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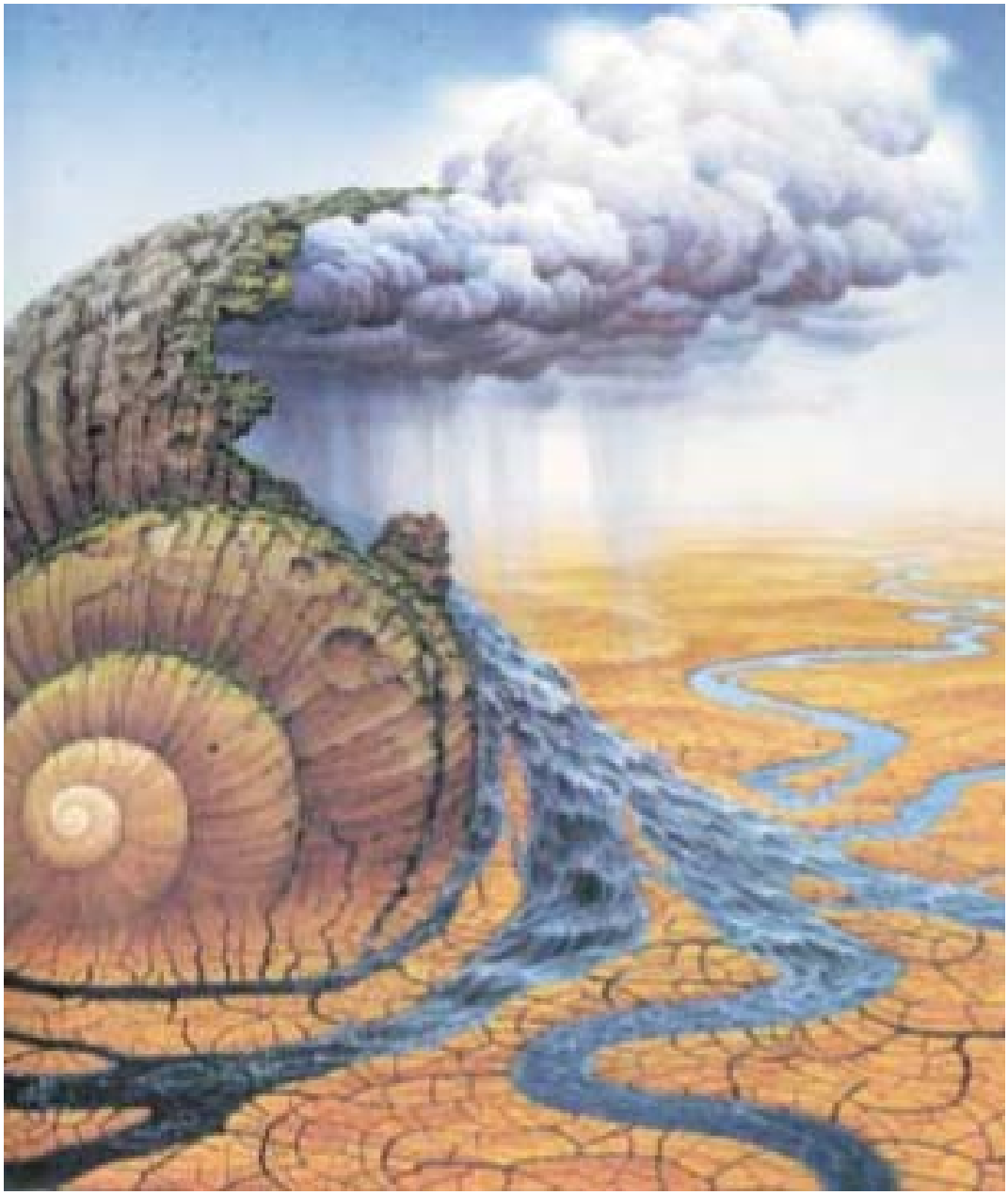

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CONTENTS

Rediscovering the Universe: the Beginning of the Final Revolution

Javed Jamil

The United States

Javedjamil@rediffmail.com; doctorforu123@yahoo.com

Abstract: The UTR is based on three main postulates: (1) The speed of light is not constant but rigid or stable, which will deprive light-speed of the status of the fastest achievable speed. (2) The universe is not expanding but rotating, a postulate that will make the universe a much-more-easy-to-understand, well-organised, well-knit unit; and (3) The gravity is an influence travelling with huge speed. [Nature and Science. 2006;4(1):1-22].

Introduction

The UTR is based on three main postulates: (1) The speed of light is not constant but rigid or stable, which will deprive light-speed of the status of the fastest achievable speed. (2) The universe is not expanding but rotating, a postulate that will make the universe a much-more-easy-to-understand, well-organised, well-knit unit; and (3) The gravity is an influence travelling with huge speed. This article describes the Philosophical Implications of the UTR.

1. Role of God

From time immemorial man has talked of God. Most of the humans have believed God created the universe and sustains it. A minuscule percentage of humans have argued that man created or invented God and their psychological and social needs sustain Him. In sciences too there have always been a huge controversy on the role of God in the creation and sustenance of the universe. The evolution of knowledge including natural sciences in the last two centuries has been under the influence of what I call Economic Fundamentalism. Industrial Revolution resulted in progressive strengthening of the grip of the industrialists over the world and the ideology they propagated. The impact of the economic fundamentalism on the growth and form of sciences has been one of the issues that I have discussed in my earlier works, "The Devil of Economic Fundamentalism" and "The Killer Sex". I feel it is worthwhile to reproduce parts of those discussions here:

"Science is the name given to the efforts for arriving at the truth and knowing the realities. It unfolds mysteries of nature and explains how scores of natural forces combine to maintain perfect harmonious equilibrium essential for the sustenance of the universe and the survival of all living beings. It teaches us how to avail ourselves materials and energies for different purposes. It would however be dangerous to presuppose that science is merely an informer and has nothing to do with our morals. What is incontrovertible is that science too, like religion, has been and is being misused by the vested interests. The dagger of blame falls not on science, but on those who misappropriate it. …….A general empathy towards religion that was the outcome of maledictory campaigns against it by the forces of economic fundamentalism influenced scientists too, who strove to present science as an antidote to religion. Religion had already been equated with orthodoxy and retrogression. It was therefore natural for the emerging edifice of science to maintain a safe distance from the faith. Hence, when science discovered that there exists a most wonderful equipoise in the universe that keeps life intact, that there seems to be a common cause of all the causes (or a common force behind all the forces), and the common cause has to be cognisant of the needs of all the creatures, scientists and philosophers named this common cause Nature. Had it been called God, the avowed antagonism of religion by science would have suffered a major setback. The acceptance of the One by science could have been a big boost for moralists. Materialists could have faced encumbrances in their naked pursuit of money. Thus, numerous laws governing the vast universe were labelled not as God's or Creator's Laws but the laws of Nature. The laws of gravitation and motion, for instance, were called Newton's Laws of Gravitation and Motion rather than the Creator's Laws, as if Newton created these laws, who in fact only tried to elucidate them. Despite all these attempts to banish God from the realm of science, the truth is that science cannot move an inch without assuming the presence of a being who is all-seeing, all-knowing, all-powerful, eternal, wise, calculating and all-pervading. It has only tried to infatuate itself by calling this omnipotent, omnipresent and omniscient being as Nature. Can science enlighten us how particles, or space, or waves forming "Nature"

possess faculties of intelligence and wisdom? Can it explain why all the physical laws remain the same everywhere in the universe. (Einstein's theory of relativity postulates that physical laws are the same in all co-ordinate frames all over the universe.) Science claims itself to be the truth and nothing but the truth, or an effort to arrive at the truth. But its signal failure has been its inability to recognise the greatest truth of the universe. It is not that science transformed its exponents into atheists. In fact, the greatest scientists of the world including Einstein, Darwin and Newton had an unshakeable belief in the presence of the One. But what their hearts were cognisant of, their pens could not describe in a scientific jargon. It was less perhaps because they found their belief scientifically untenable and more because they were scared of becoming targets of anti-religion elements that had a dominating presence in society. Both capitalism and socialism, the two great faces of economic fundamentalism had anathema for God whose fear and love created "unnecessary" impact on human morals."

The above was a part of a book written for the common people, and was not a work of Physics. The purpose of reproducing that is only to stress that the development of modern sciences has been in an environment of antipathy towards religion. It was therefore accepted as a fundamental principle by scientists all over the world that God has to be kept out of science at all costs. Heisenberg confirms this when he says:

"The mechanics of Newton and all the other parts of the classical physics constructed after its model started from the assumption that one can describe the world without speaking about God or ourselves. This possibility soon seemed almost a necessary condition for natural sciences to grow."

Why should natural sciences start on that assumption when there was no need to disprove God? Had God's existence been accepted, what bad could it have done to sciences? Still, sciences could have tried to understand "God's mind" and His creation and the laws that governed the universe. But this would have weakened the position of the economic fundamentalists against religion, which had belief in God as the foundation on which it rested. Religion posed huge risks to the advance of the economic designs of the forces of economic fundamentalism. Religion promoted morality, abstinence from certain practices like alcohol, gambling, extramarital sex and simplicity in life. All these things were seen as the foes of "development", and religion therefore was not acceptable. Faith in God and His punishment to the evildoers would greatly reduce the speed of the "growth". If scientists started confirming the existence of God, it would make life difficult for the big business. They will find it hard to promote consumerism and commercialize evils; there will be no place for bars, beaches, casinos, brothels, night-clubs and pornography in such a dispensation. The economic fundamentalists realised the huge commercial potential of human weaknesses, and would take every possible measure to use them for multiplying their wealth. Steps were taken at every level. At the legal level, the concept of Fundamental Rights was advanced with an unparalleled aggression in the ideological history of the world. Absolute freedom will give men and women freedom of choice in even choosing harmful courses. This freedom would in effect help the big business use their weaknesses for promoting their trades. The scale and tone of punishment for crimes was reduced and the scope of crimes continued to contract. Sex outside marriage, gambling, betting, sexual perversions, etc ceased to be crimes. The biggest challenge to their plan was posed by religion. It was therefore imperative to banish religion from society. When there was a huge campaign against religion and God at the social and political level, how could scientists be allowed to talk of God? The on-going battle between Church on the one hand and the Political, Economic, and Scientific community on the other further distanced sciences from God.

In spite of the general antipathy in the scientific community towards religion and God, sciences could never get free of God altogether. Top scientists couldn't keep away from talking of God. Einstein and Bohr had constant debates about the role of God in the formation and functioning of the universe. In response to the idea of uncertainty that Quantum Mechanics advanced, Einstein, in the now famous duel with Bohr, remarked, "God does not play dice". To this Bohr retorted, "Don't try to tell God what to do!" While discussing the laws of science as we see today without talking of God was not unavoidable, the creation of the universe automatically warranted such discussion. Let us try to sum up the position of the current Physics about the role of God.

Scientists have always wondered the beauty of the universe, especially how it has led to the creation or evolution of intelligent beings like us. There is a certain beauty in the underlying plan. John Polkinghorne says:

"…the universe, in its rationale, beauty and transparency, looks like a world shot through with signs of mind, and maybe, it's the "capital M" Mind of God we are seeing……..there is some deep-seated relationship between the reason within (the rationality of our minds - in this case mathematics) and the reason without (the rational order and structure of the physical world around us). The two fit together like a glove."

The laws all over the universe are the same. The Question arises why. In the theory of Big Bang, there

has not been an enough time for the distant regions to communicate with another, seeing that nothing can travel faster than the light, according to the theory of Relativity. Hawking says:

"Nevertheless, it leaves a number of questions unanswered: Why was the early universe so hot?

Why is the universe so uniform on a large scale? Why does it look the same at all points of space and in all directions? In particular, why is the temperature of the microwave background radiation so nearly the same when we look in different directions? It is a bit like asking a number of students an exam question. If they all give exactly the same answer, you can be pretty sure they have communicated with each other. Yet in the model described above, here would not have been time since the Big Bang for light to get from one distant region to another, even though the regions were close together in the early universe. According to the theory of relativity, if light cannot get from one region to another, no other information can. So there would be no way in which different regions in the early universe could have come to have had the same temperature as each other, unless for some unexplained reason that happened to start at the same temperature."

Hawking has progressively grown into an agnostic as far as the role of God is concerned. He has been busy finding solutions in which the universe could be thought to have had no beginning. In the above writing, he has raised an interesting example of students solving the same question with the same answer. If they have responded with exactly the same answer, there can be two reasons. First reason has been given by Hawking that is they must have had communicated with one another. But if there can be a surety that they could not communicate with one another, then what? There still remains a possibility, and that possibility is that they might have received the dictation from the same source.

In the Big Bang models based on the General Theory of Relativity, singularity was unavoidable. Penrose-Hawking Theorem proved that singularity at time zero is inevitable and that time-space fabric would break down at the singularity. The Big Bang could not have occurred, it was argued, without the creation by God. But this position has not been acceptable to those who do not want the existence of God within the realm of sciences. So, efforts have been on led by Hawking to find solutions where we can have a no-boundary situation for the universe. Hartle and Hawking proposed a situation where the dimension of time becomes fuzzy turning into a fourth spatial dimension as we approach towards singularity. At that point, time becomes meaningless. And that makes Hawking swell with confidence, which made him remark, "So long as the universe had a beginning, we could suppose it had a creator. But if the universe is really completely self-contained, having no boundary or edge, it would have neither beginning nor end: it would simply be. What place then, for a creator?"

But the truth remains that even this proposition does not abandon the concept of the beginning of the universe altogether. Because there again is an event where time becomes meaningful from a meaningless situation and the universe can be considered to have begun when the time becomes meaningful. The position of scientists regarding the beginning of the universe due to Divine creation has been conceded in an article written to counter the more popular belief. The article captioned "Theism, Atheism and the Big Bang Cosmology" by Quantum Smith, published in Australian Journal of Philosophy, March 1001 says:

"The idea that the big bang theory allows us to infer that the universe began to exist about 15 billion years ago has attracted the attention of many theists. This theory seemed to confirm or at least lend support to the theological doctrine of creation ex nihilo. Indeed, the suggestion of a divine creation seemed so compelling that the notion that 'God created the big bang' has taken a hold on popular consciousness and become a staple in the theistic component of 'educated common sense'. By contrast, the response of atheists and agnostics to this development has been comparatively lame. Whereas the theistic interpretation of the big bang has received both popular endorsement and serious philosophical defence (most notably by William Lane Craig and John Leslie, the nontheistic interpretation remains largely undeveloped and unpromulgated."

Another important discussion is centred about the Anthropic Principle. Before the 16th Century, the general understanding of man’s position in the universe was based mainly on theological and other ancient concepts, which were represented by Ptolemic principle. This principle states that we have a privileged position, perhaps in the centre of the universe. Galilee and Copernicus countered this and went on to pronounce that we have no privileged position in the universe. They argued that the part of universe we are living in was like any other part of the universe. But the 20th century cosmology again led to a visible transformation in thinking. It was argued that we ourselves are in fact the products of the evolution of the universe, and had we not been there, there would have been none to appreciate the beauty of the universe. This position is represented by three principles called Anthropic Principles. These three are Trivial, Weak and Strong. Trivial principle regards the existence of human beings as nothing but a mere datum and does not give it any other significance. The Weak and Strong

Anthropic principles are based on the acceptance that the existence of human beings is extraordinary. The creation of the human being depends upon a series of striking coincidences. Hawking says, "The remarkable fact is that the values of these numbers seem to have been very finely adjusted to make possible the development of life." The striking coincidences that led to the formation of intelligent life have been briefly summed up on a website, "St John in Wilderness: Physics and Faith":

"Elements up to Lithium-7 were produced in the Big Bang. All heavier elements were made later inside stars. Hence all of us are "star-stuff". Most of the molecules making up our bodies using elements manufactured in an earlier generation of stars that enriched the interstellar medium through their stellar winds or when they died in supernovae. Our own solar system then formed from this enriched interstellar medium, which contained the elements necessary for life…. However, the synthesis of the heavier elements is difficult -- the only reason they are produced at all is the extraordinary coincidence that carbon has an energy level that is nearly the same as the energies of three alpha particles (helium nuclei) inside a star. This correspondence allows the reaction: three Helium-4 nuclei colliding to form one carbon-12 nuclei (3 4He ----------> 12C) to occur with a high enough probability that a reasonable amount of carbon can be made, and from carbon, still heavier elements. (Physicists say the "cross-section" for the process is resonant, which is a consequence of the matching of the energy levels).

"Paul Dirac (1902-1984), one of the founders of quantum mechanics, noted that very large dimensionless numbers often arise in particle physics and cosmology. For example, ratio electrostatic force/gravitational force between a proton and electron=0.23x1040; ratio of cosmological distance horizon ("radius of the universe") and "classic electron radius"=3.7x1040. It can be shown from the physics of stars that these large ratios are required for the lifetime of the average star to be in the range of billions of years. The rate of expansion of the universe is to be such that several generations of stars have time to age that is, the laws of physics and the initial conditions of the universe seemed "tuned" to allowing several generations of stars to live and die (a requirement for the production and dissemination of the heavier elements). The lifetime of an average star has to be sufficiently long to potentially allow a process such as the evolution of life to occur."

Hawking describes the extraordinary combination of coincidences as follows:

"… For example, if the electric charge of the electron had been very slightly different, stars either would have been unable to burn Hydrogen and Helium or else would not have exploded. Of course, there might be other forms of intelligent life, not dreamed of even by writers of science fiction, that did not require the light of star like the Sun or the heavier chemical elements that are made in stars and are flying back into space when the stars explode. Nevertheless, it seems clear that there are relatively less ranges of values for the numbers that would allow the development of any form of intelligent life. Most sets of values would give rise to universes that, although they might be very beautiful, would contain no one able to wonder at that beauty. One can take this either as evidence of a divine purpose in Creation and the choices of the laws of science or as support of the strong Anthropic principle."

But even the arguments of strong and weak Anthropic principle have been dismissed by those who do not want to see any Designer behind all this design. They try to explain this on the basis of random selections. For example, the same website ("St John in Wilderness: Physics and Faith") counters this on the basis of Execution Parable. L:

"A perspective on the explanations of "many universes" or "many domains" (Weak Anthropic Principle) versus a Designer (Strong Anthropic Principle) is offered by the Execution Parable of philosopher John Leslie….. You are blindfolded and about to be executed by ten expert marksmen aiming at your chest. The officer gives the order to fire the shots ring out, and you find you are still alive, unscathed! What is the rational explanation for your survival? Leslie suggests there are only two rational explanations: there were an enormous number of executions that day. Occasionally even the most expert marksman will miss, and you happened to be in the one execution where all the marksmen missed, (and second that) your survival was intended and the marksmen missed by design."

