appropriate sound organ ear.

#### EXERCISE :

The following exercise would help the readers to understand the hypothesis "Buddhist ear does not hear sound but sees the form or colour and shape".

This exercise shall enlighten the readers how 'sanna' the perception of a sound impulse is modified into a form or colour and shape in mental realm.

Sit in a chair, close your eyes and begin to watch 10 complete breathings. After watching keep your eyes closed. Begin to listen to the sound that you hear irrespective of its volume, nature, distance. If you are so minute in your observance and highly sensitive you can observe mental form for each and every sound impulse that reaches you.

If you hear an engine sound you would see 'car' in your mind and if you are listening to sweet voices of birds you would see 'Birds' in your mind. So whatever the sound you hear that is immediately modified or converted into suitable form and most of the time imaginary form are coming up. If you are not visualising any form during the practice, it means you are not "hearing anything".

Here readers have to realise a fact that whether it is a sound or an object, whether you hear it or see it either physically or mentally, they are nothing but mere RUPA. the matter.

# BUDDHIST ANALYSIS OF TIME

(Based on Dhammasangai and Visuddhi Magga)

What is the Time now?

We have an immediate answer for this, because we can refer to a 'device'. It would give us the exact 'answer'.

But, What is time? This question, despite there is a vast advancement in science and technology, still unanswered because whether it is an instrumental time i.e. a micro - second measured in a rocket launching base or a light year, these two time factors are nothing but development of solar time, which is absolutely a relative time, which is being measured by a "Clock" but not cognized by our mind so absolutely it is not absolute time.

Modern science just correlates the concept of time with space and movement and with units (numbers) whereas Buddhism in addition to movements, it relates moments and events. Further Buddhism defines the 'time' without taking 'space' as a factor. When the question, 'what is the time now?' is answered, in the course of question and answer, there occur according to a time 'device' past, present and future.

In buddhist, perspective, time should be cognized with factors of past, future and present based on the other facts and factors i.e. moments, movements and events and not by 'illusory relative time' or so-called 'clock' time.

For the analysis of 'Buddhist Time', as exposed in Dhammasangani, we require to have a clear idea that 'time' is entirely a different thing from a day, week, month, year and so on and a clock time is nothing but mere a "move". A day is measured on the basis of sun and reckoned by the revolution of the earth.

Whether it a micro-second as measured in space science or a light year, all these are the development of 'Time Factor' of the earth movement. In true sense 'modern time' is neither solar nor lunar but strictly terrestrial. As such,

the earth rounding up of the sun is reckoned as 'One Year' again fixing the sun as centre point.

It has been already explained that 'Time' is entirely a different 'thing' from a day, week, year, century and aeon because in a sequence of 123 micro-seconds and 1,2,3 aeons we cannot assess that '1' is past '2' is present and '3' is future. As human faculty is too frail and is confined and habitualised by 'clock' and 'day' taking them as 'time'. The ideational time of past, present and future is untenable for mind and it tries to bring all sorts of physical apparatus for conceiving or realising the idea of time.

Hence we always assess the time either with the help of a vertical line or a horizontal line making the centrepoint always as 'present' and up and down or right and left as future and past respectively. I interviewed many of my friends, most of them fix left as future right as past and the centre point as 'present'. Few of them fix down as future up as past and the centre point as usual 'present'. But all are unable to assess the duration of centre point i.e. 'PRESENT'. If your faculties are developed like the Buddhas the present would extend to right and left or to up and down 'infinitely'.

The concept of time or duration of present is changing person to person, according to his faculty.

Buddhist concept of time clearly explains that in the sequences 1,2,3 if you are an Arhant (enlightened) sequence of aeons would be totally 'PRESENT', if you have not developed your 'insight' Vipassana, even the 1,2,3 sequence of micro-seconds would consist duration of past, present and future.

In the beginning, it was explained that Buddhism concerns with the time of movements, moments and events, either assessing them as past or future or present. As the concept of time is changing person to person some times a day is very long or very short according to mood etc.

In this paper Buddhist concept of 'Time' as exposed in Dhammasangani and visuddhi Magga is taken for analysis. Of course that may be relatively applied to 'Clock' time. Besides this, physical time, bio-logical time, space

time, rocket time, fossil time and othersuch time factors are not taken for consideration even to compare or for substantiating Buddhist concept of time.

Buddhist Time has been elaborately analysed in Dhammasangai and Milinda Panha and Acharya Buddhaghosa has also explained in his work Visuddhi Magga in detail even without deploying the term ‘time’ for concerning the idea of past, present and future with the aid of moment, movements and event. The readers always have to keep in mind the Buddhist analysis of time was made somewhat 2500 years ago i the absence of CLOCK and Digitors. The explanation of past, present, future in dhammasangani is made in the light of moments, movement and events as an extension of former three factors, but not respectively.

Buddhist Time breaks through the barriers of space and distance. Acharya Nagasena explains the KingMilinda, that : Two persons die in a place at the same moment and both are immediately reborn at the same moment. The first one is reorn in the same place where he died and the other one is reborn in the same place where he died and the other one is reborn very far away from the place where he died. Nagasena explains that he event of rebirth of these two persons takes place at thesame moment irrespective of difference of ‘distance’. Hence Buddhist time confines itself into the idea of moment going beyond the limitations of space or distance or units or numbers.

Like Nagasena’s explanation of time, Dhammasangani explains the concept of time based on events, moments and movements eventually assessing past, present and future. It further adds that ‘thought’ also is a combination of these three factors. The erses from 1038 to 1041 of Dhammasangani throw the idea of past, present and future.