This is difficult to understand however why there is insistence on finding a solution without God when a solution with God deals problems much easily. For example, scientists try to argue that coincidences and accidents, random selections can occur repeatedly in a way that it can lead to evolution of a better and more intelligent life. But they are not ready to accept that more than the probability of finding innumerable number of such coincidences in a way that they lead to what is desirable, the more probable is the presence of a Being who is designing this. This is like assuming numerous coincidences that led to the making of car rather than accepting that it has been designed and manufactured by a company.

It is also entirely incomprehensible why Occam's Razor is also disregarded while discussing the role of God. According to the well known scientific principle, "Pluralitas non est ponenda sine neccesitate". This

means the number of entities required for explaining anything must be kept at minimum. If there are many ways to explain something, the easiest and straightest one should be preferred. If there are many roads to reach a specific point, the straightest one should be used. This principle was described by a mediaeval philosopher, Occam of Razor, and is still regarded a strong principle in all sciences. Why then is this principle forgotten when we find that the easiest way to describe the creation and evolution of the universe and intelligent life within it is to accept the presence of an All-Knowing, All-Powerful, Wise God.

2. The UTR and God

Though even based on the knowledge of the universe we have till this date, it is easier to accept than not accept God, the UTR can prove to play a decisive role in arriving at the truth. The UTR says that the universe as a whole rotates on its axis. It is this rotation, which has led to the creation and sustenance of the universe, and is responsible for all the properties of the universe as a whole and its parts. Now, the rotation requires regular supply of energy from outside. Thus the universe exists because it is rotating due to an incessant supply of energy from outside the universe, and would cease to function as soon as this supply is discontinued. As the supply of energy is stopped, the Uniglobe will stop rotating and all its components will lose their individual and collective properties. The universe will be dead. The rotation of the universe as a whole thus leads to two fundamental conclusions. First, if the Uniglobe is rotating, it must be rotating relative to a preferential frame of reference that surrounds it on all sides. Second, the universe is having an uninterrupted supply of energy from that external source. That external source can be none other than God.

The UTR completely and dramatically changes the relationship between the universe and God. While all the theories of Physics describe the parts of the universe, their properties, their motions, etc, the UTR in addition describes the universe as a whole (Uniglobe). The universe becomes an entity in itself, which can be seen separately from its components. Its relationship with the Creator becomes more profound and subtler. The universe does not merely remain a container of matrices and forces that it is, in accordance with the present theories, but becomes an existence in itself that bows to God, by rotating itself relative to Him, in response to the supply of provision to it. The universe and God become intimately connected. The former becomes a well-organised state and the later its majestic king. The role of Creator is not limited to somehow cause the beginning of the universe or the Big Bang, after which the universe takes control of itself and the role of God ends forever. In the aftermath of the UTR, it can be seen that the role of God becomes permanent. It ceases not for an iota of time anywhere in the universe. He makes the universe rotate and creates it. He keeps rotating it by continuous supply of the provision for its existence. If the laws in the universe are regularly in force and the energy and mass retain their status, it is on the account of the continuous rotation of the universe at God ‘s behest. Ultimately, He may choose the time of its death and preside over its demise by deciding to abruptly suspend or terminate the supply of energy causing the rotation of the universe to stop within no time. The universe will not die because the entropy would ultimately become universal, as demanded by the second law of thermodynamics. It will also not die because, due to long, continuous burning of fuel, stars will lose their lustre. Finally also not because, due to freezing of the planet, animals and planets including human beings will be deprived of the source of their life. The universe will take its last breath because God may decide enough is enough. He may think of replacing it with another kind of the universe with another set of laws and principles. Or He may want to resuscitate the world to see what they did in the previous world.

According to the current theories based mainly on General theory of Relativity, the universe even when it began had certain properties that were not well defined though, because they were infinite, mathematically. But the universe existed as a singularity, which had infinite mass-energy. How can it be called a non-existing universe? It was in fact existing from an infinite time. It can be argued that time did not start at the Big Bang but started its ticking in a way that it could then onwards be measured. The universe then existed at the singularity; the Big Bang only led to its huge expansion. That was no creation of the universe itself, but the beginning of the creation of the components of the universe. In a way, it can be said that the universe ceased to exist as a single body after the Big Bang, and instead transferred its life to its individual components. The Big Bang, in a way, was not the birth of the universe but its death. In the UTR instead, the universe had real birth, and the time had real beginning. The universe before had no structural or functional existence, and time had no existence at all. The process of the birth began as son as the universe began to rotate. The process of creation of the universe had three main stages: Pre-(Big) Burst stage, Big Burst and Post-Burst stage. Pre-Burst stage can be regarded as the foetal stage, and at the Big-Burst, the universe was delivered. Then followed the growth of the universe.

It is interesting to see how the UTR blends physics and metaphysics together. It establishes a lasting,

never-ending relation between God and the universe. God supplies the universe the provision for its existence and the universe thanks Him by rotating relative to Him, which is its bowing or prostration to God. The UTR has proposed that every particle tries to achieve the highest speed possible and goes towards the periphery of the universe; this speed is slowed by its own weight and the effect of the surroundings on it. Metaphysically, as soon as God started distributing the provision, all particles speeded to receive their shares, and thanked God by rotating individually and collectively relative to Him. It is this combination of providing by God and thanking by the creatures that sustains the universe.

What was the purpose of the creation? Why did God create the human being? These are questions that again lead to the overlapping of physics and metaphysics. Some take the existence of the human being as the sign of God, others the result of Strong Anthropic principle. The UTR takes this to new heights. Before the beginning of the rotation of the universe, God was alone. There was none to recognise Him, to describe His creative designs, His bounties and His powers. He made a plan so that he would be recognised. First he created the universe, which recognised Him by prostrating to Him and by following the Laws He decreed. Every single particle and portion of space would rotate with the rotation of the universe relative to Him, which in a way meant submitting to Him. Their submission, however, was of lesser quality, as they submitted not out of their free will but by their inherent nature.

God's plan would ultimately lead to the creation of an intelligent being who would have the free

will to submit or not submit to the commands of God. All the particles that formed man would still submit to the Creator by rotating along with the rotation of the universe, individually and collectively with its group. But at the social and personal level, he would be free to work in accordance with the demands of God or those of his own wishes. This would give him a privileged position. He would be bestowed upon the intelligence to appreciate the beauty of the creation, to study how it works, to try to know how it was formed and to comprehend his own nature and his relationship with the universe and its creator. Thus the UTR would combine temporal with spiritual and physical with metaphysical.

Another interesting combination of physical and metaphysical is the fact that there is a relationship between God and the components of the universe based on the principle of collective existence. Atom has a nucleus at the centre, which can be described as the leader of the atomic world. The stars are the leaders of the stellar systems, and stars form galaxies, galaxies clusters and clusters super clusters. Superclusters or even larger structures like the proposed Megagalaxy form the universe. So every particle is submitting to the God individually as well as collectively in various groups. The Uniglobe submits to Him with all its constituents. God may choose in the next universe a principle by which every individual particle rotates separately relative to God.

God does not play dice nor He needs to be told what to do. He knows what He wants, and how this has to be done. He makes man exist. He provides him the means to survive-- to admire the beauty of His creation, to ponder over the mysteries of His Empire and to endeavour to know His Mind. God has programmed man's life but has given the keyboard and the mouse to him to let him function with sufficient freedom.

3. Time

Time is the vehicle in which everything that exists has to travel. It is the grinder that breaks, forms and reforms everything and every event. It is an experience, which every conscious individual does realise and every particle does undergo through. The human behaviour turns time not only into an objective observation but also a subjective feeling, which differs from individual to individual. The same period of time can be expressed differently by different individuals; and differently at different times even by the same individual. For humans, time laughs and cries; time runs, crawls or stops; time brings new hopes or new fears; and time sleeps or awakens. Time may even rule our lives or submit to our dictates. For most, at times time blossoms and at times it withers. Whether one is capable of defining it or not, every living and nonliving thing except the dead perhaps knows what time is. Depending upon its magnitude, it becomes moments, hours, days, weeks, months, years, centuries and eras. When time indicates developments without any pattern, it becomes history; when it represents transformation with a visible pattern, it is called evolution. The history of the evolution of the knowledge of time is interesting.

In terms of physics, time is an entity that gives us an idea about the rapidity of the change of an event or events and the position of an object or objects. Time was considered absolute in Newtonian Mechanics. With the transformation of the three-dimensional space into a four-dimensional one, time lost its absoluteness with the beginning of the era of Relativity. Here we shall discuss what impact the UTR will have on time and the Arrow of Time.

The first question arises: When did the time begin? The current theories based mainly on the Einsteinian ideas of General relativity and Hubble's idea of the expanding universe describe the initiation of Big Bang

as the initiation of time. At singularity, there was no time, which as explained before, in fact meant that time was not measurable. It is argued that time-space continuum had broken at the singularity so that no laws of nature could be perceived. It will therefore be safer to conclude that, according to the Big Bang models, time was already there but was moving with zero speed, that is, it had temporarily stopped moving or was moving with an immeasurably slow rate. At the Big Bang, the clock of time started ticking; the time became measurable. It became a part of the time-space continuum, and has since then been moving. Now, it leaves two questions unanswered:

First, whether time was at any time in the past measurable before the Big Bang or not. Was singularity a result of the collapse of an earlier universe? In that case, time did never in fact die, but only collapsed as a measurable property, measurable through the means that now exist in the universe.

Second, is there any universal time as such? We know from Einstein's theory that time is not absolute but relative, with its value being different in different co-ordinate frames depending upon their speeds. The faster the speed the slower the clock ticks. There is no scope for considering a universal time, which can regard time as a universal phenomenon, related to the state of the universe as a whole.

The UTR answers the questions in an entirely different conceptual framework. It has proved that the universe is rotating as a single body (Uniglobe) on its axis. This rotation of the Uniglobe is responsible for the existence of the different components of the universe individually and collectively and the universe as a whole. There was a time when the Uniglobe had not started rotating yet. It was a non-living, non-moving container having in it a haze of matter without properties. Then the universe was given a switch-on signal, and it started rotating. The process of the birth of the universe commenced, and with it commenced time. Thus, unlike the Big Bang theory in which time existed at singularity but was moving with zero speed, in the UTR, time had no existence at all. Space was there but it had no property. With the rotation of the universe, not only did the time begin but also the space become alive; then this combined birth of space and time combined them together into a four-dimensional universe.

Secondly, the UTR visualises the universe not as mere container of the huge number of parts, but also as a single body, which has its own properties apart from the priorities of its parts. There is therefore a universal time as well apart from the times of individual components. This universal time determines the progress of the existence of the universe.

Relative time too assumes a novel proposition in the Universal Theory of Relativity. Einstein's theory describes time only as dilating with the speed. In the UTR, as the universe rotates, different zones of the universe rotate with different speeds. The zones that are away from the axis rotate much faster than the zones that are nearer to the axis. In the areas closer to the periphery of the universe, the time runs much slower than the areas closer to the axis. It leads to interesting results. Our zone may be in a position, relative to which there are certain zones moving faster and others moving slower. So if somebody is able to somehow reach a zone with higher speed, his age will pass more slowly than on the earth. If he wishes to make sure his attending the wedding of his grandson, he can go to a planet in the faster zone, and after passing a few years there, he may come back. While his own age in that period might have passed only a few years, the age of his grandson, would have increased several fold. It will be possible for him to see events and meet persons, which would not have been possible for him had he continued to live on the earth. He has another option, if he does not want to travel. He may send his grandson to a planet lying in the slower zone for a few years. When he comes back, he would have grown by several years compared to a situation if he had passed all his life on the earth. Christians and Muslims may rest assured that Jesus is living in a place lying somewhere in the faster zone, and at the time of his Second Advent, he will still be young enough to show to the world the light of hope.

It is also interesting to note that the subconscious mind of the human beings experiences time to be moving much more slowly than does the conscious mind. Whenever one wakes after a deep sleep, one is often amazed to see the clock; one finds it difficult to realise that one has slept for so long. This may be explained by the UTR in an interesting way. Our conscious mind is accustomed of seeing objects, which are moving very slowly. The zone of the universe in which our planet moves is rotating at the speed of about 420,000 kms/hr. When we fall asleep or unconscious, our subconscious mind starts experiencing the effects due to the extremely fast speed of our zone. One therefore feels time to be passing at much lesser speed than when one is awake and conscious. The same effect takes over when one is too much engrossed in some activity of one's choice.

4. Arrow of Time

The events observed in the universe can be mainly of two categories: reversible and irreversible. Irreversible events are described by what is known as Arrow of Time. This indicates that the time flows in a particular direction. Reversible events are common in the universe, such as the motion of planets around the

Sun, changes of season, events observed in Newtonian, Einsteinian and Quantum mechanics. Time is not considered important, as the events can be reversed. Irreversibility on the other hand is a notion, where the time makes the event change only in one direction. If a cup is broken, the cup cannot be brought back to its former position, if the milk is soured, it cannot be reversed to its original taste and transfer of heat cannot be from the cooler to the hotter body. All the chemical reactions are examples of irreversible processes. Similarly, Hubble's Law is considered an example of irreversible processes. There are many types of the arrows of time such as Thermodynamic, Psychological, Social, Biological and cosmological. In Physics, usually three of them are discussed: Thermodynamic Arrow of Time, Psychological Arrow of Time, and Cosmological Arrow of Time.

The larger part of the universe is considered by Thermodynamic Arrow, which is based on the second law of thermodynamics. This means the entropy of the universe always increases with time. There is always an irreversible flow from Order to Chaos. This is considered now to be a fundamental property of the universe.

Psychological Arrow of Time is the one, which makes it possible for us only to remember the past and not the future. This means we cannot know of an event before it has occurred, though we can predict a future event on the basis of the knowledge we have of the past events.

The Cosmological Arrow of Time tells us that the universe is expanding and not contracting. Events of the universe can be understood only in the expanding phase. All celestial objects are going away from each other; and it is because of this property of the universe that life has evolved.

In the UTR, the universe has stopped expanding after the big burst or is expanding slowly, and is at the same time rotating around its axis, which and not the expansion is its chief characteristic. It can therefore be said that the Cosmological Arrow of Time is in fact rotating and not moving in the linear direction. It is this rotation, which in fact makes it possible for events to be reversible and irreversible. All arrows of time are related to the rotating cosmological Arrow of Time. Even irreversible processes show a kind of recycling. For example, the matter keeps circulating in the living bodies. In terms of space-time, nothing is in fact reversible, because if the process is repeated, it can be reversed in appearance but the position of the event relative to the other parts of the universe has changed, due to the various motions.

It can be argued that all the arrows of time have their origin in the cosmological Arrow of Time. As has been stated above, the cosmological Arrow of Time in the UTR is different from the Big Bang physics. In the Big Bang cosmology, the universe is expanding, in the UTR cosmology rotating. How would an expanding universe give rise to a universe in which every body and every group of bodies is rotating? How could in an expanding universe anything other than thermodynamic arrow occur, which only increases Disorder? Disorder is bound to increase, as there is nothing that can help the universe avoid it. In UTR, on the other hand, the on-going entropy will be resisted by the continuous supply of energy that passes through the rotation of the universe from outside to the innermost inhabitants of the universe. Thus the rotating universe gives rise to another arrow of time, which can be called Spiritual Arrow of Time. The universe thus has mainly two arrows of time, one is Cosmological Arrow of Time, and the second is Spiritual Arrow of Time, which are opposite to another. The former is due to the change in position due to the rotation of the universe, and the second is due to the energy supplied through it, which tries to maintain order in the universe at every level. Had the universe not been rotating or starts rotating at a decreasing rate, the disorder will proceed much faster than it is proceeding now, and the entropy would have by now reached a very high level. Furthermore, if the Spiritual Arrow of Time had not been there, the evolution of the conditions for the evolution and survival of living beings would not have been possible. Furthermore, it is the Spiritual Arrow of Time that keeps the living beings survive till the ageing process takes over them, and then when they have died, it recycles the matter into new lives. It is this arrow that allows living beings to reproduce and sustain their species despite the fact that the total matter forming them does never change in amount in the earth. This arrow is also responsible for the social behaviour of man, which is also influenced by Thermodynamic Arrow of Time. The latter tries to bring disorder into human life by trying to mix all things, while the former tries to bring order by distancing the harmful and useful things from one another.

This can be argued that the change in the state and not the reversibility or irreversibility is the fundamental property of universe. Change may be from Order to Disorder and from Disorder to Order. Even the so-called reversible processes represent change because, while with the passage of time, they can appear to have come back to the previous state, the truth is that the state has changed, on the account of the fact that position and time both have changed.

Thus while Thermodynamic Arrow of Time is one of the fundamental properties of the universe, the new Spiritual Arrow of Time will be an even more

fundamental property, which impedes the increase in entropy. This is also responsible for the uninterrupted, undiluted and incessant enforcement of the laws of nature and incessant possession of properties like mass and energy by the constituents of the universe.

Another question arises here: did the universe originate from a highly disordered state or highly ordered one. Though, both possibilities have been proposed in the Big Bang theories, the beginning from an ordered state has been stressed as a greater possibility. If the universe had begun at a disordered state, then the entropy, according to the second law of thermodynamics would have increased more or at least remained the same. The present relatively low-entropy state of the universe would then have become incomprehensible. In the UTR, this question again assumes a different status. The creation of the universe with its stages from pre-Burst to post-Burst stage would surely increase the Order and decrease the entropy. But then the entropy started to take over. The order came first and then did the entropy, and not the vice versa.

What requires explanation, is not the movement of the universe towards higher entropy towards an increasingly probable state of disordered state, but why the entropy today is so low, and why the universe is at present in such an unlikely state. It will be worthwhile to quote from "Quantum Physics: The Nodal Theory" by Hector C Parr:

"……..We decided that the temporal asymmetry was not due to any of nature's fundamental laws, but rather to the very special state of the universe, at the present time, a state of low entropy, with significant temperature differences and gravitational instability. This state of affairs must ultimately be due to boundary conditions existing immediately after the Big Bang, conditions, which, until we know their underlying reasons, seem highly unexpected. If the universe had started out in what seems to us, a more reasonable state of randomness and disorder, then long ago it would have reached a state of equilibrium, with all the matter condensed into one gigantic mass or black hole, or with everything at the same temperature so that nothing of any significance could ever happen."

We cannot offer this explanation assuming that energy cannot be created or destroyed. If the entropy has remained low, the UTR presents an easy answer. The world by itself is sure to increase in entropy unless there is a regular process of sustenance. With the universe continuously in an accelerated state owing to its rotation made possible by an uninterrupted supply of energy from outside, there is a process of Sustenance (represented in the UTR by the Spiritual Arrow of Time). This maintains the universe in a low entropy state. While the entropy leads to decay, Sustenance leads to the maintenance and rebirth of the decaying material. It will be worthwhile to also quote from an article by M. Waldrop here. He says:

"A laser is a self-organising system in which particles of light, photons, can spontaneously group themselves into a single powerful beam that has every photon moving in lockstep. A hurricane is a self-organising system powered by the steady stream of energy coming in from the sun, which drives the winds and draws rainwater from the oceans. A living cell—although much too complicated to analyse mathematically—is a self-organising system that survives by taking in energy in the form of food and excreting energy in the form of heat and waste…….