- i. VS : 1038      Which are the states that are past? These states that are past, are extinct, dissolved changed terminated, exterminated...
- ii. VS : 1039      Which are the states that are future? The states that are unborn, that have not become, not been gotten

nor created, nor recreated, nor made manifest, that not have arisen nor come to pass, nor happened nor supervened that have not arrived...

iii. VS : 1040 Which are the things that are present? These states that have been born, have become, have been gotten, created, recreated, made manifest, that have been caused to arise, that have arisen, have come to pass, that have arisen over against....

As already quoted, Dhamasangani's explanation is based on the three components of events, moments and movements finally deriving at the idea of past or present even confirming all these three into either one event or one moment or one movement.

For the analysis of present, future and past, defined in Dhammasangani, under verses 1038 to 1040, the term 'dissolution' is taken for "Time Test".

Take one cup of salt and two cups of water. As defined in verse 1040, salt and water "have come to pass" so these are 'present'. Pour the salt into water, according to verse 1039, 'saline water' has not been created just at the very moment of pouring salt into water and please apply your attention to all the words employed in verse 1039, keeping in mind 'saline water' or in other words 'Future'. When all salt completely dissolved both water and salt become 'past' according to verse 1038. Because in the solution, water and salt do not remain as two separate entities, now it is completely a different 'thing' or a solution irrespective of its ingredients. According to verse 1038 'dissolved' or 'changed'.

Now in final stage, a solution has come up; it is according to verse 1040 'present' because it has been caused to arise or 'that has been created'.

So in the duration of dissolving process, two 'present things' salt and water join together to make a 'future saline' and on the event of becoming of 'saline' both water and salt disappear and become 'past'.

The event or moment or movement of becoming of 'saline' has actually manifested these sequences of 'present', 'future', past and again present.

Now the question is, the duration i.e. for dissolving of salt into water, is what? If the clock shows 30 minutes for that event or movement or moment whether we can take the entire time quantum of 30 mts as present? In the sense the clock has run for 30 mts parallelly with dissolving process but normally we would assess that it is the dissolving process that takes 30 mts. That process carries on its work in every moment relatively we can say that in every micro-second of 'Clock - Time'.

In scientific interpretation becoming of 'future' saline continues even at the last moment of a salt molecule i.e. 'present' dissolving into 'present' (water) and ultimately dissolved and extincted completely and they water and salt turn past the 'future' saline becomes 'present' according to vs 1040... those states that have become i.e. here saline water has become.

So, if we observe moment of dissolving action, actually 'present' is becoming 'past' and 'future' simultaneously. That means, present extends to past and future.

Dhammasangani further defines that thought process also comes under the states of present, future and past. According to verse 1041 :

Which are the states that have past... future... present.... as their object of thought?

Conscious states and their mental properties which arise in connection with states that past.... future... present...

## MATTER, THOUGHT AND TIME

The Yogacara school also agrees to Dhammasangani's concept of time taking a moment as nascent, static and evanescent phase literally called utpada, sthiti and bhanga respectively. Dhammasangani describes that all matter, RUPA can be classified as past, present, and future. In logical scale they can be

anaogically considered bhanga-past, utpada future, sthiti - present. Even by this logical assertion our puzzil is not untie. We witnessed the nature of bhanga, utpada and sthiti al these three in one vent of 'salt dissolving in water'.

For this problem Buddhaghosa usually comes here too for our rescue. He throws bit a clear definition that the rupa (matter) that passed over these three phases may be defined as 'Past'. The Rupa, matter that has not yet reached the course of three phases may be defined as future and the matter that are in the process of three phases may be classified as present.

In his explanation Buddhaghosa is very clear, according to him 'sat, water and saline are in the process of three phases utpada, sthiti and bhanga thus it can be reckoned that the entire process of 'dissolving' as 'present' irrespective of its duration i.e. according to clock-time.

In thought process too, abhidhamma has assessed that duration of thought be the 1/17th duration of a moment of matter. However, some scholars presume that thought changes rapidly and breaks up more quickly than matter. It has been established by such scholars that Abhidhamma has calculated that sixteen moments of thought arise and cease to exist during the life time of a single moment of matter. They further argue that the moment of matter which arises at the same time as moment of thought, dies simultaneously by with the 17th moment of thought.

This argument apparently seems to be accurate but it is influenced by 'clock time' and numerical concept of time. But Abhidhamma considers time either as an even or movement or a moment. As such duration of moment of matter and thought should be taken as an analogue of a 'revolving disc' which has no axis. In its centre point if the speed is 'Unit 1' at the edge or rim the speed would be '17 Units'.

The centre point of the disc may be taken as 'matter' and the edge or rim may be taken as "thought". When disc starts to rotate the centre point and the edge begin to move simultaneously but in different speed, as such the moment of matter and thought begins t the same moment and ends at the same moment. But it is not like that striking of a bell for 17 times comparing it as

the 17 moments of matter and all the 17 moments are made in one strike in the mind as one moment of thought. The ability of thought is very higher than matter and it should not be confined into mere quality of quickness measuring with either help of 'Time' or 'Units'. When rapidity is adopted instead of ability, the clock time would mislead us.

If the moment of matter and thought is reckoned in accordance with the quantum of 'Clock Time' the Buddha traveling upto celestial realms teaching Brahamas and returning back to earth to resume his routine life would not be possible.

If we reckon the Buddhas's celestial mission with the aid of modern time when he goes to Tusita and stays there for a day (whether we have to take this 'one day' as terrestrial or celestial time, it is another hurdle) and returning back to earth, by this deed, i.e. by his arrival, the terrestrial time would have passed at least 5000 A.D. (common era). The thought power of celestial beings are so high in all respects.

Fortunately the Buddha's faculty could reckon the 'time' either it is one micro-second of terrestrial time or one Maha Kalpa of celestial world just as 'one moment'.

**NOW WHAT IS TIME?** : It is nothing but moments, movements and events mentally conceived as past, present, and future. We would conclude this argument by the very word of the Lord Buddha.

“Even so was my past existence at that time real, but unreal the future and present existence; and my future existence will be at one time real but unreal the past and present existence; and my present existence is now real, but unreal the past and future existence. All these are merely popular designations and expressions, mere conventional terms of speaking, mere popular notions. (Digha Nikaya)

Hence the Buddha has only one time that is “ETERNAL PRESENT”.

# THE COSMIC COMPASSION OF BUDDHISM TO REALISE ECOLOGICAL WORLDVIEW

## Buddhist Cosmology

Is there any difference between cosmos and an electron, in the sub-atomic area? The Buddhist answer is “No”. It may be fitting to see Buddhism as a book on Cosmology that contains space as its first page and Nibbana (enlightenment) as last one, consisting of several chapters.

The chapters of Buddhist cosmology start from space, air, fire, water, earth, matter, five senses, perception, sensation, male, female, action, mind, elements such as thinking, thought and feeling, individuality (personality), meditation and finally end with Nibbana, the enlightenment.

The chapters on material cosmos or the earth cover from oceans, rivers, lakes, land, desert, and hills. All these and other material things, whether it is a tiny sub-atomic particle like electron or gigantic planet like Jupiter, are nothing but combination of the major elements like air, fire, water, earth, and four sub-elements such as colour, taste, odour and energy. This is what is called Matter or RUPA, the form or colour and shape.

The remaining chapters deal with the other side of the cosmos, from five senses to Nibbana, the enlightenment. It is an aggregation of mental elements such as sense impression (Phassa), Perception (Sanna), Sensation (Vedana), Memory, thought, thinking, feeling (Sankhara), consciousness (Vinana). All these mental components or elements make a person or personality or individuality (CETANA).

So, the whole cosmos is divided into two major components MATTER and MIND i.e. RUPA and NAMA whether it is a sentient being (right from an amoeba to man) or an insentient existent (right from a sub-atomic particle to a planet), these are part and parcel of the cosmos. As such, they are not and

cannot be cut off from the cosmos.

The human being is a mixture of matter and mind, RUPA and NAMA. Thus it is a micro-cosmos having all the qualities or same proportion of the macro - cosmos.

According to Buddhism, Space and Nibbana obviously lack corporality. Hence Space and Nibbana exclude the cosmos.

This cosmos is maintained by a force of five basic rules or laws called

1. Rudu Niyama - Seasonal law- Physical law
2. Beeja niyama - Seed law- Biological law
3. Citta Niyama - Mental law - Psychic law
4. KammaNiyama - Law of action - Deed
5. Dhamma Niyama - Casual law or Natural law

The Mother Nature bestows her love on living beings when these basic laws are scrupulously adopted and adored by living beings.

1. Rudu Niyama - Seasonal Law or Physical Law

The mother earth nourishes her children by adopting this seasonal law. The earth is revolving itself every day and rounding up the Sun making a day and a year. This is Kamma the action. All kmmas or action produce effects or results. By this action of the earth, seasons are coming up following the sequences of spring, summer, rainy and winter. As a result of the seasons, all living beings are nourished, grow and live. The mother cosmos always showers her compassion on her children.

But unfortunately, her beloved children grow greedy and greedy. We have to be here reminded of always a serious point that basically there is a psychological pollution in modern mind, other than physical and tangible pollutions. The mental pollutions are nothing but consumerism, followed by use and throw policy, fast, packed and tinned food, heaping of wastage such

as polythene materials, bottles and garbage. These polluting materials, which are thrown at the face of mother earth, indirectly make imbalances in four basic elements Air, Fire, Water and Earth and eventually rupture the ecological system. Thus when the Rudu Niyama (seasonal law) is disturbed, it results in untimely downfall and drought. So, the mother earth is unable to nourish her children by way of making regular seasonal changes.

## 2. Beeja Niyama - Seed Law - Biological Law

Due to consumerism we violate biological laws also by way of making crossbreeds both in animal kingdom and vegetation. We consider only the good reproduction but are not aware of violation of biological law. If we consume short-term grains, cereals, vegetables obviously our life span also would be short - ened and the immunity power is reduced. The nature further brings new kinds of diseases.

The cloning methodology adopted for breeding animal species and mankind is still another violation of Beeja niyama. There would be a severe response from the cosmos even after several centuries.

Sexual perversion and eviations are also violation of biological law.

## 3. Kamma Niyama - Law of action or deed

## 4. Citta Niyama - mental Law or Psychic Law

These two laws are like two sides of a same coin. Citta, the mind induces action. A bad thought leads to a bad action and ultimately bad result or effect.

In Anguttam Nikaya, a Buddhist scripture, Lord Buddhawarns that when lust, greed and wrong values grip human heart, immorality becomes widespread in society that means pollution has started in a corner of this Universe. When its effect reaches the solar system and earth, we unfortunately lack in spiritual sight or Divine Eye (Dibba Cakku) and observe only gross physical results and are unable to feel subtle imbalances that are created in

the cosmos and their negative impacts in the future.