"The second law asserts that all of nature is on a one-way ticket to disorder and decay. Yet this does not square with the general patterns we observe in nature. The very concept of "entropy," outside the strict limits of thermodynamics, is a problematic one.

"Thoughtful physicists concerned with the workings of thermodynamics realise how disturbing is the question of, as one put it, 'how a purposeless flow of energy can wash life and consciousness into the world.' Compounding the trouble is the slippery notion of entropy, reasonably well defined for thermodynamic purposes in terms of heat and temperature, but devilishly hard to pin down as a measure of disorder. Physicists have trouble enough measuring the degree of order in water, forming crystalline structures in the transition to ice, energy bleeding away all the while. But thermodynamic entropy fails miserably as a measure of the changing degree of form and formlessness in the creation of amino acids, of micro-organisms, of self-reproducing plants and animals, of complex information systems like the brain. Certainly these evolving islands of order must obey the second law. The important laws, the creative laws, lie elsewhere."

It cannot be overemphasised that the UTR will prove to be an important chapter in the book of energy. It will help understand all the intricacies of the natural processes involved in the survival and flow of energy.

5. Quantum Mechanics

Apart from Classical Mechanics and Relativity, Quantum Mechanics is the third important branch of Physics, which has proved most successful in practical terms but equally controversial in the philosophical arena. Quantum Mechanics deal mainly with the matter and radiation at the atomic level. The development of Quantum mechanics
has led to several fundamental concepts. The most important of them are:

discreteness of energy

the wave-particle duality of light and matter, and Heisenberg's Uncertainty Principle.

The spectrum of light emitted from energetic atoms is composed of individual lines of colour. It is not continuous. These individual lines represent the discrete energy levels of the electrons in those excited atoms. When an electron in a high-energy state jumps down to a lower one, the atom emits a photon of light, which corresponds to the exact energy difference of those two levels. Thus energy is not released as continuous emission, but in certain bundles called quanta. When an electron jumps from one higher state to the lower-energy state, a photon is released having the energy equal to the difference between those two states. It is this principle, which has given the name Quantum Mechanics to the study of the atomic particles and radiation. It is also the fact that electrons can only exist in some discrete energy states that prevents them falling in the nucleus.

The second important component of the Quantum mechanics is the duality of electromagnetic radiation. In 1923, Loui De Broglie hypothesised that a material particle could also exhibit wave-like properties. In 1927, Davisson and Germer showed that electrons could behave as waves indeed. On the other hand, light was also exhibiting particle like behaviour. It necessitated the duality of light, which sometimes behaved as wave and sometimes as particle, It was argued that light actually acts as a particle and the wave in fact represents only the probability of finding it at a certain position.

The third important constituent of the QM is the Heisenberg's uncertainty principle, which states that the position and momentum of a particle cannot be measured simultaneously with precision. This was because, at least one photon was required for measurements, and that photon would change the position and velocity of the particle. If we shorten the wavelength, the measurement of position becomes more precise and that of momentum less precise, and vice versa.

Quantum Mechanics led to huge debates, as it challenged many of the previously held philosophical views. Uncertainty principle was presented as representative of the objective uncertainty of nature. It was advocated that one cannot know the truth of nature, as uncertainty is inherent in nature. This and the wave-function-collapse, the formulation of Bell's inequalities and subsequent evidences that they are violated caused an enormous controversy over determinism. It was argued that Quantum Mechanics proved the indeterministic nature of nature, a position that was aggressively opposed by a number of scientists, led by Einstein. He once wrote to Born,

"The quantum theory provokes in me quite similar sensations as in you. One ought really to be ashamed of the successes, as they are obtained with the help of the Jesuitic rule: 'One hand must not know what the other does.'"

The great debate reached a flash point in Copenhagen Interoperation with Bohr being its chief architect. Describing the basic premises of the Interoperation, Darrell Rowbottom says:

"….there are certainly salient characteristic features that most physicists would understand as being 'Copenhagen' in origin:

It is assumed that the wave-function is a complete description of the quantum mechanical state of an individual system or an ensemble of systems prepared in the same fashion. …..To be more direct, this is a statement that any parameters in addition to the wave-function, which would further specify a quantum mechanical state, are not necessary. Feyerabend agrees, in his description of this interpretation 'A quantum system does not possess any properties over and above those that are derivable from its wave function description.'

Complementarity between particles and waves is introduced; a quantum entity is described as either a particle, or a wave, depending upon the circumstances. ....My favourite definition of 'wave-particle duality', put forward by Tipler, is: 'Everything propagates like a wave and exchanges energy like a particle'. Bohr's definition, however, was not nearly so precise; he made no reference to situations other than interference experiments in his discussions and furthermore, as Jammer notes: 'Bohr never gave a clear-cut explicit definition of the term "complementarity".' It is important to emphasise that Bohr, himself, did not necessarily believe that it was correct to refer to a quantum mechanical entity as being either a wave or a particle, but rather it was the best way to discuss them in terms of established classical concepts: 'The quantum theory is characterised by the acknowledgement of a fundamental limitation in the classical physical ideas when applied to atomic phenomena. The situation thus created is of a peculiar nature, since our interpretation of the experimental material rests essentially on the classical concepts.' …Nonetheless, it should be noted that the two classical concepts of 'wave' and 'particle', in the sense which complementarity employs them, are considered to be mutually exclusive. But why should we try to explain quantum mechanical entities in terms of just these classical ideas? This is an arbitrary decision, which proves to be restrictive. As Home correctly points

out: 'It is… possible to go beyond Bohr's wave particle complementarity by not adhering to classical pictures but still retaining visualisability in terms of wave and particle amenable to an event-by-event realist description.

Any apparent interpretation problems that are based on classical thought are dismissed as being 'wrong'. Squires elucidates, 'If we abandon them then we will have no problems. Thus questions which can only be asked using classical concepts are not permitted.' This statement should not be seen to imply that classical physics cannot be considered, in principle, to be a 'special case' of the quantum mechanical theory. No explicit attempt is made to say that the correspondence principle is invalid; thus we are still permitted to expect that the results of quantum mechanics will reduce to those of classical mechanics at a certain parameter limit. The foremost analogy of such a 'classical limit' is the reduction of special relativity to Newtonian Mechanics in the limit of velocities, which are a small fraction of the speed of light, such as those experienced in daily life on Earth.

An anti-realist stance is adopted, and the results of measurements are taken to be the only valid concern in quantum mechanics. In fact, a broader statement is implied, that physical theories should only be concerned with predicting reproducible results that can be empirically tested; this approach mirrors that of the logical positivist 'Vienna Circle', which was very philosophically active in this period. In the words of Bohr: 'The entire quantum formalism is to be considered as a tool for deriving predictions.' …No direct comment is made regarding the physical reality of fundamental particles, or their properties such as mass, charge, or spin. On the contrary, as Home explains, it is assumed that there is 'no physical reality to dynamic properties (position, velocity, energy) of a quantum system, unless they are measured'.

The act of measurement itself is conveniently ignored; no credible explanation of what constitutes a measurement is included. Bohr himself relied on the explanation that the measuring apparatus was 'classical'… 'The essentially new feature in the analysis of quantum phenomena is… the introduction of a fundamental distinction between the measuring apparatus and the object under investigation. This is a direct consequence of the necessity of accounting for the functions of the measuring instruments in purely classical terms.'

In the Copenhagen Interpretation, it can be argued that Quantum Mechanics is considered completely separate. Copenhagen Interoperation was in fact a work of the ideology of Bohr, who went on to say:

"'There is no quantum world. There is only abstract quantum physical description. It is wrong to think that the task of physics is to find out how nature is. Physics concerns what we can say about nature.'

Einstein was a great opponent of Bohr's ideas. Describing their debate over the issues related to Quantum formalism, Home sums it up:

"Bohr's pragmatist thesis was too anthropocentric for Einstein. Einstein held that the primary aim of physics is to construct theories that "approximate as closely as possible to the truth of physical reality." For Bohr however the main task of physics is to enable us to make sense out of our empirical or perceptual experience. He did not contest that our experience is of an independently existing physical world, but unlike Einstein, Bohr was reconciled to a non-realist and acausal representation of quantum events in terms of a self-consistent, mathematical formalism.' Darell Rowbottom says, "Like it or not, the aggressive tone with which I refer to both Bohr, and his vain 'interpretative' attempt, is unashamedly intentional. The Copenhagen interpretation is not really an 'interpretation' at all, in any meaningful sense of the word. It is simply not acceptable to say 'Do not ask that question', and give no logical reason why the question cannot be asked; this is the behaviour that one would expect of an irate secondary school teacher. Deception and illusion, smoke and mirrors, these are the tools that are employed by the anti-realists in this curious intellectual game. If Bohr and his cohorts truly believed that the purpose of physics is only to gain predictive power, then why bother wasting time in adopting an 'interpretation'? Merely to satisfy the 'ignorant'? Is it not indicative of the dishonest nature of this entire process that, rather than make a clear 'Copenhagen Dictum', which would presumably have stated 'Get on and do the maths', the adherents to this orthodoxy instead entered into a misleading discourse designed to 'comfort' its victims? This wasteful exercise in 'swings and roundabouts' only served to convince scores of intelligent people that it was simply safer to toe the line than it was to question High Priest Bohr, or his flock."

Einstein was disillusioned with Quantum Mechanics, as he did not like the idea of abandoning the Locality, Causality and Determinism. He also tried to support his ideas through an experiment, called EPR Paradox. But the idea of locality was constantly troubling the quantum physics. Bell's theorem, published in 1964, braved a very strong challenge to the locality. Bell proved that the idea of locality was not compatible with the Quantum Mechanics, as there seems to be a faster than light influence on very distant events. Rowbottom says,

"With the realist approach that I advocate, it should be of no surprise to the reader that I find these

results, which are widely accepted as being correct, to be of serious concern. They could be perceived to be an indication that we must abandon not only the concept of locality, but perhaps ultimately determinism or causality, in our pursuit of a description of physical reality. For, furthermore, this type of non-locality is independent of the distance between the particles involved; it implies that a physically real description of quantum entanglement would involve a potentially 'faster than light' connection between the entangled bodies."

It is clear from the above that Quantum Mechanics produces several problems, two most important of which are that it challenges the concept of locality and that it talks of uncertainty, which like a black cloud shrouds the great concepts of classical physics, causality and determinism.

Let us now try to evaluate the situation after the UTR proposed in this work. The UTR is based on three basic concepts: (1) that light-speed is not the maximum speed present in the universe, and there may be faster modes of the communication of influence; (2) that the universe as one single body (Uniglobe) is also rotating on its axis with speeds in a significantly large zone of the universe much, much greater than that of light; and (3) that the propagation of gravity takes place at a huge speed, in the range of the square of the speed of light.

This theory immediately sets in to have a huge influence on Quantum Mechanics. This instantly slaughters the Bohr's view that classical and quantum mechanics are independent of one another. This is because the extraordinary speed of the rotation of the universe would create a massive impact on the particles inside the atoms in contrast to the slow speeds of the earth or galaxy. The UTR sees the Universe as a single entity apart from the collection of its constituents. Quantum Mechanics can therefore not be separated from the classical one. Both will remain very much parts of the greater picture, which in the UTR comprises four, not three, important constituents: Rotation of the Universe, Classical Mechanics, Relativity and Quantum Mechanics. The rotation of the universe will have more pronounced effect on the atomic particles because of the ability of some of them to move very fast, and spin, their miniature sizes and their microscopic orbits. The macroscopic objects, like the earth, have very large size and their deviation (due to the gravitational effects of the Sun) from theirs running along with the rotation of the universe are very slow. But the microscopic particles move very fast, and their directions change extremely rapidly. The fundamental property of the particles to move as fast as possible will not allow them to fall into the nucleus. This effect may be the only reason or the additional one apart from the commonly understood reason, which is the iscrete nature of energy that stops electrons from spiralling to the nucleus. This hidden movement of the particles along with the rotation of the universe may be responsible for certain uncertainties. It is possible that when this is worked out in detail, the uncertainty will be found diminishing.

The relationship between the universe as a whole, and its components, with the microscopic world is extremely important, not incomprehensible as some Quantum theorists led by Bohr thought. The universe may be compared with the world with the atoms being the unit houses. The way the social and geographical world is composed of regions, countries, provinces, cities, colonies and houses, the universe of physics consists of the Magagalaxy/s, superclusters, clusters, galaxies, star systems, planets, molecules and atoms. Every component has its own unique system in addition to the one that prevails everywhere. Thus the universe has a federal kind of system. But the universe as a whole retains several significant powers. Atoms and the particles within them cannot be separated or isolated from the universe; they may have their unique system of forces, but they are also influenced by the universal forces like the gravity and electromagnetic radiation. There may be other forces that may not have been explored so far. The rotation of the Uniglobe requires a close connection between all the constituents, which alone can make the rotation of such a huge body possible.

It may shock some readers but I have to say that the universe comprises small particles rather than that the universe is composed of the particles. One may fail to immediately appreciate the difference between the two. But when one ponders it with a little deeper contemplation, one can note the difference. The difference is the same as between saying that "He is their father" and "they are his sons". Both may sound to mean the same, but from a chronological or historical point of view, the former is more correct than the latter, because, he was present before them, and it is he who fathered them, rather than they who chose him as their father. It can be argued though that he too had no authority in choosing his children. But this is another question that belongs to a different field. However, in terms of Quantum Mechanics, it is to be understood that the universe started functioning as an entity before the microscopic world started making its appearance within the universe. Repeating the above-mentioned example, it will be more correct to say that "the children are like the father" rather than that "the father is like the children." The QM is the product of the universe; its particles gained energy and mass and all other properties due to the rotation of the universe; and therefore, the rotation of the Uniglobe has to be taken

into account to understand the mysteries of the Quantum world.

The other important question in the QM is that of locality. In the UTR, locality too will acquire a new meaning and status. The UTR says that there can be and there are many influences travelling much faster than light, but instantaneously acting forces are prohibited. We are therefore midway between locality and nonlocality. Nonlocality in terms of the Einstein's theories of Special and General Relativity will have to be abandoned forever in favour of the Universal Superlocality introduced as one of the implications of the UTR. If Einstein's locality breaks down in Quantum mechanics, it is because Einstein's theories put a bar on the highest possible speed of any information, which cannot travel faster than light. There is no such bar in the UTR, which proposes that the speed of gravity is as high as of the order of the square of the speed of light. Thus, the electrons can know about each other almost instantaneously (not absolutely instantaneously) about distant electrons. This would explain the breakdown of locality, but there will be no breakdown of universal superlocality. Locality is a constant thorn in the flesh of QM, and many believe the two are not compatible with each other. Rowbottom says:

"So which of the two remaining options is it that I propose to take? Well, as I have already explained, the successes of the formalism imply that is should be altered only as a last resort; such alterations are, moreover, outside the scope of this dissertation's title. It would seem, then, clear that I should agree with option (b), and 'accept that a realist model of quantum mechanics must be non-local'. Indeed, my conclusion is the same, but with one important proviso." Prof. Home agrees with him, "You are correct in saying that what I meant to imply (perhaps I was not very clear)… is that in order to reconcile with the observed violations of Bell-type inequalities one needs to give up one of the "macroscopic" or "classical" prejudices." Then Rowbottom remarks:

"The choice to abandon locality, which I indeed support, is based upon 'weighing up' the relative advantages of each macroscopic prejudice, respectively, and reaching the conclusion that locality will require the least intuitive effort to sacrifice. Non-locality is also the most appealing choice because of the work which has already been done in this direction, by de Broglie-Bohm."

It is therefore the most feasible option that locality must be abandoned and Superlocality must be introduced so that instantaneous actions do not become possible at any level within the universe. The UTR will thus prove to be a philosophical saviour of Quantum Mechanics. The UTR has made it automatically possible to preserve most of the classical "prejudices" including causality and determinism, and has only given a new status to locality.

It is clear that Bohemian ontological interpretation is much better than the Copenhagen Interpretation. Asserting this position, Rowbottom says,

"I believe that the Bohemian ontological interpretation, combined with environment-induced decoherence, is decidedly superior to the Copenhagen Interpretation. At a small, but necessary cost, namely the sacrifice of locality, we can obtain a real description of quantum mechanics that will serve to satisfy our intuitive needs, and allow us to relate our experience in the macroscopic world to that which occurs in the microscopic domain.

"The other supposed 'price' is the adoption of a 'quantum potential', but I contend that this is entirely acceptable in the circumstances. My 'practical realism' speaks of introducing 'supplementary concepts…, (which) answer more philosophical, and physical, questions than they ask'. In this case, we have managed to retain the objective reality of position and velocity, the principle of determinism, and the principle of causality. As I mentioned, towards the beginning of this dissertation, physicists were willing, for hundreds of years, to accept Newtonian gravity's implied 'action at a distance'; is the 'quantum potential', then, really any different? Is it not possible that this 'apparent problem' will be resolved, in times to come?"

Bohm rightly took the view that the abandonment of causality had been too hasty:

"…..it is quite possible that while the quantum theory, and with it the indeterminacy principle, are valid to a very high degree of approximation in a certain domain, they both cease to have relevance in new domains below that in which the current theory is applicable. Thus, the conclusion that there is no deeper level of causally determined motion is just a piece of circular reasoning, since it will follow only if we assume beforehand that no such level exists."

Furthermore, the uncertainty principle implies that a particle can never be at rest, but is subject to constant fluctuations even when no measurement is taking place, and these fluctuations are assumed to have no causes at all. This is clearly understandable in the UTR. The UTR has declared it as the most fundamental property of any particle that it cannot exist at rest, and tries to achieve the maximum speed possible to move along with the rotation of the universe. The particle therefore tries to move out towards the periphery of the universe, and its movements are impeded only by its own weight and the influence of the bodies around it. The influences on the

particles in the atom are too great to let it break that barrier in order to travel independently with the rotation of the inverse. But it is free enough to fluctuate inside the atom. These fluctuations are not independent of any external influences as the standard quantum theory believes, but are definitely due to the rotation of the Uniglobe.