Buddhism warns of deterioration of Nature that occurs when immorality grips the society. So, if action and thinking go against nature through violation of Kamma Niyama and Citta Niyama, there occur cosmic pollution and this cosmos has to inevitably adjust the imbalance which would manifest in the form of earthquake, new kind of diseases and other such similar natural calamities.

#### 5. Dhamma Niyama - Casual Law or Natural Law

Good human action and thinking i.e. observance of Citta and Kamma Niyama is helpful for well being of sentient beings because the balance of four basic elements is not ruptured and disturbed. So regular seasons will come up i.e. Rudu Niyama will work well. On the other hand violation of four other laws make negative results. Dhamma Niyama is nothing but the result or the impact of either observance or violation of Rudu, Beeja, Kam and Citta Niyamas.

Rudu Niyama is violated by pollution and it causes imbalance in basic four elements air, fire, water and earth.

Beeja Niyama is violated when natural course of reproductive system is meddled with either in animal kingdom and in vegetation.

Citta Niyama and Kamma Niyama are violated when we indulge in perverted thinking and other immoral activities.

Dhamma Niyama thus means nothing but the outcome of violations or observance of former four laws. Earthquake, storms, drought, untimely rains and all other natural calamities occur in order to set us right from diverted ways of behaviour or breakdown of moral course of life and thinking. When widespread sexual perversion or undue exploitation occurs in a particular area, by violations of Citta and Kamma Niyamas, storm and heavy casualty occur in order to change the course of thinking of people in that area and thereby set right morality.

## Cosmic Love

Cosmos means love because it protects and preserves living beings by enforcing five basic laws. Modern science has established a truth that there are more than ten galaxies in this cosmos functioning for the support and good for living beings on the planet earth.

According to Buddhism, love is not one thing or one feeling or one experience but love is experiences of Metta - friendliness, Karuna - mercy, Mudita - appreciative joy on account of others' well being and finally Upekkha - equanimity. These four qualities are the embodiment of cosmic love. An electron revolves in sub-atomic area due to cosmic love.

Buddha defines the qualities of Love in one of his discourses called Kriya metta Suttam as follows:

1. One, who would be the embodiment of love would seek peace, his words would be soft and polite.
2. Humility will be his religion and he would be away from hatred.
3. He would be self-sufficient, self-content, thus keep away from violence.
4. His life would be very simple, his needs and deeds are limited.
5. He never indulges himself in immoral activities.
6. He always concerns about well being of all the sentient beings.

Which are very strong

Which are very soft

Which are very long

Which are very short

Which are at his sight

Which are far away

Which are born

Which are in the womb

7. All beings would like his presence and live in his presence.

8. Buddha concludes that such person would be like a mother who has only one child for her entire life span.

Hence Buddhism warns the humankind that the world, including nature and living beings either stand or fall with the type of moral force Kamma Niyama or Citta Niyama at work.

Hence, the tremendous responsibility of the humans for the survival and well being of the whole cosmic order. And it may be achieved through the observance of basic laws.

# BUDDHIST INVESTIGATION OF SPACE IN SUB - ATOMIC AREA

(With scientific Illustrations)

Akaso na kattha ci patithito - The Buddha

What is the difference between modern atomic theory and the Buddhist atomic theory? Believe it or not, it is nothing but the difference in time span i.e, 2500 years and 100 years respectively. Buddhist held their explanation related to atom some what 2500 years ago whereas modern atomic theory is an infant comparatively to the theory of Buddhists, emerged between 1900 - 2000 A.D. deriving with the help of sophisticated devices and assumptions.

Whether it is of Buddhist theory or modern theory, both of them hold one common fact that, whether it is an irreducible particle Kalapa, in Buddhist sense or an Electron as per modern interpretation, there is always an intervening gap, space, antara between these were particles or sub - atomic entities. Buddhism also employs certain technical terms such as Anu, Paramanu, Cunna, Kalapa and so on at same time we can take following terms as counter part of Buddhist terms in modern science, atom, neutron, photon, electron, protons etc. Modern science is further going on adding more terms to denote the sub-atomic particles instead of qualifying them according to their role in the participation of a particular element or atom. Most of the modern theories related to atom and atomic physics based on assumption, presumption, and finally inference as these particles are extremely tiny. The scientific instruments such as Electronic Microscope as well as human eyes are so frail and weak to observe the reality of sub-atomic area. Hence modern theory adds more list and classifying them into energy or electrical impulses, some times the word 'cloud' or 'cloudy cushion' is also used.

Buddhism clearly exhorts that such sub - atomic particles can be observed only by Divine Eyes' (Dibba Cakku). Further, because of assumption and presumptions, modern theories are replaced by forthcoming assumptions and they make former obsolete ignoring the fact that their own theory also an assumption.

These two theories Buddhist and modern accept one basic law that whether it is an Anu, or Paramanu, or Cunna or Kalapinga as well as in physical science Atom, Nucleus, Electron etc, each irreducible particles or atom or sub-atomic particles is separate entity and identical to others (e.g. the tipe of a pin).

Modern science classifies the category of matter as follows, solid, liquid, fluid and gas. The following illustration shall explain arrangement of atoms in different elements i.e solid, liquid, fluid and gas.

According to modern physical science as well as Buddhist law each Anu or atoms are separate entities, though millions of such were particles participate in a group of particular matter. So matter is nothing but an aggregation of separate entities like small balls as in the tip of a ball - pointpen and they are identical to each other in all respect.