Uncertainty Principle says that the position and momentum of a particle cannot be measured simultaneously with precision. For example, there is no guarantee where a positron or electron will be in the orbit or which direction will it adopt if it moves in a straight line. Let us examine some facts:

The Universe is moving as a whole. So the zone in which we lie is also moving with tremendous speed. 420000 kms/sec) in more or less a straight line owing to the vast size of the universe. Now in 24 hours, the earth rotates 360 degree. That means, in one hour, it rotates 15 degree, and in one minute, 1/4 degree. Now if an electron is experimentally moved in one direction, say at 6.00 AM, due to the motion of the universe in a specific direction, it will tend to move in that direction. Now, if the same experiment is performed at 8.00 PM, within two hours the earth is rotated about 30 degree. It means, the direction of the motion of the universe is now 30 degree different from the previous position. So, the electron can now move in a direction about 30 degree away from the previous one. Not only the direction of the electron will keep changing, the direction of photon that would measure it may change a little. In the macroscopic world too, this would happen, but the larger gravitational attraction between the earth and the objects will not let the change be pronounced. Also, the macroscopic objects have much smaller speed than the microscopic particles. Therefore the speed of the zone plus the speed of the macroscopic object will not change much. The speed of the zone plus the speed of the particle on the other hand will cause much larger effects in different directions.

The Quantum Mechanics strengthens the case of the UTR, as it talks of two possibilities, both of which can be explained only by the second postulate of the rotation of the Uniglobe. One of them is Bohm's Implicate Order. Bohm rejects the assumption that wave-function collapse gives the most complete picture, and avoids the notion of the collapse altogether. Bohm's ontological interpretation assumes the existence of real particles, which are complex structures, and are always accompanied by a quantum field. It argues that these particles are not only acted upon by the electromagnetic forces but also by what is called the Quantum Potential. It is this potential that carries the information and provides nonlocal connections. It corresponds to the Implicate Order, which is like a vast ocean of energy on which the physical world is just like a ripple. The Standard Quantum theory, on the other hand, points to a universal quantum field—the quantum vacuum or zero point field--underlying the material world. The energy density of this quantum vacuum is estimated to be about 10-108 J/cm2. The rotation of the Uniglobe will help in better understanding, which of the two seems to be the better approach.

There cannot be a more preposterous logic than that the Quantum Mechanics demonstrates a detachment between the microscopic and the macroscopic worlds. The crossroads where the present physics seems to be stuck at the moment leaves an unmistakable impression that the two are separate indeed. If the Quantum Mechanics were accepted as different from the macroscopic world, it would only mean that our world has two faces; the outer and greater picture is entirely different from the inner and smaller picture. This is like saying that a living being is totally different from its cells. The problems we face today in reconciling the two is basically the result of the philosophically unfounded principle of locality, which has outlived its utility as a genuine limiting principle in the physical world. Light cannot be allowed to adorn divinity, which turns its small speed into an infinite one for all practical purposes. Light-speed barrier is an artificial barrier erected by Einstein's mind. Physicists have unfortunately turned this barrier into a wall that cannot be scaled. This is despite the accumulating evidences at the microscopic as well as the macroscopic level pointing to the brittle nature of the foundation of this wall. To talk of light-speed as the fastest possible speed is as to talk in the tenth century of the speed of the horse being the fastest achievable speed on the earth. Furthermore, the set of laws in the larger world cannot be different from the set of laws governing the inside of its constituents. This is another matter that the significance of different laws assumes different proportions at different levels. The genes functioning within the cells have no parallel in the macroscopic world. But this does not make cells a different world from the world of living beings. Bohm's endeavours to bring in the two closer, is admirable, but he has not succeeded in presenting a plausible ground for his ideas of Quantum Potential and Implicate Order. What brings this Implicate Order into action? The Universal Theory of Relativity will
not only make the microscopic and macroscopic worlds as inseparable parts of the same system, but will also give a plausible ground to this organisation. The universe will not remain a passive container where the constituents are fleeing away, as if they are scared of the presence of one another. The constituents and the constituents (microscopic particles) of the constituents

(macroscopic structures) will not remain unaware of the properties and characteristics of one another. The Universal theory of Relativity will make everyone indispensable for the gigantic system. They will become inseparable parts of the universe, each of them significantly contributing within its own domain to the overall organization and functioning of the Great Empire. The Uniglobe will have an axis, the axis that will make it an enviable Kingdom, worthy for all of us to follow in our social world.

6. Determinism

Determinism denotes the world is governed by laws, and the future can be predicted on the basis of events in the past. This means what the world is today had in fact been determined much earlier; to be more precise just when the universe began to make its appearance. Under the assumption of determinism, one might say that given the way things have gone in the past, all future events that will in fact happen are already destined to occur. According to Laplace, "We ought to regard the present state of the universe as the effect of its antecedent state and as the cause of the state that is to follow. An intelligence knowing all the forces acting in nature at a given instant, as well as the momentary positions of all things in the universe, would be able to comprehend in one single formula the motions of the largest bodies as well as the lightest atoms in the world, provided that its intellect were sufficiently powerful to subject all data to analysis; to it nothing would be uncertain, the future as well as the past would be present to its eyes. The perfection that the human mind has been able to give to astronomy affords but a feeble outline of such intelligence."

Determinism in Physics has very well established roots. This is one of the major principles of Classical as well as Relativity physics, and is sometimes referred to as one of the classical "prejudices" along with causality and locality. In QM, probabilistic outcomes play a major role, and future events cannot be predicted precisely. However, Bohemian Quantum Mechanics has clearly established that, if locality can be abandoned, QM can become deterministic in nature. Even otherwise, probability should not be viewed as the opposite of determinism. If a certain
outcome is more probable than others, it indicates a certain amount of certainty. The outcome is not wholly, at random. If it can be predicted that the probability of finding an electron at a certain place is greater than at other places, it clearly shows a preference. If a formula can be derived to indicate this preference, this must obviously have a reason. If we know the reason, we can become more certain. The Universal Theory of Relativity may help in finding that cause because it has added several new dimensions to the theory of Physics. I am not a mathematician and I don't intend to involve myself into it. But I am confident that the new features of the UTR will help reduce that uncertainty to a remarkably low level. The rotation of the universe has to play an important part in the events occurring at the quantum level also.

Locality and determinism are also dependent on each other because if actions are instantaneous without any time lag in between, it cannot be determined, which caused which. Quantum Mechanics is now regarded as nonlocal. The UTR however makes it possible to preserve determinism by abandoning locality in Einsteinian terms and replacing it with superlocality. The UTR establishes that light speed is only rigid and not constant, and has given a formula for gamma that makes it possible for the matter to travel faster than light. The theory has also postulated that the Universe as a whole (Uniglobe) is rotating on its axis and a huge portion of the universe is rotating with a speed faster than light. Furthermore, according to the theory, gravity has to travel at much higher speeds than that of light to enable the world to continue with its existence. Thus, Quantum Mechanics becomes superlocal rather than nonlocal. The actions in one part of the world would continue to influence the actions in other parts, and the cause and effect will preserve their sanctity. But all these influences will become much faster than the current physics visualises. Determinism will become not only rapid but more meaningful. Because, in the present state of Physics, while the ability of the past events to affect the future is surely very much there, this ability becomes highly restricted on account of the slowness of the speed with which they can influence others. This also means, in reality, it is erroneous to assume that a certain event has happened in the past; for though it may have happened in the past, for practical purposes it will occur in the future for a distantly lying object. For example, what has happened on the Sun one minute before will actually happen for the earth after 7 more minutes.

By putting a bar on the speed of information or influence, which is a very slow speed in the backdrop of a huge universe, Einstein's theories have not strengthened but weakened determinism. What we see as its result is that, soon after the Big Bang, the portions of the universe start distancing from one another, not only in terms of their physical positions nut also on terms of their ability to influence one another. Soon, most of the components of the universe get so far from one another that it requires not minutes, hours, days or weeks but years for them to communicate with one another. There are huge regions, which require not tens or hundreds but thousands, even millions and billions of

years to know about their well being. Effectively, it can be said that if light-barrier is real, the universe's collective existence has no meaning at all; for objects only lying in close vicinity are physically capable of influencing one another, positively or negatively. The universe's status then becomes of the ancient human society when men and women belonging only to their village or tribe were in position to interact. The universe at a collective level will then emerge as a very backward organisation, where there is hardly any communication between various regions. This is an awkwardly unceremonious proposition to believe; for the universe then cannot even be called an organisation, as every organisation needs a regular communication between at least most of its members. If the news of the death of a star takes millions of years to reach the other stars who cannot even shed a few tears on the death of their fellows, the life of the universe loses the very foundation of collective existence. This makes Einstein's position ludicrous. On the one hand, he has an unshakeable faith in Determinism and is not ready to accept any theory as a complete theory if it violates it. On the other hand, he makes determinism lame by making it unable to move with a significant speed. As a natural corollary to that the principle of cause and effect lose its raison d'être. Theoretically, we can claim that one event is the cause of another event that preceded it. But practically, we delay the effect by drastically curtailing its velocity. The information or force or influence of any kind from the causing effect will only crawl at the speed of light before it reaches its destination changing it the way it wanted to, or the way the affected object wanted to be changed a long time back. What meaning would then causality have? The picture that emerges is of a universe in which a present event may have been determined a long time back in the path of its history, but hardly by events that lie outside the path of its history. In totality it can be said that the present state of the portions of the universe is only the effect of a tubular past leading to the Big Bang, and it has hardly any effect of what has been happening in the rest part of the history of the universe.

There is no time for others to take care of one another, or even say "hello," as this hello will take so much time that it would hardly reach the one for whom it was intended. The world thus becomes totally disorganised and individualistic; it is reduced to a mere container of selfish individuals with no desire or ability to communicate with one another. But is this the real universe, we know? The universe that stares us is far from that disorganised state of affairs. It seems to be well-organised and well-knit unit. Its constituent parts seem to be constantly in touch with one another. They do not appear to be unconscious of one another's presence; they seem to form a universe that seems to be in a perfect state of harmony, a harmony that cannot be there without mutual trust and knowledge of one another's' limitations and capabilities.

Compare this picture of an unsociable type of the universe with the image of the universe that emerges as a result of the application of the Universal Theory of Relativity. Determinism gains enormously in strength in the new theory, for the objects of the universe do not seem to be as far away from one another as in the GTR. The principle of causality is not as meaningless, and of little practical utility, as in the current physics. The distance between different constituents of the universe may still be the same in terms of kilometres. But their proximity is far greater in terms of their ability to communicate with one another; for there is no curb on the speed of information that is exchanged between them. They are not merely dependent on the tortoise of light; they also have the horse of the gravity, which runs hundreds of thousands times faster than the tortoise. And there is no bar on having even faster means of communication. Whether they really have any is a matter of speculation. For any event to affect another event it has not to wait for thousands of thousands of years; it can do the same within months or hundreds of years; even less if there is an unknown faster means of communication. The horizon of the ability to influence within one second increases hundreds of thousands of times, if the gravity is the means of communication; even more if there are other means hitherto unknown. It is not the tubular history of past events that would affect an event at present or in the future, but a more spherical and wider sum of histories. These histories, unlike the case in GTR, will not necessarily go back to 10-35 second just after the Big Bang, but to almost all the areas of the universe. The universe thus becomes a much better organised social and collective unit; it is not just the individuals that matter but the whole world that plays a role in its functioning. The universe is not merely a land having different tribes or villages
not connected to the outside world but a globe having a state like system.

It can be said that the causality and determinism in GTR are local, because nothing can be nonlocal; in the UTR they are not nonlocal but superlocal.

There is another remarkable feature that the Universal theory of Relativity presented in this book adds to the causality. Max Born (1949) stated three assumptions that dominated physics until the twentieth century:

"Causality postulates that there are laws by which the occurrence of an entity B of a certain class depends on the occurrence of an entity A of another class, where

the word entity means any physical object, phenomenon, situation, or event. A is called the cause, B the effect."

"Antecedence postulates that the cause must be prior to, or at least simultaneous with, the effect."

"Contiguity postulates that cause and effect must be in spatial contact or connected by a chain of intermediate things in contact."

What are laws? Aronson, Harré, and Way (1994) say:

"Laws are invariant relations between properties. We have argued that judgements of verisimilitude are based on similarity comparisons between the type of object referred to by a scientist and the actual type of the corresponding object in nature. The relative verisimilitude of laws can be thought of in the same way, namely as the degree to which the relationships between properties depicted in relevant theories resemble the actual relationships between properties in nature"

In the currently accepted version of Physics, causality the way it is understood has become geriatric. The ultimate cause was the Big Bang event, when the laws were already formed that will determine every single event in the future universe. The laws that hold today are the same laws without any change whatsoever. Despite such an old age, how they are surviving is not known. What causes them to maintain their sublimeness? Why does a law like the second law of thermodynamics not affect the life of the laws themselves? When everything else degenerates or gets recycled or undergoes evolution, why not the laws? If it is these laws that lead to the evolution and then degeneration and/or recycling within the universe, why do they not degenerate themselves? How come they did not undergo a phase of evolution themselves instead of appearing within an extremely minute fraction of the first second? Who made them, and who sustains them?

The UTR changes the whole picture in an entirely novel way. The properties of the matter and the laws governing them did not come into existence at a certain point, and then continued their existence on their own. It was not that God chose the laws at the time of the Big Bang, or laws appeared themselves, and then they would continue to exist as they were forever. The UTR informs that the whole universe rotates around its axis. It is this rotation that causes the universe to continuously exist. The properties and the laws of nature are ultimately all the result of the rotation of the Uniglobe. This position has a very interesting impact on the understanding of causality and determinism. If the present events are being caused by the events in the past, it is not merely due to that fact that the past events were responsible for the present. It is also because the continuing rotation of the universe has made it possible for the laws and the properties to survive between the past and the present. The causality and determinism are therefore continuous; they were not created once at the Big Bang, but are being safeguarded incessantly through the sustenance of the universe by its rotation. So, all causes are unified in one cause, and that one cause is being controlled by an external agency, the most Powerful, Greatest and Wisest God. If the determinism is real, it is on account of the specific properties of the space and time, such as mass (both gravitational and inertial), inertia, energy, etc, and laws such as laws of gravitation, electromagnetism and quantum mechanics. If the matter has mass and energy, and it is governed by certain laws, it is not because these are inherent in the matter or in the universe, or they had been created once in the past to exist forever. On the contrary, it is because they are the effects of the non-stop, smooth, orderly and regular rotation of the universe. Causality is therefore Continuous. As soon as the Final cause, that is the rotation of the universe will stop, at the behest of the Power that regulates it, all the effects will cease to happen. The matter will lose its properties, the laws will no longer be functional and energy will become unavailable. In short, the universe will become dead. Cause and effect will have no existence.

What is happening on the earth is not being resulted from a single cause. It is the combined effect of the numerous causes, and all these causes and effects are ultimately the result of One Cause: the rotation of the Uniglobe.

7. The Ultimate Picture

The landscape of the knowledge of the universe that emerges in the wake of the Universal Theory of Relativity is vastly more picturesque than what we have been enjoying till now. The universe viewed in the light of General Theory of Relativity and Big Bang Cosmology is a passive, clumsily stark looking collection of individual groups of matter. Quantum Mechanics makes it even more shambolic by shrouding it in the dark clouds of uncertainties. The universe itself appears to have hardly any dynamic existence. It seems to be a universe, which was in a highly excited state at the time of Big Bang, but has since then lost its virility; it has willy-nilly bequeathed all its properties to the material that it contains without retaining anything for itself. The sphere of the universe itself continues to expand without anything adding to it except an increasing emptiness in space. It is becoming more and more hollow with the ticking of the clock; its hollowness is making the components of the world strangers to one another with every passing moment of time, because galaxies are falling apart from one another.

The distance between all the parts of the universe is growing but the vehicle of communication, that is available to them, is limping with the same old velocity. The space is continuously growing, and growing fast; where it is coming from, nobody knows. The expansion of the universe is not expanding its wealth, resources and means; the communication is getting harder, the overall density is declining and the matter is huddling into ghettos. God has either been banished to a place from where He cannot regulate or control it, or has been converted into a nominal Head of a defunct State soon after the first tiny fraction of the second of the beginning of the creation. Even if He is there, He cannot play any discernible role. There are many, of course, who are not ready to assign anything or any role to God, in the past, present or future, declaring Him to be the creation rather than the creator of the creatures.

The Universal Theory of Relativity rescues the universe from this sorry state of affairs. This theory resuscitates it, as an entity in its own; it is excitingly lively and systematic. Its components are neither selfish individuals who do not want to connect with others, nor ignorant creatures that have no means of knowing about one another. They are individuals, but they also belong to different tiers of organisation, and ultimately they are the active citizens of an active State of Uniglobe, which has a unique King. They are the part and parcel of a fraternity that knows its aims and objectives. The Uniglobe provides them the raison d'être by rotating relative to a preferred frame of reference that surrounds it, and as grateful recipients they are ready to be the denizens of the universe significantly contributing in all its activities.

The chief foundations of the modern Physics comprise the two mutually contradicting theories of Relativity and Quantum Mechanics. One argues that there can be no communication faster than that of light, the other vehemently challenges it by apparently enabling particles to communicate at much higher velocity. Nevertheless, Einsteinanism rules. This is despite the fact that Einstein himself accepted that light constancy was logically difficult to explain but empirically proved by experiments. Ironically, in his development of the special and general theories, he depended on empirical facts, but did not accept the same logic in Quantum mechanics, where he insisted on refuting the experimental results on the basis of his idealism, founded on the empirical constancy of light. The question here is: can anything empirical be illogical? Whatever we observe as the results of experiments has to be based on certain laws, and even if our experiments or we differ from what is actual or real there has to be a basis of this difference. There was nothing diabolical with the empirical "constancy" of light-speed. The absurdity is the unexceptionable fascination Einstein developed for light, turning constancy into an absolute dogma that gives light a sheet anchor role. Taking a clue from Scriptures perhaps that often describe God as "Light", he too started believing light as divine. This resulted in his giving a kind of absoluteness to light that was only a prerogative of God. He had developed an unshakeable belief in his heart and mind that nothing can surpass light in attributes. This was evident in his total approach in the development of the infrastructure of physics. He made the light-speed constancy as the foundation stone of the edifice he wanted to construct. This, not his idea of cosmological constant described by him as "my greatest blunder", was in truth his greatest folly. There is no logical reason why a small speed like that of light—small in the backdrop of the gigantic universe—can be accepted as the maximum. It was perhaps his belief in the absoluteness of light that he devised a formula for gamma that had the stamp of divinity for light. It made impossible for anything to travel faster than the electromagnetic wave-particle. It positioned light as the Final Criterion relative to which all speeds would be measured and all the properties of the matter would change. This is also perhaps the reason that he used c2, instead of a numerical constant, in his famous mass-energy equation. Does that not mean that he might have believed everything was created ultimately of light? And as nothing has so far been proved beyond to travel faster than light, no physicist has dared challenge his ideas. The increasing likelihood of the nonlocality of quantum mechanics, the apparent faster than light speeds of quasars, the faster than light initial expansion of the universe—all these evidences have faded before Einstein's thunderous claim. Physicists have simply prostrated before the idol of Einstein.