Modern science classifies the nature of element according to convergence of each atom or sub-atomic particle prevailing in an atom. Hence solid thing accordingly means all atoms, participating in a mass or piece of an element, almost touching each other. Here touching means the orbit of outer - shells of adjacent atoms are very near, but in the case of a liquid object they fumble with each other, finally in the case of air / gas they grope each other. Thus a solid thing makes definite volume and shape; liquid makes definite volume and irregular shape; gas / air makes irregular shape and volume, unless they are content of a regular shaped container.

So solidity means convergence of these particles rather than qualitative aspect of particular element, as such when the participating atoms withdraw each other their position and increase the intertices, the nature of element is classified as solid, liquid, gas, compound, alloy etc.,

Whether modern science has assessed or not, but according to Buddhist investigation..... that atoms do not come into contact with one another and that between two atoms there is always an intervening space (antara). Here, Prof. Y. Karunadasa of Sri Lanka opines that there is space between two atoms. If we go further we could find more space in an atoms. If we go further we could

find more space in an atom itself. The following illustration shall throw the idea.

For example 3 Hydrogen Atoms are taken.

Illustration 2 (a)

In given illustration 1 (a) the diameter of the Electron's orbit is taken as 15 mm for clear exposition of Electron's orbital position. If three atoms are touching each other or otherwise if convergence of each atom is more, there makes space. Please refer to III. 1 (b).

However if an electron revolves in a particular path making an orbit, it precisely means it travels in the space like the earth moving on in space. Like that all electrons are spinning the nucleus of the atom. If we pluck the electrons one by one and all the particles in the nucleus for arranging like brick wall or sequential position they will occupy very minimum place as shown in the illustration 2(c). If we take the triangle for assessing the approximate coverage of the area of these three atoms as shown in the III 2(b), we would get the idea how they occupy very minimum area. The actual space covered by three atom along with their were particles would be as much as shown in the arrow mark of the Illustrations.

Illustration 2 (c)

Here the readers have to apply the 3 dimensional view in all the illustrations.

As the electrons are revolving at a high velocity of 1,86,000 miles per second, practically each orbit would be an energy ring. When three orbits converge as possible as they can there comes the quality of the things solid, even in such solidity as shown in the III 2 (a to c) the electrons, due to their high velocity make a ring resulting a space among three atoms.

As for as Buddhist concept of space in the paramanu is concerned, there are different kinds of assertion formulated by various Buddhist Thought that (1) there is light in the intervening space. Some Buddhist school opine that

(2) air (Vayu Dhathu) prevails in the interstices acting as plaster to hold the almost, thus making solidity, but Theravadins consider in a different way. Their concept is very scientific that (3) there is always an intervening space (antara) in between paramanu, as well as between all the sub-atomic particles.

The following illustration will discern the truth. The atom taken for analysis is Sodium (Na).

#### ATOMIC NUMBER 11

The arrangement of orbits and distribution of electron adopt the following formula according to modern atomic theory.

#### TABULATION

The arrangement of orbits and distribution of election adopt the following formula according to modern atomic theory.

#### TABULATION

The number of shells or orbital lines starts from inside that is immediate to Nucleus and thus making one by one moving to outer.

1st inner shell	... $2 \times 1^2$	... $2 \times 1 \times 1$	2 Electrons
2nd Shell	.... $2 \times 2^2$	... $2 \times 2 \times 2$	8 Electrons
3rd Shell	.... $2 \times 3^2$	... $2 \times 3 \times 3$	18 Electrons
4th Shell	.... $2 \times 4^2$	.... $2 \times 4 \times 4$	32 Electrons
5th Shell	.... $2 \times 5^2$	.... $2 \times 5 \times 5$	50 Electrons
6th Shell	.... $2 \times 6^2$	.... $2 \times 6 \times 6$	72 Electrons

Outer Shell has 1 Electron

Middle Shell has 8 Electron

Inner Shell has 2 Electron

In given Illustration, the positions of the electrons are hypothetically taken as the starting point of each electron in the particular orbit. Here the readers have to be aware of the fact that all the electrons from their shell (Orbit) spinning the nucleus, thus making concentric balls apparently. As such, the nucleus of sodium atom is almost covered by three concentric (Electronic) balls.

The ultimate outer - sphere or orbit should have, according to formula, 18 electrons. As sodium has only 11 electrons, after successive distribution of electrons from inner shells i.e 2, 8 the ultimate outer shell instead of possessing 18 electrons it has only one electron, after the proper distribution according to tabulation.

While examining the orbits or sphere shells of electrons, there is also a space or distance being maintained. On the other hand in the particular sphere itself, the electrons are evenly located without colliding with each other not making rapture in the shell disfiguring the shell.

So in sub - atomic area also practically speaking space available in the following manner.

i. The electrons participating in an orbit maintain certain variable or invariable distance between each other during the course of revolution.

ii. The shells or orbital spheres also keep certain distance among them in order to avoid collision of each shell or orbit as the electrons are spinning the nucleus.

iii. Thus there is always a distance or space between orbits and nucleus.

In view of the above, if modern science capable of plucking all the particles one by one, and make a sequential line of such particles like making of a wall, the volume of the atom according to Rutherford, will be very very less comparatively with actual space covered by an atom when it is active.

#### Illustration 4 (Sodium Atom) 4 (A)

Rutherford concerns with the atom which is active. But, if we analyse the illustrations 4 (A to D) actually one atom covers very minimum area of space.

1. Illustration 4 A shows a hypothetical structure of Sodium Atom.

2. Illustration 4B shows the hypothetical structure or position of electrons without making orbital lines (Spheres) clearly exposing the intervening space between each electron and Nucleus, thus making a tiny universe.