But, how long? Einstein's dominance on physics continues because there have not emerged alternative ideas that can provide the philosophical basis for a new theory of Physics. The Universal theory of Relativity hopes to initiate filling of that vacuum by providing an alternative philosophical basis to Physics. Its postulates are logically easy to understand, and have experimental evidences to support them. These evidences will grow in quality and quantity when physicists would take a fresh look at the foundations of Physics in the aftermath of the presentation of this theory. The philosophical discussion will enter a new phase, where physics would ultimately stand on the same podium to express its viewpoint on which metaphysics stands. God will be recognised as the True Lord of the Universe, who holds the ultimate reins. The origin of the universe will

become a more interesting field of sciences, and the fate of the universe will be debated with a sense of purpose that seems to be currently missing. Knowledge itself will emerge as a new incarnation; it will be better equipped, healthier and stronger.

There are many questions that have to be answered. As the theory of Physics stands today, there is still doubt why the universe does not fallback in the centre because:

According to theories of gravity, mutual attraction between the particles would lead to the collapse of all the matter in the centre, and the Uncertainty Principle leads to the conclusion that even empty space is filled with pairs of virtual particles and antiparticles. These pairs would have an infinite amount of energy and therefore they would have an infinite amount of mass. That will curve the universe to an infinitely small size.

The Universal Theory of Relativity will solve these problems in a very simple way. Its postulates of the rotation of the Uniglobe and the principle that everything seeks to achieve the highest possible speed along with the rotation of the universe better explain why the matter does not collapse in the centre. And in the UTR, there is no admission to infinity; there cannot be infinite energy or infinite curvature of space-time in the centre.

The Universal Theory of Relativity remarkably strengthens the gravity so that it becomes a truly important performer in the affairs of the universe. Physicists have always realised the importance of gravity because of its ability to act at long distances and its unique nature of always being an attractive force. But they have not been convinced about the way in which it functions. Newton thought that gravity acted instantaneously, but Einstein made it paralysed by putting a bar on its speed, which cannot be more than that of light. But, due to its ability to influence the distant objects, Einstein had to take the help of Geometry to let it function without disturbing his self-created barrier of highest speed. The UTR has reactivated the gravity by providing it a faster vehicle to travel. It will now be
easier to understand the nature of gravity and the role it plays in the administration of the universe. Geometry may still be required to understand it but faster communication will make it easier to understand it as a force to reckon with.

It will also be noted that, while Einstein talked of relativity, there are no more than a few evidences in the current physics to observe the relativistic changes that his theory visualises. The relativistic speeds are not anywhere seen, except in the expansion of the universe itself in some areas, which is ironically regarded as the speed of the expansion of space and not that of matter; matter is only dragged with the space. Moreover, there seems to be very little practical utility of the relativistic changes in understanding the universe as a whole, as the relativistic effects become pronounced only when the speeds become very close to the light speed. The use of the relativistic changes in understanding the origin of the universe has in fact only further confounded it; it has produced singularities, which like their infinite nature pose infinite problems. The Universal Theory of Relativity, on the other hand, makes relativity an effective player, and without causing the infinite problems of infinities. This is a remarkable achievement indeed. The UTR does not challenge the idea of relativity that Einstein proposed but makes it more plausible by reinterpreting the empirical constancy of light. The Uniglobe is rotating with relativistic speeds, except perhaps in the innermost zones. There are areas where relativistic effects, in accordance with the new gamma rather than that presented by Einstein, must be noticeable. They will be seen as having considerably younger age. The Universal theory of Relativity will make it more understandable why the universe looks isotropic and homogeneous in all directions but not of the same age.

It has to be stressed here that physical laws are only qualitatively not quantitatively identical in all co-ordinate frames all over the universe. The velocity with which a man can throw a ball upwards is different for different planets and moons. The value of gravity keeps changing from one place to the other. The UTR tells us that time is moving with different speeds in different zones of the universe. Even the mass and energy related with particles differ from place to place, depending upon the distance from the axis. Chemical and biological laws may take different forms in different areas. Radioactivity may be lesser in faster moving zones. Elements having higher atomic numbers may form there. Chemistry may be more stable. The nuclear reactions in faster zones would produce more energy than the slower zones.

Dark Energy was a wild idea before but has now become an essential part of the discussion of the structure and function of the universe. Today's cosmologists and physicists are in agreement that almost 70 per cent of the universe are made up of dark energy and 30 per cent of dark matter. This means the observable matter and energy form very little of the universe. Einstein had first given this idea in the form of a cosmological constant. At that time he gave this concept to count for the reason why the matter does not fall back at one place due to gravitational attraction. Omega is the ratio of actual cosmic density to the critical cosmic density. If omega is less than one, the universe will continue to expand forever. If it is more

than one, the universe will expand to a point after which it will start contracting. An omega equal to one would keep the universe expanding with the ratio of actual density to critical density staying the same. Another important observation that led to the possibility of the dark energy being present is the fact that the outer portions of the galaxy are rotating as fast as the inner portions. This could be possible only, they inferred, if there is a dark energy present there.

After the presentation of the UTR, we will have to take a fresh look at the concept of the dark energy. A rotating universe with very high speeds especially in the outer regions would be having immense amount of energy. The rotation of the universe is enough to stop the fall of the universe to a single point. It will account for both the dark matter and dark energy present in the universe.

In short, the comparison between the modern understanding of the universe dominated by Einstein's ideas of relativity and Hubble's ideas of an expanding universe and the more vivid comprehension of the universe as the result of the Universal Theory of Relativity will show immensely striking differences. The comparison is based on three main foundations:

First, the current theories take light-speed as constant, and make it impossible for any matter, or influence to travel faster than light. The UTR describes light-speed not as constant but rigid with an inherent stabilising mechanism, making it possible for matter to achieve speeds much beyond that of light. Moreover, the current theories make matter passive mover along with the expanding space. The UTR makes matter dynamic by proposing that each and every particle tries to achieve the highest possible speed, which is opposed by its own weight and surrounding influences.

Second, the current theories talk of an expanding universe, while the UTR talks of a rotating universe. This brings a massive transformation in the understanding of the structure, function, origin and fate of the universe. It changes in fact the whole philosophical edifice of our knowledge. The rotating universe makes the universe a vibrant entity and not mere passive container of matter, space and events. It is not matter, space and events that form the universe; but it is the universe that contains, guides and regulates matter, space and events. This concept imparts a new look to the relativistic concepts, quantum mechanics and philosophical issues like locality, determinism, role of God etc.

Third, the current theories talk of gravity as a slowly moving (only with the speed of light) but long ranging influence; the UTR makes gravity a much faster, smarter and effective force in the overall governance of the universe.

The space too assumes a special significance. The so-called empty space too is rotating along with the Uniglobe. The Big Bang cosmology starts from a singularity, which is a point, and then the space is created; this creation of space continues till now, and will continue forever. But this space is progressively diluting all the properties of the universe and its components. The contradiction here is for all to see. While, neither matter nor energy can be created or destroyed -- even natural laws cannot be created or destroyed --, claims the current Physics, space is being continuously created. This leaves us in an aesthetically shabby situation where nothing can be created or destroyed, except the empty space, which is being continuously created, and according to some models (like oscillating universe, closed universe, etc.) can also be destroyed. The universe before its beginning was a single space-less singularity, and the universe now has enormous space with numerous singularities inside it. What a massive gain for space, while nothing else has gained anything! In the UTR cosmology, space was always there, but it was a dead space having no property whatsoever. With the commencement of the rotation of the universe, space too came alive and got fully functional. The rotation of the Uniglobe is not only sustaining the enforcement of natural laws, the existence of matter and energy but also that of the dynamic space.

Similarly, the UTR better explains the incompatibility of Quantum Mechanics with the "prejudices" of Classical Physics by abandoning the concept of the constancy of light in favour of the rigidity of light; this makes speeds beyond that of light possible. It will be interesting here to understand Bohm's ideas of seeing the universe as a whole, for he seems to have come very close to what the theory of Universal Relativity establishes. David Bohm says:

"It is proposed that the widespread and pervasive distinctions between people (race, nation, family, profession, etc., etc.), which are now preventing mankind from working together for the common good, and indeed, even for survival, have one of the key factors of their origin in a kind of thought that treats things as inherently divided, disconnected, and "broken up" into yet smaller constituent parts. Each part is considered to be essentially independent and self-existent. (Wholeness and the Implicate Order)".

David Bohm's position of the wholeness of the universe has been described in an article, captioned "Of David Bohm's Holographic Universe" by Michael Talbot. The article says:

"Bohm began his theory with the troubling concern that the two pillars of modern physics, quantum mechanics and relativity theory, actually contradict each

other. This contradiction is not just in minor details but is very fundamental, because quantum mechanics requires reality to be discontinuous, non-causal, and non-local, whereas relativity theory requires reality to be continuous, causal, and local. This discrepancy can be patched up in a few cases using mathematical re-normalisation techniques, but this approach introduces an infinite number of arbitrary features into the theory that, Bohm points out, are reminiscent of the epicycles used to patch up the crumbling theory of Ptolmaic astronomy. Hence, contrary to widespread understanding even among scientists, the new physics is self-contradictory at its foundation and is far from being a finished new model of reality. Bohm was further troubled by the fact that many leading physicists did not pay sufficient attention to this discrepancy. Seeking a resolution of this dilemma, Bohm inquired into what the two contradictory theories of modern physics have in common. What he found was undivided wholeness. Bohm was therefore led to take wholeness very seriously, and, indeed, wholeness became the foundation of his major contributions to physics.

According to quantum physics no matter how far apart two quanta's of light (photons) travel, when they are measured they will always be found to have identical angles of polarisation. This suggests that somehow the two photons must be instantaneously communicating with each other so they know which angle of polarisation to agree upon. Eventually, technology became available to actually perform the two-particle experiment, but no one was able to produce conclusive results. Then in 1982 a remarkable event took place. At the University of Paris a research team led by physicist Alain Aspect performed what may turn out to be one of the most important experiments of the 20th century. There are some who believe his discovery may change the face of science. Aspect and his team discovered that under certain circumstances subatomic particles are able to instantaneously communicate with each other regardless of the distance separating them. …. This meant that either Einstein's long-held theory that no communication can travel faster than the speed of light or the two particles are non-locally connected. Because most physicists are opposed to admitting faster-than-light processes into physics, this daunting prospect has caused some physicists to try to come up with elaborate ways to explain away Aspect's findings. But it has inspired others to offer even more radical explanations. David Bohm believes the reason subatomic particles are able to remain in contact with one another regardless of the distance separating them is not because they are sending some sort of mysterious signal back and forth, but because their separateness is an illusion. Bohm postulates that the ultimate nature of physical reality is not a collection of separate objects (as it appears to us), but rather it is an undivided whole that is in perpetual dynamic flux. For Bohm, the insights of quantum mechanics and relativity theory point to a universe that is undivided and in which all parts merge and unite in one totality. This undivided whole is not static but rather in a constant state of flow and change, a kind of invisible ether from which all things arise and into which all things eventually dissolve."

The UTR has made this wholeness of the universe not just a philosophical conjecture but an established reality. I have great respect for Bohm for his extraordinary insight that was comparable to that of Einstein. But unfortunately, Bohm did not have sufficient time to convert his ideas into a complete theory that would explain everything. More unfortunately, Bohm was closely linked to Einstein who would critique the every chapter of the book he wrote. Instead of building a theoretical basis for his results that proved the nonlocal nature of quantum mechanics, and his idea of the wholeness of the universe, he sat on assiduously submitting these ideas to Einstein's light-speed barrier. This made him think of the universe as a hologram and his quantum potential as an entity that would make the world phantasmic rather than real. The UTR not only confirms that his basic idea of the wholeness was correct in essence, but also establishes the true nature of this wholeness. The theory provides the axis on which this wholeness rotates by concluding that the universe (named Uniglobe in this theory on account of its unified nature) as a whole rotates on its axis. But, unlike Bohm's ideas based on the absence of an objective reality, the unified Order of the UTR is not an illusion or phantasm but a reality. As has been explained at several places in the book and in the beginning of this chapter, the universe after the establishment of the theory of Universal Relativity will transform into Uniglobe, which is a well-established, well-organised, state kind of entity having an unfailing system of governance. Uniglobe comprises the components, not that the components form the Uniglobe. Uniglobe sustains its denizens by arranging provision for all of them, and therefore despite their individual statuses they are also the miniatures of the Uniglobe.

What are the prospects of finding a unified theory of everything. The prospects have been certainly on the rise in the wake of the development of Superstring and M-theories. But still there are lots of unanswered questions. The Universal Theory of Relativity will surely become the gateway for the ultimate unification of the theory of Physics. There are many reasons for this assertion:

First, the UTR raises the status of motion as the most fundamental property of the universe and its

components. Mass, energy, inertia, charge and time, and all other properties are the direct result of the motion. If there is no motion, the matter will be dead having no property whatsoever. This is the first important step in the unification.

Second, the rotation of the Uniglobe as a single body makes all the matter and forces a single body having their functional existence due to the collective motion. The rotation of the Uniglobe means different parts of the universe are moving with different speeds, depending upon the distance from the axis. Obviously the circumference perpendicular to the axis is moving with the greatest speed. This speed has to be millions of times the speed of light. On this circumference, therefore, extraordinary energy situations can be visualised that would be enough for the unification of all the four forces of nature, namely gravity, electromagnetic, strong and weak forces. This super fast strip might not have just caused the beginning of the forces in the universe immediately after the universe began to rotate as the first step in the origin of the universe, but must also be having the same nature now. It may be regarded as the Mother of all Forces.

Third, infinities have no place in the UTR. The solution of the problem of infinities by the artificial and dubious mathematical methods like renormalization is therefore not required in the UTR. The presence of infinities has been the biggest headache in all attempts to unify the forces including the Superstring theories. The fundamental principle that infinities do not exist in the universe, along with the disrobing of light-speed from its infinite status will make things easy for all those who are looking for a unified theory of physics.

Fourth, the presence of Uniglobe as well-organised functional entity will give the universe the unification that no idea or philosophy in the past could give.

Fifth, the Strong Force can be better understood as the effect of the rotation of the universe. It is this force that combines the nucleons together. The immense energy possessed by the nucleons on account of their having a relatively big mass and the extraordinary speed of the universe would make them high-energy particles. Their same size and mass would keep them glued together.

I have to admit that I am primarily a thinker. I happen to be neither a physicist nor a mathematician. I have built the whole edifice of the Universal Theory of Relativity without using but a very little, primary level mathematics. Even in the little mathematics I have used I might have made errors. I hope physicists and mathematicians will now find it much easier to develop formulas and equations on the basis of the scientific and philosophical foundations I have provided. Then the true picture of the unification of the theory of Physics will become abundantly clear. I do hope this would come sooner than later, and we will soon enter a stage in the history of knowledge when all the fields of knowledge will lie within the belly of the mother of all knowledge, Physics.

Correspondence to:
Dr. Javed Jamil
Javedjamil@rediffmail.com
doctorforu123@yahoo.com

Is Time the imaginary number?

Arnold Carbajal

The United States
acarbaja@bellsouth.net

Abstract: The number used for impedance is a complex number composed of a real number plus an imaginary number. V=I*(R+J) voltage =current times impedance J is an imaginary number to make the math come out right. You may substitute that kind of imaginary number for time. I recommend that time should be substituted for the imaginary number in all calculations, in scientific disciplines, that use an imaginary number to make the math come out correctly. This could lead to all sorts of new equations in all of these fields, and show how time itself is entering into the function of the real world in these scientific disciplines. [Nature and Science. 2006;4(1):23-24].

Keywords: imaginary; science; time

Introduction

In several scientific disciplines that involve mathematics an imaginary number is used in the calculations to make the numbers come out right. That should mean that there really is something acting on the physical world that is represented by that imaginary number, since it makes the math come out correctly in real world calculations.

An example of this is voltage = current x impedance

The number used for impedance is a complex number composed of a real number plus an imaginary number.

V=I*(R+J) voltage =current times impedance J is an imaginary number to make the math come out right.

Current is plotted horizontally on a graph and an imaginary vertical axis is used for j; a2 +b2 = c2 pythagorean theorem is used to calculate a value for the current. Showing that the imaginary number represents another dimension acting on the current. This imaginary axis, for the imaginary number, on the graph, is at a right angle to the real axis for the current. So the imaginary number is acting, mathematically, as another dimension. Einstein's general relativity theory, to explain gravity, (which has been proven experimentally correct) uses time as a 4th dimension. In the real world the 3 dimensions, length, width, and depth are each one at a right angle to the other two

dimensions. Time, being a 4th dimension, should be at a right angle to the 3 physical dimensions, to qualify as a 4th dimension. The imaginary number, used in calculating current and other things, has an imaginary axis on a graph that is at a right angle to the real axis, and it is therfore acting as a 4th dimension. Since the only proven 4th dimension is time:

I recommend that time should be substituted for the imaginary number in all calculations, in scientific disciplines, that use an imaginary number to make the math come out correctly. This could lead to all sorts of new equations in all of these fields, and show how time itself is entering into the function of the real world in these scientific disciplines.

Could lead to seeing how time influences every science that uses imaginary numbers. Could (maybe) give a mathematical link between general relativity, [gravity] and electromagnetism, through substituting time symbols that represent time in each discipline into the other discipline. - Perhaps leading to a way of using electromagnetism to influence gravity. Might even lead to a unified field theory that works.

Complex imaginary number applications (http://en.wikipedia.org/wiki/Complex_number)

This substitution for the imaginary number being time is already done in relativity theory:

Relativity

In special and general relativity, some formulas for the metric on spacetime become simpler if one takes the time variable to be imaginary.

Since the universe is uniform I recommend:

SUBSTITUTE TIME FOR THE IMAGINARY NUMBER, IN EVERY SCIENTIFIC DISCIPLINE THAT USES

AN IMAGINARY NUMBER TO MAKE THE MATH COME OUT CORRECTLY.

See what new equations that it leads to and do experiments to verify if those equations accurately show what happens in the real world.

Website showing example of use of imaginary or complex numbers:
http://regentsprep.org/Regents/math...icalresouce.htm

Application to Electrical Engineering:

First, set the stage for the discussion and clarify some vocabulary. Information that expresses a single dimension, such as linear distance, is called a scalar

quantity in mathematics. Scalar numbers are the kind of numbers students use most often. In relation to science, the voltage produced by a battery, the resistance of a piece of wire (ohms), and current through a wire (amps) are scalar quantities.

When electrical engineers analyzed alternating current circuits, they found that quantities of voltage, current and resistance (called impedance in AC) were not the familiar one-dimensional scalar quantities that are used when measuring DC circuits.

These quantities which now alternate in direction and amplitude possess other dimensions (frequency and phase shift) that must be taken into account.

In order to analyze AC circuits, it became necessary to represent multi-dimensional quantities. In order to accomplish this task, scalar numbers were abandoned and complex numbers were used to express the two dimensions of frequency and phase shift at one time.