3. Illustration 4C shows the space available in an atom, when sub-atomic particles are arranged in sequential lines as making of a brick - wall.

4. Illustration 4D shows the amount of space actually consumed by all the components of one atom such as electrons, neutrons, protons, etc.

So according to modern atomic theory, the components of an atom occupy more space than its actual capacity, due to their action in sub-atomic area i.e revolving or spinning the nucleus.

As per above diagram, the components of an atom occupy more space than their actual volume, due to their functioning in the sub-atomic area. Even we could find intervening space among the sequentially arranged particles, if they are in sphere shape.

In absolute truth (pamatha sacca), the so-called solid things have more space than “sub-stances”. Hence Buddhaghosa says that training on space kasina would reveal hidden things under the earth, creating ‘space’ in the rocks, by creating space inside them travelling unobstructed into walls and other things possible. (Visuddhi Magga V:37).

When solid things like rock have more space, as illustrated throughout this paper, comparatively the human body, majorly occupied by 80% of water, would have more space than its actual size as exposed in blood and flesh.

Buddhaghosa has rightly explained that when two objects having more space (body and wall) it will not be so difficult to pass through water without disturbing each other or like a comb passing through a thicket of hair.

Rutherford opines that an atom has both mass and volume. But as far as Buddhist investigation is concerned, the volume maintained by an atom along with the other sub-atomic particles is very less than actual volume of all such particles.

However, Buddhaghosa assures that training on space Kasina would reveal the fact more space available in the solid things rather than substances or material existents. As such the above study would establish the fact that right from an atom to galaxy space is covering all the 'SPACE'.

With the very word of the Lord Buddha we can conclude the arguments: Ananda, "This great earth rests on water, water on air, air on Akasa (Space). The Buddha further adds that Akasa (space) for its part does not anything - Akasa na kattha ci Patithito.

# BUDDHIST ANALYSIS OF ATOM

## (Buddhist Micro-Cosmology)

This paper purporting to clarify certain queries raised by readers from SRI LANKA on account of my previous research paper entitled “Buddhist Investigation of Space in Sub-Atomic Area” which appeared on “Daily News” in Sri Lanka during 20-22 Nov. ‘99.

Many of the readers have responded to the above article or it would be more appropriate to say that many of them have reacted to it. So, the following analysis would serve both the purpose of answering the queries and enlighten us about the “Atom” in Buddhist point of view in the context of modern physical science.

Being a Buddhist monk and a student Abhidhamma, I would like to refer to the Buddhist perspectives to answer this question, which I feel is more accurate than modern scientific interpretations.

What is a photon?

What is an electron?

What is a molecule?

What is an atom?

What is an element?

What is a matter?

What is a mass?

If we place all these questions before a scientist he would answer each question in a different angle and from a different point of view. Such an answer often fails to interrelate the idea of modern science and sometimes even contradicting his own hypothesis. On the other hand, Buddhism gives only one answer to all these questions whether it is a photon or electron or proton or an atom and so on. If the question is regarding something that is of

size of Himalaya or tiny speck, it is nothing but an aggregation of four major elements air, fire, water and earth, accompanied by four sub - elements such as colour, smell, taste and Nourishment (energy).

An atom, according to modern physical chemistry which is composed of many sub - atomic particles, can be defined only as an aggrandizement of above said four major characters or element and four sub - elements or qualities as the Buddhist perspective suggest.

Mahayana tradition, especially the Vijnanavadins refuted the possibility of the independent existence of an object because they posited the infinite divisibility of matter.

Further, the Vijnanavadins argued that deriving at an end to the irreducible unit of matter is impossible. According to them there are no two separate entities as mind and matter. They considered matter as the gross form of mind.

This refutation could not be accepted in the Theravada point of view since the entire Buddhist philosophy deals with the presence of Nama, the mind and Rupa, the matter. Theravadins established the concept of infinite divisibility or reduction of matter going even beyond to the level of atom and its sub - atomic particles upto the end, practically speaking to physical annihilation by means of reduction of size.

Buddhist analysis of an atom concerns with reducing of matter rather than dividing it. So, it would be very appropriate, if we use the term “irreducible” instead of “indivisible” to denote the ultimate entity of matter. Accordingly, the term irreducible means the ultimate entity of an Atom limiting itself to further reduction. However Buddhism, while analysing the matter or an atom starts right from sub-atomic particles and moves on to the level of magnified universe. The Theravada perspective unchanges the quality of matter which is subjected to such reduction or magnification, whereas modern science depicts it in a different way naming such reduction as electron that is negatively charged particle or as proton that is positively charged particle etc. Buddhist analysis as explained above employs the term Kalapa which means “ultimate

irreducible entity”. So obviously the ultimate irreducible particle possesses all the characters of the matter which is subjected to such reduction quantitatively as well as qualitatively. Hence, the definition given by modern physical chemistry that an electron is a negative charged entity while the proton is positive charged entity is untenable. The reduction may make a change only in the size or volume or weight of matter because “matter” is nothing but a crowd of ultimate “irreducible” particles i.e Kalapas.

According to the Buddhist point of view such formation right from the ultimate irreducible particle Kalapa to the magnified Universe is based on or composed of equal participation of four “Mahabhutas” AIR, FIRE, WATER & EARTH.

Thus, an irreducible entity of an atom i.e. Kalapa which forms an atom by a process of aggregation always possesses basic nature of matter i.e. form (tangibility) colour, taste smell and energy. Hence Theravadins arrived at the conclusion that an atom or its sub-atomic particles are identical to each other in all respect irrespective of their role in an atom, having all the qualities of matter as explained above.