In mathematics, i is used to represent imaginary numbers. In the study of electricity and electronics, j is used to represent imaginary numbers so that there is no confusion with i, which in electronics represents current. It is also customary for scientists to write the complex number in the form a + jb.

Introduce the formula E = I • Z where E is voltage, I is current, and Z is impedance.

Possible Student Questions:

The impedance in one part of a series circuit is 2 + j8 ohms, and the impedance in another part of the circuit is 4 - j6 ohms. Find the total impedance in the circuit. Answer: 6 + j2 ohms

Investigating the equation v = i x (r + j)

v = voltage or potential difference (charge difference); i = current, r =resistance, J = imaginary number.

Well let's do the substitution and see:

v = i x (r + j) substituting t (time) for j (the imaginary number)

v = i x (r+t); substituting i for charge/time [coulombs/time]

v = charge/t x (r + t); v = charge/t x r + charge/t x t; t's cancel

v = i x r + charge. For alternating current.

That equation that I derived from substituting j with t makes sense after considering it.

v = i x r + charge [substitution was made for i = charge/time (or coulombs/t)

That equation makes sense for alternating current.

Current goes from max to 0 then back to max in the opposite direction and then to 0.

When the current is at 0 and ready to change direction the charge (built up at both ends of the wire) is at a maximum, so the potential difference has reversed and ready to push the current back in the opposite direction. So, the value of the voltage (potential difference stays constant) throughout the cycle. As I x r increases the charge moves away from the ends of the wire, in current, and charge at ends of wire goes down while current goes up, still keeping voltage value v, constant. That equation does describe what is happening with alternating current.

The substitution of j for time worked.

Also, v - (i x r) = charge is valid. When v = i x r then the charge built up at the end of the wires is 0. V = i x r in direct current, and with direct current there is never a charge built up at the end of the wire because the charge is flowing constanly in one direction through the wire.

This is easy to do as you see. Go to any scientific discipline that uses an imaginary number (as another dimension) to make the math come out correctly and substitute t (time) for the imaginary number and then derive your own equations. My argument for why this is a valid substitution is at the top of this email.

The imaginary number may be simply there to handle capacitance and inductance, but the important thing is that to use it to calculate current it is plotted on a graph using the imaginary number on a vertical imaginary axis at a right angle to the real axis for current. That means the imaginary number is acting like a fourth dimension.

That means t for time can be substituted for it. Time is the only thing proven in general relativity theory to act like a fourth dimension and act on the physical world producing a warped space-time metric which is used to explain gravity. (General relativity theory was proven experimentally correct accurately predicting the angle a star passing near a solar eclipse would appear to move as light passed by the sun, and was bent by the sun's gravity.) So time is proven to act as a fourth dimension. The imaginary number with its imaginary axis acts as a fourth dimension. The time substitution for the imaginary number is therefore valid. There is no dimensional inconsistency. The imaginary axis is at a right angle to the real axis for current, and the pythagorean theorem is used to calculate current. Another dimension is at a right angle to the other three dimensions, length, width and height, which are each one at a right angle to the other two. The imaginary axis qualifies as another dimension, and so does the imaginary number plotted along it.

Summary

You may substitute that kind of imaginary number for time.

References

1. http://en.wikipedia.org/wiki/Complex_number
2. http://regentsprep.org/Regents/math...icalresouce.htm

On the Parabolic Curve of Primary Mirrors

Kyle DeGrave

Abstract: In order for a parabolic mirror to work, light has to reflect off of every point on it and be directed in a straight line to the focus. With this in mind, we know a light ray traveling parallel to the y-axis and reflecting off of the point (x, f) has to be directed to the focus in a straight line parallel to the x-axis. In order for a vertical light ray to reflect in this way, the point (x, f) on the mirror has to have a slope of 45 degrees or, in other words, a slope of one. This means that the derivative of the parabolic function at the point (x, f) has to equal 1. [Nature and Science. 2006;4(1):25-26].

Keywords: parabolic curve; parabolic mirror

In order to make a reflecting telescope such as a Newtonian Reflector, the primary mirror is often ground into the shape of a parabola. The reason for this is that when light enters the telescope tube, it is reflected off of the parabolic mirror and, due to the unique parabolic shape, is focused at a single point (the focus) which is a certain distance away from the center of the mirror (the focal length). The purpose of this paper is to try to describe which parabolic curve is suitable to fit a known focal length. The general solution has been known for a long time, but I was able to use a kind of guess and check method to find a similar solution on my own. This is one way in which the solution can be derived. We will assume the parabola is centered at the origin, so we know the general form of the parabola will be similar to y = ax^2 where *a* is some particular coefficient depending on the given focal length.

In order for a parabolic mirror to work, light has to reflect off of every point on it and be directed in a straight line to the focus. With this in mind, we know a light ray traveling parallel to the y-axis and reflecting off of the point (x, f) has to be directed to the focus in a straight line parallel to the x-axis. In order for a vertical light ray to reflect in this way, the point (x, f) on the mirror has to have a slope of 45 degrees or, in other words, a slope of one. This means that the derivative of the parabolic function at the point (x, f) has to equal 1.

So, knowing that the parabolic function will take the form y = ax^2, and that the derivative of this function evaluated at the point (x, f) must equal 1, we can figure out the general equation for any parabolic mirror with a particular focal length.

Take the case where f, the focal length, equals 4. In order to find the x-coordinate for (x, f) we need to solve y = ax^2 for x.

4 = ax^2
(4/a) = x^2
(2/sqrt(a)) = x

We know that at the point ((2/sqrt(a)), 4) the slope of the parabolic curve must equal 1. To find an equation for the slope of the tangent line to the parabolic curve at any point we take the derivative of y = ax^2.

y = ax^2
y' = 2ax

We know x = 2/sqrt(a) and that the slope at this point has to be 1. Plugging in y' = 1 and x = 2/sqrt(a) we get:

1 = (4a)/sqrt(a)

Rearranging we get:

Sqrt(a) = 4a
a = 16a^2
1 = 16a
1/16 = a

Plugging *a* back into our original parabolic equation we get:

y = (1/16)x^2

which will produce a focal length of 4.

We have just found the parabolic equation for a mirror that produces a focal length of 4. However, we can generalize this equation for *any* focal length. Take *f* to be the focal length, but this time, instead of assigning a value to *f*, we will leave it like it is.

f = ax^2
f/a = x^2
sqrt(f)/sqrt(a) = x

f' = 2ax

1 = (2a*sqrt(f))/sqrt(a)
sqrt(a) = 2a*sqrt(f)
a = 4fa^2
1 = 4fa
1/(4f) = a

Therefore, by plugging *a* back into the parabolic equation we get the general solution:

y = 1/(4f)x^2

where *y* is the curve that a parabolic mirror takes with any focal length *f*.

Research on Interference Verification and Simulation of Six DOF Parallel Kinematics Machine

Yonggeng Wei[1], Yong Shi[2], Zhixing Wang[1]
1. School of Mechanical and Electrical Engineering, Harbin Institute of Technology, Harbin, Heilongjiang 150001, China; wyg_1972@163.com
2. School of Astronautics, Harbin Institute of Technology, Harbin, Heilongjiang 150001, China

Abstract: Parallel Kinematics Machine design is difficult because of many restriction conditions, design parameters and complicated motion procedure. All these lead to a longer design period. In this paper, the interference verification and its simulation of the six DOF Parallel Kinematics Machine were researched. Firstly, restriction condition was established, structural parameter of machine was calculated and interference verification was developed in theory. Secondly, 3D design was developed by Pro/E software, and interference verification and assembly were processed in 3D design. Finally, the 3D model was imported to Adams software and the corresponding simulation was processed, then the interference phenomena could be observed by the simulation. The project made the design more efficient and the design cost lower, and it also reduced the design period and has been applied to practice. [Nature and Science. 2006;4(1):27-33].

Keywords: Parallel Kinematics Machine (PKM); interference verification; workspace

1. Introduction

The fixing platform and the moving platform of the 6 DOF PKM based on Stewart are linked by six driving bars whose length is alterable through movement joints (huke joints or sphere joints). Tool fixed on the moving platform can machine all kinds of complicated surfaces by the alterability of the driving bar length. Its structure is shown in Figure 1.

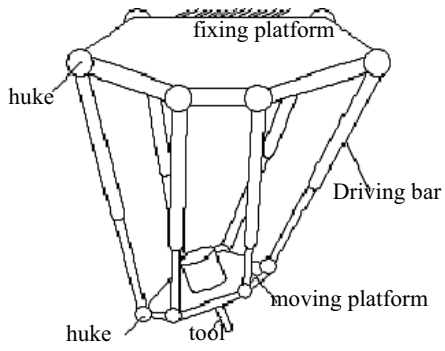

Figure 1. Structure of 6 DOF PKM

Workspace is chief index of PKM capability in structural parameter design. However, traditional design means is: structure of PKM is designed from middle to both sides, from top to bottom. Because of unforeseen factors, it will lead to small workspace, interference between parts and has to be designed again. Designers waste a lot of time to do repeated work. There are virtual and simulative designs in some literatures. But the simulation is not real structure of PKM and cannot process dynamic interference verification to erose parts of PKM. The design method leads to low efficient, increased design cost, long design period and is unfit to market competition. This paper develops interference verification of 6 DOF PKM. Its design method is: through parametric design idea of Pro/E software, we can conveniently process 3D design of PKM, assembly check-up and interference verification. 3D model of PKM in Pro/E software is imported to Adams software for dynamic simulation. The dynamic simulation is real

motion of PKM and resolves the problem that dynamic interference verification cannot be processed between erose parts of PKM.

2. Structural parameter of 6 DOF PKM and its restriction condition

We designed 6 DOF PKM of crossed structure by the design project mentioned above. The PKM's photo was shown in Figure 2. It was made up of the fixing platform, the moving platform and 6 driving bars whose length was alterable. The fixing platform and the driving bar were linked by 2 DOF huke joint. The moving platform and driving bar were linked by 2 DOF huke joint and 1 DOF rotation pair. We built the fixing coordinate system $O-XYZ$ at the center of circle of the fixing platform huke joint points and built the moving coordinate system $O'-X'Y'Z'$ at the center of circle of the moving platform huke joint points. Its sketch is shown in Figure 3. In the Figure 3, the fixing platform huke joint points are allocated to inside circle and outside circle. Circle's radiuses are R_{f1} and R_{f2}. The moving platform huke joint points are also allocated to inside circle and outside circle, but there is height $H1$ between two circles. Circle's radiuses are R_{m1} and R_{m2}. ϕ_f and ϕ_m are distributed angles of the fixing platform and the moving platform. Because close two huke joint points of the fixing platform and the moving platform are symmetrical, the position of all huke joint points can ensured by ϕ_f and ϕ_m. So structural parameters of PKM are: R_{f1}, R_{f2}, R_{m1}, R_{m2}, ϕ_f, ϕ_m and $H1$.

Workspace is chief index of PKM capability to design PKM. It is important to obtain the largest workspace by optimization and not to generate interference between the parts of PKM. However, chief factor to affect workspace is geometry restriction condition. Therefore geometry restriction condition has crucial effect to design PKM. There are four types of geometry restriction conditions:

Figure 2. 6 DOF PKM

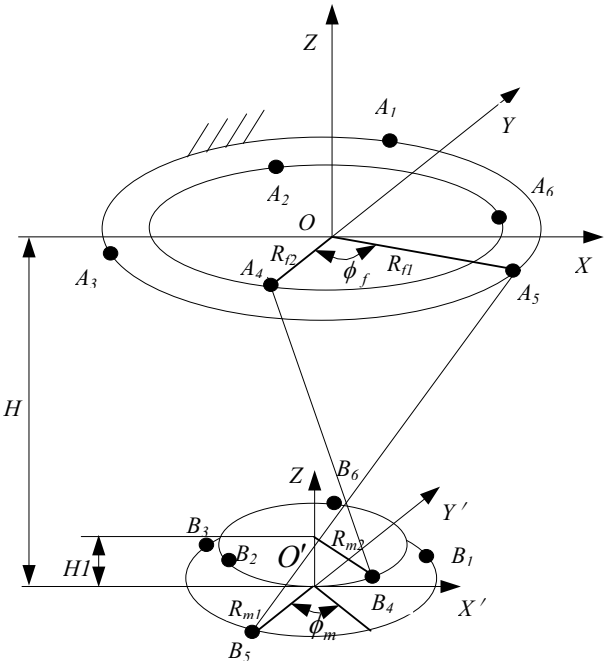

Figure 3. Structure of 6 DOF PKM

1) Length restriction of driving bar

It includes: maximal valve and minimal valve of length of driving bar, valve of subtracting factual travel length valve of driving bar from minimal valve of driving bar length. They shall meet below formula:

Length of driving bar shall meet between maximal valve and minimal valve of length of driving bar:

$$l_{\min} \le l_i \le l_{\max} \quad i=1,\ 2,\ \cdots,\ 6 \qquad (1)$$

Factual travel length valve of driving bar is:

$$l = l_{\max} - l_{\min}$$

Valve of subtracting factual travel length valve of driving bar from minimal valve of driving bar length shall meet constant L:

$$l_{\min} - l \ge L \qquad (2)$$

Thereinto, L is obtained by design experiences.

2) Limitation of angle of huke joint

It includes limitation of angle of huke joint of the fixing platform and the moving platform. Huke is made up of two level rotation pairs (Figure 4). One level rotation pair is linked directly with the fixing platform or the moving platform. Two level rotation pair is vertical to one level rotation pair. We build the coordinate system $n_1 n_2 n_3$ at huke joint point. The coordinate system is invariable to the machine system and $n_1 n_2 n_3$ is unit vector. We define vector of the driving bar as n, axis vector of one level rotation pair as n_1, axis vector of two level rotation pair as n_2. By right hand theory, we define n_3 as vector product of axis vector of one level rotation pair and axis vector of two level rotation pair shown as below:

$$\boldsymbol{n_3 = n_1 \times n_2}$$

Then, rotation angles of one level rotation pair and two level rotation pair may be expressed shown as below:

$$\theta_1 = \arctan_2\left(\frac{n \bullet n_3}{n \bullet n_2}\right) \qquad (3)$$

$$\theta_2 = \arccos(n \bullet n_1) \qquad (4)$$

θ_1 and θ_2 shall meet nether formula:

$$\begin{cases} \theta_{1\min} \le \theta_1 \le \theta_{1\max} \\ \theta_{2\min} \le \theta_2 \le \theta_{2\max} \end{cases} \qquad (5)$$

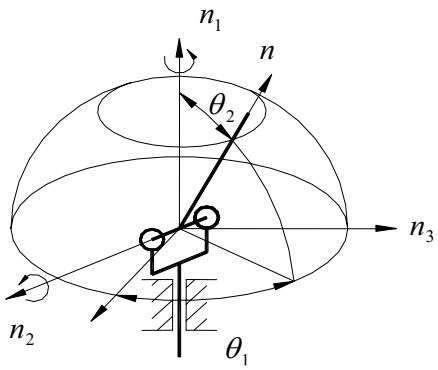

Figure 4. Diagram of huke mechanism

In fact, angle θ_1 is not limited if structure of PKM is reasonable.

3) Interference between columned parts

It includes: minimal distance between two driving bars, minimal distance between two servo motors, minimal distance between motor principal axis and driving bar. The interferences may be summarized three types as below:

a) Interference between surfaces of crossed two columned parts.
b) Interference between surfaces of columned parts and circle plane of columned parts.
c) Interference between circle planes of two columned parts.

4) Interference between erose parts

It includes: interference between servo motor and frame of PKM, interference between the moving platform and frame of PKM, etc.

After restriction conditions have been built, we could calculate structural parameter of PKM. Firstly, we define workspace of PKM as a cylinder and define initialization of PKM. Initializations of PKM include:

distributed angle and radius of circle of the fixing platform, distributed angle and radius of circle of the moving platform, distance between the fixing platform and the moving platform, distance between up circle and down circle of the moving platform huke joint point. We can obtain coordinate valve of the fixing platform huke joint point and the moving platform huke joint point from initialization of PKM. Second, it need obtain motion track of PKM. Interference usually occurs at border of workspace according to structure of PKM and character of workspace. So while to optimize structural parameters of PKM, all data of motion track of PKM is defined at border of workspace and distribution is average. Third, after motion track of PKM has been built, all data of length and vector of six driving bars can be calculated by inverse solution of PKM and at the same time all data of position and pose of tool can be recorded. And then, restriction condition can be obtained by calculating a series of border points of workspace. Such as maximal valve and minimal valve of length of driving bar, vector of driving bar at different position, center vector $n_{。}$ of all track points of driving bar obtained by vector of driving bar (Figure 5), limitation of angle of huke joint of the fixing platform and the moving platform and so on. Then we can go on interference verification by restriction condition and obtain factual workspace. At last, if result is not satisfying, it is necessary to modify parameter and recalculate. Otherwise calculation is terminated.

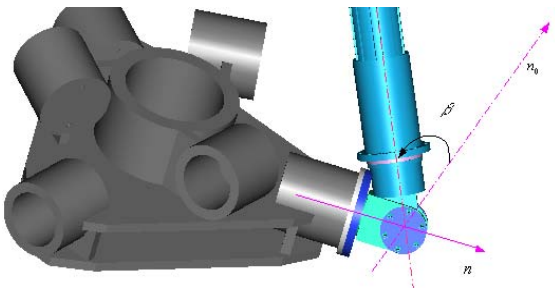

Figure 5. Interference verification of huke

Thereinto, center vector $n_{。}$ of all track points of driving bar is defined as: such as huke joint of the moving platform, track point of driving bar is defined as a cone and vertex of the cone lies to huke joint point of the moving platform. So center axis of the cone is center vector $n_{。}$ of all track points of driving bar. $n_{。}$ is also defined in the fixing platform in this way.

3. 3D design of 6 DOF PKM

Pro/E software provides capability of bidirectional relation by single database. The capability is accordant with concept of synchronous engineer in modern industry. In design, any data modified will be transmitted to all over relational files and data of relational files will be updated automatically. The design course is very simple, at the same time by single database, all dimensions in the middle of design is saved in the database and it is no longer difficult to modify CAD model. The designer only modifies 3D parts, then 2D drawing, 3D assembly and mold and so on can immediately be modified in according to change of dimension. Therefore, consistency of work to modify is guaranteed, mistake by people is avoided and time to modify drawing is reduced.

Adams is application software based on virtual prototyping technology. Virtual prototyping technology is a high technology that can resolve conflict between traditional design and manufacture. The designer can obtain virtual prototyping of machine system by physical and geometrical information of parts offered by CAD system. Then kinematics and dynamic analysis can be really simulated by system simulation software. Movement of parts can be observed and be experimented, at the same time design mistake can easily be modified on the computer, different project can be simulated. After project of optimization has been obtained by uninterrupted modification, physical prototyping may be manufactured. By design of virtual prototyping substituting physical prototyping, not only design period is shortened, but also quality and efficiency of design is gone up.

3.1 Assembly check up based on Pro/E software

After all structural parameters of PKM have been calculated, we may design all the parts, assemble and intervene verification the parts in the Pro/E software. Parts of PKM are divided four types in the assembly: driving bar parts, the moving platform parts, the fixing platform parts, frame parts. Assembly sequence is shown as below:

1) Driving bar parts are assembled. It is the key parts of PKM and there are lots of parts to be checked such as switch of limitation position and sensor and so on.

2) The fixing platform huke is fixed on the fixing platform.

3) The fixing platform is fixed on the frame of PKM.

4) Driving bar is inserted in the huke of the fixing platform.

5) Driving bar is assembled with huke of the moving platform.

6) Huke of the moving platform is assembled with the moving platform.

3.2 Interference verification based on Pro/E software

There are four types restriction conditions mentioned above. First and second types restriction condition will be checked in the Pro/E software and the rest will be checked in the Adams software.

1) Length restriction of driving bar

First, we open assembly drawing of driving bar and adjust driving bar to maximal length. Second, we open "analysis" menu from "model analysis" menu and "model analysis" dialog box will appear. In the dialog box, we choose "integral interference" from "type" edit box and click "calculation" button. The system will automatically calculate whether the assembly is interferential. If it happens to intervene, part of interference will be red and name of the parts will be shown in the "result" edit box. Similarly we adjust driving bar to minimal length and check whether to intervene.

2) Limitation of angle of huke joint

According to traditional design method, dimension of huke joint is estimated by design experiment. However, it is very difficult to obtain movement relation between huke joint and driving bar because figure of parts is erose and it is possible to lead to intervene between huke joint and driving bar. The interference can be checked by Pro/E software.

Such as the moving platform, we have obtained center vector $n_{。}$ of all track points of driving bar and corresponding position vector n of cylinder of the moving platform huke joint through above. Because movement track of driving bar is cone, we define half of vertex angle of cone as β. Then, we assemble the moving platform with huke joint by angle β. The driving bar turns around on axis of n_0 and look dangerous position for assembling. It can be observed whether to intervene. If it happens to intervene shown as Figure 5, we modify dimension of part and until reasonable design.

4. Dynamic simulation based on Adams software[3][4]

Modeling and assembly are main advantages of Pro/E software. But dynamic simulation is main advantage of Adams software. Then, we build model and assemble in the Pro/E software and simulate in the Adams software by importing model from Pro/E software.

It need simple the model before the assembly drawing is imported to Adams software from Pro/E software.

1) Define markers points

Movement relation between two close parts need be built by adding joint after assembly drawing has been imported to Adams software from Pro/E software. Orientation of joint is guaranteed by two markers. It is

convenient to build markers in the Pro/E software before model is imported to Adams software from Pro/E software.

2) Delete unnecessary parts

Simulation goal based on Adams software is interference verification. Thus, it only need to guarantee shape dimension of PKM for reducing calculation and delete unnecessary parts such as bolt, bearing and so on..

3) Deal with assembly drawing

When PKM is assembled, the moving platform is localized the center and its pose angle is defined 0º. Simultaneity, it is noticed: if there is embranchment assembly drawing in the whole assembly drawing in the Pro/E software, embranchment assembly drawing which is imported to Adams software will be defined as a part.

We define function of position and pose of the moving platform of PKM as $U(x,y,z,\alpha,\beta,\gamma)$. Thereinto, x,y,z is center position coordinate of the moving platform and α,β,γ is pose of the moving platform. Angle α expresses gradient orientation of the moving platform. Angle β expresses gradient range of the moving platform. Angle γ is equal to angle $-\alpha$. After restriction joint of PKM is given and the absolute coordinate system is obtained, we add movement function to the marker point of the moving platform and go on simulation. We design two movement functions to check third type restriction and fourth type restriction mentioned above: point movement function and circle movement function. Point movement function means: center of the moving platform localizes to a point of workspace, nutation β is defined as constant, α changes from 0º to360º surrounding the point. The function checks third type restriction. Circle movement function means: center of the moving platform localizes to a circle of workspace, nutation β is defined as constant, α changes from 0º to360º surrounding the circle. The function checks fourth type restriction. Figure 6 is 3D model of PKM.

We can observe the movement whether to intervene such as between motors, close driving bar and so on from different angle of view while PKM motions. Because the 3D model is real dimension of PKM, the movement is reappearance of movement of real PKM.

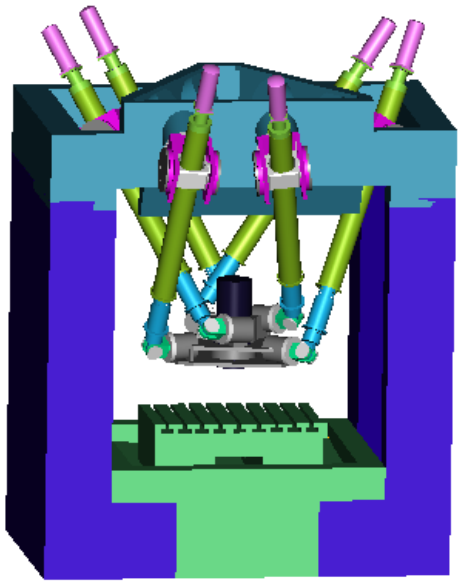

Figure 6. 3D model of PKM

5. Conclusion

The project develops 3D design and dynamic simulation from traditional 2D design, the project makes the design more efficient, and makes the design cost lower, it also reduces the design period. The project has been applied to practical engineering, and the application result is satisfying.

Correspondence to:
Yonggeng Wei
School of Mechanical and Electrical Engineering
Harbin Institute of Technology
Heilongjiang, China, 150001
Telephone: 01186-451-8641-3847
Mobile telephone: 01186-13936429157
Email: wyg_1972@163.com

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The Research On Intelligent Soybean Decision-Making System

Yushu Yang[1], Fulin Wang[1], Yongsheng Ma[2]

1. School of Engineering, Norththeast Agricultural University, Harbin, Heilongjiang 150030, China; ysyang731203@yahoo.com.cn
2. School of Water Conservancy & Civil Engineering, Norththeast Agricultural University, Harbin, Heilongjiang 150030, China

Abstract: After the flow of soybean growth technology having been analyzed, the design of soybean decision-making consultation system follows the life cycle standard of software engineering; database technology and the theory of expert system. The system will be exploited in steps and the summary is brought up by using frame- work analytical method. The article concludes the structure of system; function realization and character. [Nature and Science. 2006;4(1):34-36].

Key Words: reasoning machine; decision-making system; agricultural information

Introduction

Intelligent Soybean decision-making system is by modern technology and informational measures to help peasants to solve the practice problems which they encounter in the production of soybean about picked seeds; balance fertilization; prevention and cure the pests; analysis of economy benefit, and it provide the technician of soybean production with decision-making service.

1 System introduction

The structure of system which bases the triangle structure increases repository; method library ;model dictionary ;reasoning machine ;data extract ;special data-base of DSS and so on .The system constructs four libraries including language process system and problem process system which is inserted in four libraries.

Intelligent Soybean decision-making system makes up of four parts which are before production decision-making system; during production decision-making system; after production decision-making system and management system of informational library, moreover every system include many subsystems.

2 Technology key

2.1 The design and achievement of reasoning machine

The problems in agricultural field are particular complexity and illegibility. To solve the fuzzy problem, the system adopts fuzzy matched arithmetic which bases fuzzy production rule and applies target drive of origin knowledge control and heuristic search arithmetic to clear up conflict .The system looks upon exact reasoning as a particular example of fuzzy reasoning and naturally supports the reasoning in the case of incomplete knowledge .

2.2 The function of automatism acquisition in the system required information

During the decision , to the exact the system needs peasants to input a few data-bases ,some of which are very professional and difficult to understand for peasants .We adopt indirect input ,the system makes certain the required data on the relation of two

data .For example, the system asks the content of quick result nitrogen in the fields ,we will create a soil fertility data-base ,the matter of which is the content of soil quick result nitrogen ; potass and so on .The peasants only input the place where they stay ,because the system can research the required data from the relevant data – base on the peasant's place to easily finish input of many items of the organic matter ;quick result nitrogen; potass; phosphor and so on.

2.3 The application of buffer library

During the decision, some data are temporary or the middle result .To reduce the occupancy of EMS memory variable; the redundancy of data and improve the rate of the decision and analysis and simply the program of output, the data-base system adopts the buffer library, and the target library and fact library of the system adopts the method of buffer library.

To have peasants rapidly understood the option flow of system, we design a option guide, namely from the first step every steps have explanations which make clear to do something in the step, then press the button of next step till accomplish, so as to greatly improve the system easy option and achieve the stupid of intelligence decision-making support system.

3 The design and development of system

The interface of human machine accepts expression of decision-making problem and object in direct natural language and approach natural language manner, then the function of natural language processing by parsing; semantic structure and so on switches them into the forms which the system can understand After the program has run, the dialog subsystem outputs the process of solve and result in a manner which decision maker can legibly understand and appointed manner. The dialog subsystem commences a solve process of decision-making problem by ceaselessly mutual of decision maker, furthermore it provides decision maker with kinds of information and supports the data extract; data organization; model building and knowledge manipulation and soon.

The intelligence soybean decision-making support system to solve the need of different decision makers and the adaptability of different decision-making problems combine the independent model with other model to constitute the composite model in equal sequence. The process of found involve with dynamic; close coupling and calling and so on to form model sequence. Such as balance fertilization system.

The model library of this system has prediction class model, such as the disaster forecasting model; output forecasting model; seeding quantity forecasting model and so on, which is memorized in the case of subprogram; language statement and data. The data moduses storage save the data according to the format of rule, and the system combines the decision-making model and data into the knowledge representation.

The collection; making-up and analysis of data are very important sector in development of decision-making support system, we must pay more attention to them. Under the guidance of field experts, we widely collect books of dependent field; science research finding; science discussion result and the related data of word; picture; language and tape. We discard the dross and select the essential and eliminate the false and retain the true and analyze the process to find regularity of data and build the logical relation model and so on with the abundant of knowledge of experts.

The field of agricultural knowledge continually enriching, the knowledge structure complicating and the feature of decision-making problem make the knowledge representation of DSS more and more difficult with the development of agricultural economy and science technology. The knowledge representation of this system is carried out the tradeoff between consistency and complexity to solve the contradiction of uniform and isomerization representation, so the system not only has better representative ability but

also is convenience to achieve the interface between the decision-maker and the system and between every subsystem. Because of the above reasons, the modality of knowledge representation comprises the rule knowledge; variable declaration and data image knowledge and so on three partitions.

The system on the man and machine interaction interface uses generalized form processing technology and mode of dialog to be simple and visual expedience paper layout. As decision-making, users only quiz on the need of system and gain the requisite decision-making results according to prompt option. The system provides users with speech and kinescope data for reference to the effect of the picture and its accompanying essay.

4 Conclusions

The research under the guidance of system engineering theory adopts the method and measure of knowledge engineering and put the soybean expertise knowledge; experience and the method of solving problem into systematization and formalization on the computer artificial intelligence. We build the intelligence soybean decision-making support system of the northeast by model technology and expert system technology. The process of research adopts advantage technology not only on the agriculture but also on the computer, and the built environment can partly replace the experts to widely guide production and practice. It is somewhat meaning of theory and practice to generalize and apply the intelligence agricultural information technology. The system has already been generalized and applied in most towns and countries of hei long jiang province, and the peasants at large reflect well effects.

Correspondence to:

Yushu Yang
School of Engineering
Norththeast Agricultural University
Harbin, Heilongjiang 150030, China
Telephone: 01186-451-55190562 (Office)
E-mail:ysyang731203@yahoo.com.cn

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cDNA Clone of β-1，3-Glucanase from Phaseolus Vulgaris and Construction of Expressed Vector for Plant

Yan Yu Qing, Sun Di, Wang Quan, Wei Li, Xin Ling, Wang Yang, Xu Xiang Ling*

Biology Department of Harbin Normal University, Harbin, Heilongjinag 150025, China;
yanyuqing88@yahoo.com

Abstract: β-1,3-glucanase is one of the important composition involved in resist affected by plant pathogeny. We have isolated total RNA from leaves of phaseolus vulgaris, cloned cDNA of β-1,3-glucanase gene using RT-PCR in order to improve the ability of resistant pathogeny of plant. We linked this gene with pGEM-T-Easy, analysis the whole gene sequence .The result of sequence of this gene showed: cloned cDNA whole length is 1035 bp,encoded 331 amino acid, has 85% homology compared with reported sequence, conserved region of amino acid almost consistent with others .This cloned gene has been embodied by GenBank, logging number is DQ093563. We have constructed the express vector of this cloned gene for plant. [Nature and Science. 2005;4(1):37-46].

Keywords: phaseolus vulgaris; β-1，3-glucanase; cloned cDNA; sequence analysis; plant expressed vector

Introduction

β-1,3-glucanase are abundant in various plant species .Some studied showed that β-1,3-glucanase refer to many physiology process, including cereal germination, hypocotyls and coleoptile development, phloem transportation, callus movement, canaliculus tissue transportation and regulation, cell wall biology synthesis, flower development, microspore formation, pollen tube development, fruit mature, plant caducity and immobility etc. Recently, along with study deeply, that is discovered that β-1,3-glucanase play an important role in resistant disease of plant. β-1,3-glucan and Chitin are important composition in cell wall of fungi, β-1,3-glucan and Chitin exposure on surface of top end of mycelia of fungi which accept the attacked by β-1,3-glucanase and chitinase. The experimental of resistant fungi in vitro showed that β-1,3-glucanase can restrain the growth of mycelial. But then β-1,3-glucanase and chitinase work together show more distinctness about their resistant fungi than only use one.

More important thing is that oligosaccharide which released from cell wall of fungi during hydrolyzation induced whole resistance disease of plant as excitated factor in many reactions of resistant disease of plant. This aspect reports are focus on studying the work together of soybean and soybean epidemic disease.

GEBP (Glucan Elicitor Binding Protein GEBP) was found in soybean that locus at member of cytoplasm of radicle. GEBP can specific combine with oligosaccharide excitated factor which was release from β-1,3-glucanase degradation and induce defense reaction of plant.

The bioactivity of resistant disease of β-1,3-glucanase arose people think much of it. So far, at least 26 kinks of β-1,3-glucanase and their cDNA clone have been isolated. Furthermore have already transformation β-1,3-glucanase into tobacco, Chinese goosebeery, rose, tomato, cole, clover, carrot, ect, many plants, obtain expressed in different degree.

This study focus on clone cDNA of β-1,3-glucanase from Phaseolus Vulgaris and whole sequence analysis, construct expressed vector of β-1,3-glucanase for plant. Genetic transformation into plant are process of studying.

1. Materials and Methods

1.1 Plant Material

Phaseolus Vulgaris was provided by Agriculture Academic Gardening Institute of Hei Longjiang in China.

1.2 Bacteria and Plasmid

Host cell, *E. coli* JM109 from TaKaRa Bioengneering (Dalian) Co., Ltd. China, Vector, pGEM-T-Easy, from Promega Co., pMHL7133-*Gus,* from Japan.

1.3 Enzyme and Reagent

Enzymes and IPTG、X-gal、dNTP, from TaKaRa Bioengneering (DaLian) Co., Ltd, China, and Promega Co; RT-PCR Kit from Invitrogen Co., T_4DNA ligase from GIBCO Co., UNTQ-10 Kit from Shanghai Sangon Biological Engineering Technology & Services Co., Ltd, Primer was synthesized by TaKaRa Bioengneering (DaLian) Co., ltd, China, Gene sequence analysis was done by Shang Hai Bioasia Bioengneering Ltd., Co..

1.4 Treat of PhaseolusVulgaris and Isolation Total RNA

Phaselous Vulgaris was planted in plastic shed in order to germination and growth. Two weeks later, take young leaf on the top, isolation total RNA use Guanidine Isothiocyanate method of our improved .

1.5 cDNA First Strand Synthesis of Target Gene, PCR Amplification and Clone

Template is 1 μg total RNA of Phaselous Vulgaris, primer is oligo（dT）, according to the description of ThermoScript™ RT-PCR system of Invitrogen Co., synthesize cDNA first strand.

Based on the sequence of β-1,3-D-Glucanase of Edington, B. V. (1996) reported, use Primer Premier 5.0 software to design two primers for PCR reaction:

5’CTGGATCCTCAAATCGGGGTGTGTTATG 3’
BamH Ⅰ
3’GGTGGTTTTATTCTGTCTTCTCGAGGT 5’
Sac Ⅰ

We insert the restriction enzyme sites of the BamH Ⅰ and Sac Ⅰ on the 5′ end and 3′ end in order to clone and construct expressed vector in the further.

Take 1 μl the product of RT-PCR amplication for target gene in 25 μl system.

Conditions: 94℃ 2 min, 94℃ 30s, 55℃ 50s, 72℃ 1 min， 72℃ 10 min, 4℃ hold, 30 cycles.

Use the UNTQ-10 Kit from Shang Hai Sangon Biological Engineering Technology & Services Co., to purified PCR product, T_4ligase link it with pGEM-T-Easy vector, screen positive clone on LB plate with Amp ,IPTG and X-gal.

1.6 DNA Sequence Analysis

Commission Shang Hai Bioasia Bioengneering Co., Ltd., sequence the target gene, analysis the results of target sequence.

1.7 Construction Recombinant Express Vector for Plant

Isolated plasmid of pMHL7133-*Gus*, remove phosphorylation, link the β-1,3-Glucanase gene to the vector.

2.Results and Discussion

2.1 Isolation total RNA of β-1,3-Glucanase gene from Phaselous Vulgaris and PCR amplification from Figure 1 show integrality of RNA is perferably. PCR product is 1.1 Kb, consistent with result of anticipate (Figure 2).

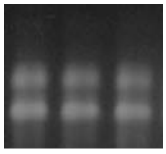


Figure 1. Isolation total RNA from phaselous vulgaris leaf

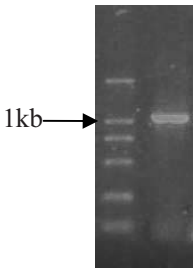


Figure 2. cDNA PCR amplification of β-1,3-Glucanase gene

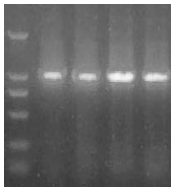


Figure3.Recombinantplasmid pGEM-T-Glu ws cutted by BamHⅠand SacⅠ

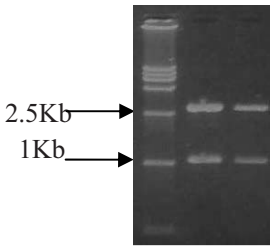


Figure 4. PCR identification of recombinant plasmid

2.2 cDNA Clone of β-1,3-Glucanase of Phaselous Vulgaris

Reclaim 1.1 Kb segment from gel, link with vector of pGEM-T-Easy, obtain recombinant plasmid of pGEM-T-Glu, double enzyme of BamHⅠ and SacⅠ cut it, get 1.1 Kb segment (Figure 3), PCR amplification of recombinant plasmid also get 1.1 Kb segment (Figure 4), thereout indicate cDNA clone of β-1,3-Glucanase has been insert into cloned vector.