## SHAPE OF THE ATOM

Buddhism comes to the consideration of the physical appearance of atom also.

Theravadins considered that the ultimate irreducible particle would appear in a shape either in spherical form or having atleast six distinguishable parts, an upper part, a lower part, an eastern, southern, western and finally northern part having variable or in variable areas either with concavity or convexity. With the presence of four major elements or characters and their subqualities i.e. colour, taste, smell & nourishment (energy) always is inevitable.

This makes solidity (extension and resistance) cohesion, heat and motion possible because the participation of four elements and sub-element is not only equal in their proportion but also simultaneous occurrences in all matter.

# ANALYSIS OF WATER MOLECULE

## (Buddhist Analysis)

Buddhism defines an atom and a molecule as unitary (electron or Kalapa) Dravyaparamanu and aggregate molecule (Sanghata - Paramanu) respectively. The Dravya Paramanu is the smallest or ultimate irreducible particle of a matter.

It is very subtle (Sarvasukshma) and part-less (Niravayavat) having six distinguishable out-lines. The aggregate Sanghata Paramanu i.e aggregate molecule possesses all sub-atomic entities forming a "Mass". Buddhism clearly explains that the variation of intensity in the four major character in the nature of elements naming them as Hydrogen or Gold and so on. But science presumes that mere addition of number of sub-atomic particles. At the same time the electron taken from a gold atom is identical to the electron taken from an Iron atom. More adding of number of electrons or other sub-atomic particle changes the qualities of matter or element. So according to modern science 79 mustard seeds (electrons) would compose Gold. If the number of electrons (mustard seeds) are reduced into 26 it would change as Iron. When identical particles are increased as explained in the above illustration, the mass can increase but miraculously the qualitative change takes place.

Buddhism differs from this point confirming that either addition or deduction would make change in physical aspect but not in the quality. The further argument shall discern the truth. As per the chemical formula  $H_2O$ , water is a bonding of these atoms of two gases, 2 Hydrogen atoms and 1 Oxygen atom.

When three atoms of two gases having the character of motion after bonding in the above proportion i.e 2:1 change their basic characters of motion and restore the character of cohesion followed by heat and extension and resistance along with necessarily other sub-elements such as colour, taste, smell and nourishment according to their intensity after such bonding.

If water is frozen below to  $0^{\circ}C$ , the basic character of water (cohesion)

is changed and the quality of earth element comes into being (that is extension and resistance). Further more solidity becomes prominent. The earth character or quality prevailing in water becomes intensified when the heat (fire)element gets weakened in the participation of water molecule. Thus wherever you feel touching sensation or resistance that precisely means you perceive earth quality of a particular matter. In the cvase of wate, two gases change their quality motion first and resume the quality of cohesion in bonding, finally when fire element is reduced or intensity of heart is reduced the cohesive character turns into extension and resistance i.e it takes the form of ice. Thus solidity (the earth element) comes into being.

Hence, according to Buddhist interpretation, touching sensation in water is a mild character of earth quality prevailing in water or in the case of strong blow of the wind, we feel the touching sensation that is too a proof that earth element is prevailing in air which basically having the quality of “motion”.

In order to sum up the above example for clarity of exposition:

1.H<sub>2</sub>O One Oxygen atom and two Hydrogen atoms are bonding which makes a molecule of water i.e the quality of motion is changed into cohesing. Though modern science call it change nor change in the intensity of participating 8 elements.

2)Hydrogen, when it is alone, without bonding with anyother gas it has the quality of burning, thus fire element prevails. Hence in H<sub>2</sub>O bonding also fire is prevalent.

3)When heat element subsides then the character of extension and resistance arise i.e solidity or earth element.

4)Moving or flowing from top to bottom proves (even after bonding of two gases) that air element still persists in water. Flow of water is due to presence of air element (i.e. Motion).

5)Sustaining on the ground or on anything proves that “water”element is prevalent. Generally in atmosphere temperature H<sub>2</sub>O bonding remains

in the character of cohesion. So modern science classifies it as one of the major elements though there is equal participation of remaining three major characters, fire, air and earth in Buddhist of point of view.

According to Buddhist micro-cosmology, whether it is an electron or an irreducible particle of a mass, there are always four major elements namely earth, water, fire and air. Such presence is equal in their proportion along with sub-elements such as colour, smell, taste and nourishment (energy) with variable intensity of participating elements. Thus the character of a matter i.e Gold, Silver, Iron etc. is determined by the intensity but not due to proportion or not due to mere addition of number of electrons.

Whether it is an atom or any other thing as much as equal to the size of Himalaya, as a whole, it is only one kind of “substance” or “matter” or “thing” it is perceived according to their ability i.e eye - colour, nose-smell, tongue - taste and the body nourishment (energy).

So the intensity of the major elements accompanied by sub-elements determines the quality of elements both physical as well as chemical right from Hydrogen to Uranium.

Thus, according to the Buddhist perspective an electron or an atom or a molecule or a mass, is nothing but a combination of four major characters that is extension, motion, cohesion and heat followed by sub-elements colour smell taste and finally nourishment (energy).

## BUDDHIST HYPOTHESIS

(with reference to Buddhist and modern Atomic Theory)

1. With reference to the Buddhist analysis of atom (as discussed throughout previous paper) the nature or character or physical as well as chemical quality of matter is not determined by mere number of electrons or by sub-atomic particles but on the basis of intensity of four basic elements air, water, fire and earth whether it is gold or silver and so on. Then the question arises here what is intensity? Here intensity means the number of revolution of electrons in the orbits. The number of revolution of electrons in every orbits

varies as the circumference of orbits increases in all other orbits starting from nucleus. That precisely means, for example in a solution atom two electrons in the first orbit electrons in outer orbits. The solitary electron in the ultimate third outer orbit would take bit more time to complete its orbit though all go round in the same speed in their orbits i.e 1,86,000 miles per second as per modern sciences assumption.

2. The role of fire element (atmosphere temperature) pressure, gravitation force all these factors should be taken for consideration. When fire element (heat) is made more and more active, then status of matter changes i.e solid liquid, fluid gas etc. So in the analysis of water molecule it would be more appropriate to say that water is nothing but method form of H<sub>2</sub>O bonding in atmosphere temperature, if we take the starting point of H<sub>2</sub>O bonding from solid state i.e from 0°C and in between 1°C to 100°C liquid and it again H<sub>2</sub>O bonding restores the original quality of air i.e motion without disfiguring the bonding nature i.e H<sub>2</sub>O.

3. Hence according to Buddhist perspective the classification of matter is nothing but mode of revolution of electrons and role of heat element but not only on the basis of number of sub-atomic particles available in an atom. It should be considered about pressure, gravitation also but normally modern science ignores the impact of these factors for determining the status of the element.

4. So, instead of changing the number of sub-atomic particles, if the speed of electrons or circumferences of orbit are adjusted then the characters of matter would change. In addition to this, if all the factors heat (temperature) gravitation, pressure, circumference and speed of electrons are changed there would be also changes in the character without changing the participants in an atom. This is what Buddhism calls the change of INTENSITY.

## A BRIEF STUDY ON ATOMISM IN JAINISM

In the Jain metaphysical terminology “Dravya” (substance), denoted as a real existence is considered as ultimate “Part” of a matter which is characterized by persistence through change. Jainism considers “Anicca” as a character of persistence. It establishes the non-absolutist realism on the basis of persistence through change.

Buddhism employs the term “Kalapa” as an irreducible particle of matter whereas Jainism employs “Dravya” literally means “substance” or “matter” or “thing” etc.

So “Dravya” means ultimate “part” of a matter. According to Jain perspective “substance” is a real “thing” not only on the point of view of it is being perceived through five senses but also on the basis of its dynamic reality with permanent substantiality manifesting itself through change, origination, and cessation. In their terminology they call it Utpada (origination) Vyaya (change) and ultimately Dravya, matter.

Jain philosophy classifies six ultimate substances as under

- |    |                       |                                                             |
|----|-----------------------|-------------------------------------------------------------|
| 1. | Dharmastikaya         | Medium of motion                                            |
| 2. | Adharmastikaya        | Medium of rest                                              |
| 3. | Akasastrikaya         | Space                                                       |
| 4. | Jivasatkaya<br>“soul” | Psychical existence, here they mean<br>as matter i.e Dravya |
| 5. | Pudgalatastikaya      | Physical existence (matter and energy)                      |
| 6. | Kala                  | time                                                        |

The first five categories in the above list are denoted by a technical term “Astikaya” which means real existence. We may note one thing that “SPACE” also is considered as “Astikaya” whereas in Buddhism it is “pannathi” it can be only “understood”. But Kala time has no plurality under Jainism hence it has no parts, hence it is no “Astikaya” real matter.

Each of those substances continues to exist and though they co-exist spatially and temporally, they are mutually inconvertible.

## MATTER AND SENSES IN BUDDHISM

Whether it is a chunk, of matter or one cubic centemetre of a matter, or wee particles of sub-atomic area, as far as Buddhist inquiry is concerned, it is a clique of rudimentary elements such as air, fire, water and earth, working according to its intensity. Hence the question what is matter? or what is an atom? may concern with different type of definitions in modern science. Buddhism, on the other hand defines that whether it is a bulk of matter or an ultimate irreducible matter of a particular element, it is nothing but a combination of four elements air, fire, water, and earth. So, according to Buddhist perspectives an atom consists of four elements rather than so-called electrons, protons, neutrons and so on.

Further, Buddhism defines that the presence of four elements is a simultaneous process either in a chunk of matter or in a wee particle of an atom and at the same time it is neither aggrandizement on sequential process coming up from space to earth following the development of elements right from space, air, fire, water, and finally earth.

The dimensional effect makes the sequential order based on the extension of element in different directions from an unmoving central point, other than any qualitative differences of the elements. Thus the Space; - spreads over to all the directions (for mathematic assertions we may assess that space spreads over to 5 directions).

**AIR** : It can move all four directions or Upward, Downward, Rightward and Leftward. So Air, From its centre point spreads over to 4 directions.

**FIRE** : Upward, rightward and leftward  
(Gravitation force never works on the movements of fire. Hence tip of the fire always is in upward position. So fire spreads over to 3 directions.

**WATER** : Top to bottom (either from left to right or from right to

left). So water spreads over to 2 directions.

**EARTH** : It is unmoving and static that is remaining in its central point. Hence it has one direction.

**SENSES AND ELEMENTS** : Physical body has evolved to perceive the external elements according to its nature i.e., solidity, fluidity and so on.

As discussed above, earth can be perceived by all the senses Eye, Ear, Nose, Tongue, and finally (Body) touching sense.

**Eye** : The Eye perceives volume of the earth or a solid thing taken for examination along with its colour.

**Ear** : The ear can hear (the sadda pramana of Pathavi, Prithvi, Bhoomi, like this, it can hear all the sound symbols of different languages denoting the element earth).

**NOSE** : Smell of the earth, during a sudden down fall one can