2.3 cDNA Sequence Determine and Analysis of β-1,3-Glucanase of Phaselous Vulgaris

Sequence result shows: This cDNA whole length is 1035 bp, ORF from 3-998 bp, encod 331 amino acid, putative molecular weight 36.9 KD, isoelectric point 8.64 (Figure 5).

```
1      GCATGATGGGCAACAATCTCCCATCAGCCAATGAAGTTATAAACCTTTACAGATCAAACAAC
1        M  M  G  N  N  L  P  S  A  N  E  V  I  N  L  Y  R  S  N  N
61     ATAAGAAGAATGAGACTTTACGATCCCAATCAAGCAGCTCTGCAAGCACTCAGAAACTCA
21       I  R  R  M  R  L  Y  D  P  N  Q  A  A  L  Q  A  L  R  N  S
121    GGCATTGAACTCATTCTTGGAGTGCCAAACTCTGATCTTCAGGGTCTTGCCACCAATGCC
41       G  I  E  L  I  L  G  V  P  N  S  D  L  Q  G  L  A  T  N  A
181    GACACTGCTCGTCAATGGGTGCAAAGGAACGTGCTGAACTTTTGGCCCAGTGTTAGAATC
61       D  T  A  R  Q  W  V  Q  R  N  V  L  N  F  W  P  S  V  R  I
241    AAGTACATAGCAGTTGGCAATGAAGTGAGTCCTGTTGGAGGTTCCTCTTGGTATGCCCAA
81       K  Y  I  A  V  G  N  E  V  S  P  V  G  G  S  S  W  Y  A  Q
301    TATGTTCTACCTGCTGTCCAAAATGTATACCAAGCTATAAGGGCTCAAGGCCTCCATGAT
101      Y  V  L  P  A  V  Q  N  V  Y  Q  A  I  R  A  Q  G  L  H  D
361    CAAATCAAGGTTTCAACAGCCATTGACATGACCCTTATAGGAAACTCCTACCCTCCATCA
121      Q  I  K  V  S  T  A  I  D  M  T  L  I  G  N  S  Y  P  P  S
421    CAAGGTTCCTTCAGGGGTGATGTTAGATCATACCTAGACCCTATAATAGGGTACTTGCTA
141      Q  G  S  F  R  G  D  V  R  S  Y  L  D  P  I  I  G  Y  L  L
481    TATGCAAGTGCACCTTTGCTAGTGAATGTGTACCCTTATTTCAGTTACTCTGGCAATCCT
161      Y  A  S  A  P  L  L  V  N  V  Y  P  Y  F  S  Y  S  G  N  P
541    CGTGATATATCACTTCCCTATGCTCTTTTCACTTCACCAAATGTTGTGGTGAGGGATGGC
181      R  D  I  S  L  P  Y  A  L  F  T  S  P  N  V  V  V  R  D  G
601    CAATATGGGTACCAAAATCTGTTTGATGCTATGTTGGATTCAGTGCATGCAGCCATTGAT
201      Q  Y  G  Y  Q  N  L  F  D  A  M  L  D  S  V  H  A  A  I  D
661    AACACTAGGATTGGTTACGTGGAGGTGGTTGTGTCTGAGAGTGGGTGGCCCTCAGATGGA
221      N  T  R  I  G  Y  V  E  V  V  V  S  E  S  G  W  P  S  D  G
```

```
721     GGGTTTGGTGCCACGTATGACAACGCACGTGTGTACTTGGATAACTTGGTTCGTCGTGCT
241      G  F  G  A  T  Y  D  N  A  R  V  Y  L  D  N  L  V  R  R  A
781     GGAAGAGGAAGCCCTAGAAGGCCTTCGAAGCCTACAGAGACTTATATATTTGCCATGTTC
261      G  R  G  S  P  R  R  P  S  K  P  T  E  T  Y  I  F  A  M  F
841     GATGAGAATCAAAAGAGTCCTGAGATAGAGAAGCATTTTGGGCTCTTTAAACCCAGCAAA
281      D  E  N  Q  K  S  P  E  I  E  K  H  F  G  L  F  K  P  S  K
901     GAGAAGAAGTACCCCTTTGGATTTGGTGCCCAAAGGGATGCAAAGATTGTGGTTGATGAG
301      E  K  K  Y  P  F  G  F  G  A  Q  R  D  A  K  I  V  V  D  E
961     TTCAATGCAACATATCCCCTTAAGAGTGACATGTAAGGTTGGAACCCTAGTTCTCAAAGT
321      F  N  A  T  Y  P  L  K  S  D  M  *
1021    CTGTTGTAATATT
```

Figure 5. Glu Nucleotide Sequence of β-1,3-Glucanase Gene of Phaselous Vulgaris and Putative Amino Acid Sequence

Homologous searches 1035 bp of Glu nucleotide sequence through BLASTN software, result shows 136 items which have homologous sequence with it in database of GeneBank, more of them are β-1,3-Glucanase gene, more homology in turn are *Phaseolus vulgaris, Glycine max, Medicago sativa, Pisum sativum, Cicer arietinum, Hevea brasiliensis,etc*. Homologous rate of correspond region are almost between 84%and 99%.

Send 331 amino acids sequence of Glu encoded to the server of NCBI, use BLASTP tool to homologous searches,result show 448 items which have homologous sequence with Glu protein, all of them are β-1,3-Glucanase gene, more homology in turn are *Phaseolus vulgaris, Medicago sativa, Cicer arietinum, Pisum sativum, Hevea brasiliensis,etc.* Homologous rate of all of them are above 78%.

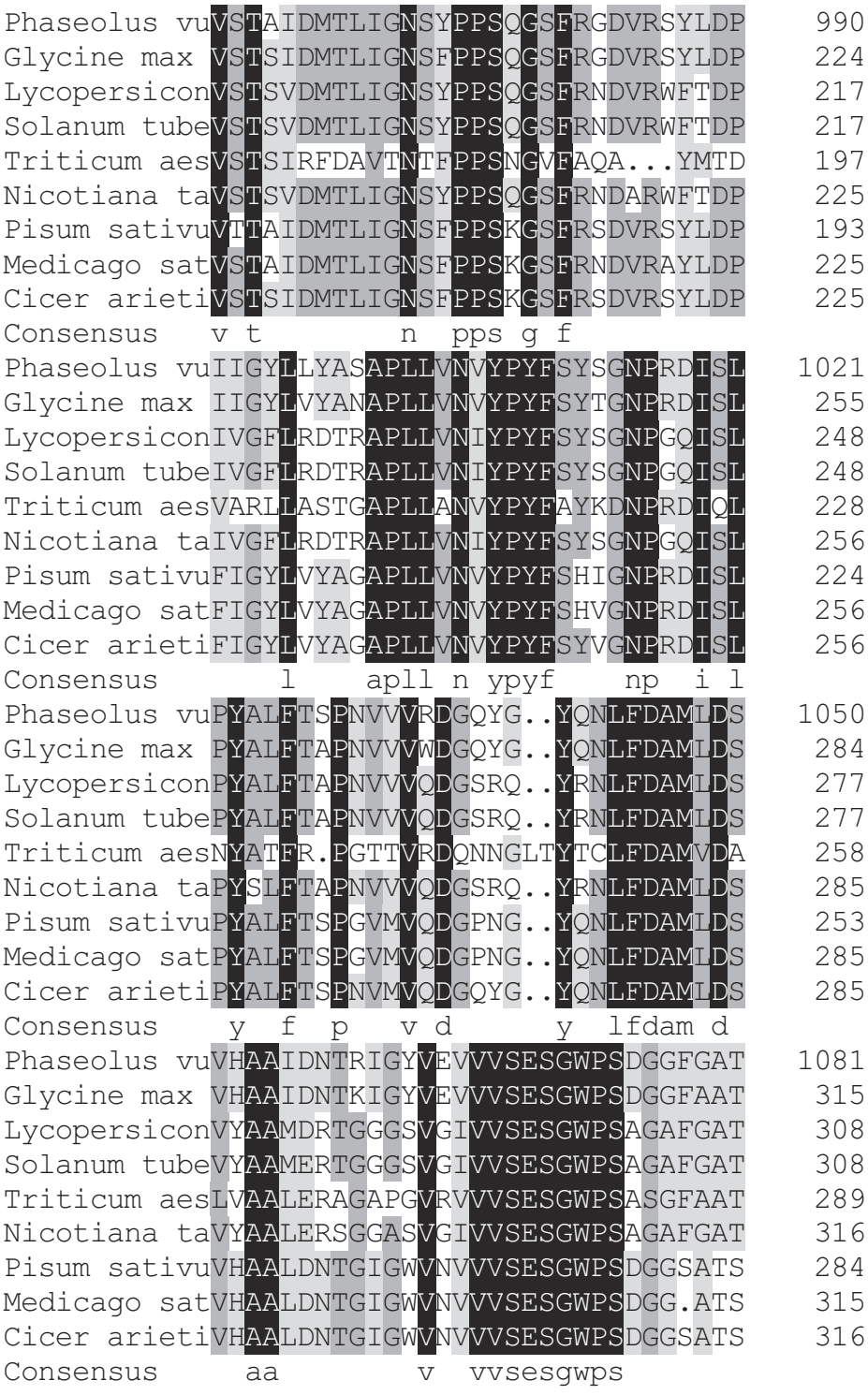
Compare homologous sequence of Glu gene with 3 items of β-1,3-Glucanase gene from *Phaseolus vulgaris* which were publicized in GenBank (Figure 6), result show that Glu gene has high level homology with Ga gene（caa37289）, Gb gene（P23535）， Gc gene（S13323）on correspondence amino acid sequence. Sufficiency testify that Glu gene is one of members of β-1,3-Glucanase gene family. But it has portion difference with others on amino acid sequence, putative different Phaselous Vulgaris species can cause a little diversity on amino acid sequence.

```
Glu         MMGNNLPSANEVINLYRSNNIRRMRLYDPNQ    867
Gc          MMGNNLPSANEVINLYRSNNIRRMRLYDPNG     69
Ga          MMGNNLPSANEVINLYRSNNIRRMRLYDPNQ     69
Gb          MMGNNLPSANEVINLYRSNNIRRMRLYDPNQ     69
Consensus   mmgnnlpsanevinlyrsnnirrmrlydpn
Glu         AALQALRNSGIELILGVPNSDLQGLATNADT    898
Gc          AALGALRNSGIELILGVPNSDLQGLATNADT    100
Ga          AALQALRNSGIELILGVPNSDLQGLATNADT    100
Gb          AALQALRNSGIELILGVPNSDLQGLATNADT    100
Consensus   aal alrnsgielilgvpnsdlqglatnadt
Glu         ARQWVQRNVLNFWPSVRIKYIAVGNEVSPVG    929
Gc          ARQWVQRNVLNFWPSVKIKYIAVGNEVSPVG    131
Ga          ARQWVQRNVLNFWPSVKIKYIAVGNEVSPVG    131
Gb          ARQWVQRNVLNFWPSVKIKYIAVGNEVSPVG    131
Consensus   arqwvqrnvlnfwpsv ikyiavgnevspvg
Glu         GSSWYAQYVLPAVQNVYQAIRAQGLHDQIKV    960
Gc          GSSWYAQYVLPAVQNVYGAVRAQGLHDGIKV    162
Ga          GSSWYAQYVLPAVQNVYQAVRAQGLHDQIKV    162
Gb          GSSWYAQYVLPAVQNVYQAVRAQGLHDQIKV    162
Consensus   gsswyaqyvlpavqnvy a raqglhd ikv
Glu         STAIDMTLIGNSYPPSQGSFRGDVRSYLDPI    991
Gc          STAIDMTLIGNSYPPSQGSFRGDVRSYLDPI    193
Ga          STAIDMTLIGNSYPPSQGSFRGDVRSYLDPI    193
Gb          STAIDMTLIGNSYPPSQGSFRGDVRSYLDPI    193
Consensus   staidmtlignsyppsqgsfrgdvrsyldpi
Glu         IGYLLYASAPLLVNVYPYFSYSGNPRDISLP   1022
Gc          IGYLLYASAPLHVNVYPYFSYSGNPRDISLP    224
Ga          IGYLLYASAPLHVNVYPYFSYSGNPRDISLP    224
Gb          IGYLLYASAPLHVNVYPYFSYSGNPRDISLP    224
Consensus   igyllyasapl vnvypyfsysgnprdislp
Glu         YALFTSPNVVVRDGQYGYQNLFDAMLDSVHA   1053
Gc          YALFTSPNVVVRDGQYGYQNLFDAMLDSVHA    255
Ga          YALFTSPNVVVRDGQYGYQNLFDAMLDSVHA    255
Gb          YALFTSPNVVVRDGQYGYQNLFDAMLDSVHA    255
Consensus   yalftspnvvvrdgqygyqnlfdamldsvha
```

Figure 6. Compare Deduce Amino Acid Sequence of Glu Gene from Phaseolus Vulgaris with Amino Acid Sequence of β-1,3-Glucanase Genes from Other Phaseolus Vulgaris. The Embody Number of Genbank of Comparing Sequence: Ga(CAA37289); Gb(P23535); Gc(S13323).

Use DNAMAN4.0 Multiple Sequence Alignment tool compare homology of protein product of Glu gene encoded with protein product of Glycine max, Lycopersicon esculentum, Solanum tuberosum, Triticum aestivum, Nicotiana tabacum, Pisum sativum, Medicago sativa, Cicer arietinum gene encoded which were embodied in Genbank.(Figure 7), the result shows Glu gene from Phaseolus Vulgaris has portion homology with β-1,3-Glucanase gene of Glycine max, Lycopersicon esculentum, Solanum tuberosum, Triticum aestivum, Nicotiana tabacum, Pisum sativum, Medicago sativa, Cicer arietinum. Illuminate that there is different of β-1,3-Glucanase gene among different species and genus.

```
Phaseolus vuMMGNNLPSANEVINLYRSNNIRRMRLYDPNQ    867
Glycine max MLGNNLPSANDVIGLYRSNNIKRMRLYDPNQ    101
LycopersiconMMGNNLPSHSEVIQLYKSRNIRRLRLYDPNH     94
Solanum tubeMMGNNLPSHSEVIQLYKSRNIGRLRLYDPNH     94
Triticum aes...NNLPPANEVVQLYRSKGLTGMRIYFADA     82
Nicotiana taMLGNNLPNHWEVIQLYKSRNIGRLRLYDPNH    102
Pisum sativuMMGNNLPPANEVIALYKANNIKRMRLYDPNQ     70
Medicago satMMGNNLPPANEVIDLYKANNIKRMRLYDPNQ    102
Cicer arietiMMGNNLPPANEVIDLYKANNIKRMRLYDPNQ    102
Consensus      nnlp    v  ly        r y
Phaseolus vuAALQALRNSGIELILGVPNSD.LQGLATNAD    897
Glycine max AALEALRNSGIELILGVPNSD.LQGLATNPD    131
LycopersiconGALNALRGSNIEVILGLPNVD.VKHISSGME    124
Solanum tubeGALNALRRSNIEVILGLPNVD.VKHIASGME    124
Triticum aesKALSALRGSGIALILDVGGTDVLASLAANAS    113
Nicotiana taGALQALKGSNIEVMLGLPNSD.VKHIASGME    132
Pisum sativuPALNALRDSGIELILGIPNSD.LQTLATNQD    100
Medicago satAALNALRNSGIELILGVPNSD.LQSLATNSD    132
Cicer arietiAALQALRNSGIELILGVPNSD.LQSLATNND    132
Consensus    al al  s i   l     d
Phaseolus vuTARQWVQRNVLNFWPSVRIKYIAVGNEVSPV    928
Glycine max TSRQWVQKNVLNFWPSVKIKYVAVGNEVSPV    162
LycopersiconHARWWVQKNVRDFWPHVKIKYIAVGNEISPV    155
Solanum tubeHARWWVQKNVKDFWPDVKIKYIAVGNEISPV    155
Triticum aesNAANWVRDNVRPYYPAVNIKYIAAGNEVLGG    144
Nicotiana taHARWWVQKNVKDFWPDVKIKYIAVGNEISPV    163
Pisum sativuSARQWVQRNVLNFYPSVKIKYIAVGNEVSPV    131
Medicago satNARQWVQRNVLNFWPSVKIKYIAVGNEVSPV    163
Cicer arietiIAIQWVQKNVLNFYPSVKIKYIAVGNEVSPI    163
Consensus       wv  nv    p v iky a gne
Phaseolus vuGGSSWYAQYVLPAVQNVYQAIRAQGLHDQIK    959
Glycine max GGSSSVAQYVLPAIQNVYQAIRAQGLHDQIK    193
LycopersiconTGTSNLAPFQVPALVNIYKAIGEAGLGNDIK    186
Solanum tubeTGTSSLTSFQVPALVNIYKAIGEAGLGNDIK    186
Triticum aesDT.....QNIVPAMRNLNAALNGAGLGA.IK    169
Nicotiana taTGTSYLTSFLTPAMVNIYKAIGEAGLGNNIK    194
Pisum sativuGGSSWLAQYVLPATQNVYQAIRAQGLHDQIK    162
Medicago satGGSSWLGQYVLPATQNIYQAIRAKNLHDQIL    194
Cicer arietiGGSSWLAQYVLPATQNIYQAIRAKNLHDQIK    194
Consensus              pa  n   a     l   i
```


Phaseolus vuVSTAIDMTLIGNSYPPSQGSFRGDVRSYLDP 990
Glycine max VSTSIDMTLIGNSFPPSQGSFRGDVRSYLDP 224
LycopersiconVSTSVDMTLIGNSYPPSQGSFRNDVRWFTDP 217
Solanum tubeVSTSVDMTLIGNSYPPSQGSFRNDVRWFTDP 217
Triticum aesVSTSIRFDAVTNTFPPSNGVFAQA...YMTD 197
Nicotiana taVSTSVDMTLIGNSYPPSQGSFRNDARWFTDP 225
Pisum sativuVTTAIDMTLIGNSFPPSKGSFRSDVRSYLDP 193
Medicago satVSTAIDMTLIGNSFPPSKGSFRNDVRAYLDP 225
Cicer arietiVSTSIDMTLIGNSFPPSKGSFRSDVRSYLDP 225
Consensus v t n pps g f
Phaseolus vuIIGYLLYASAPLLVNVYPYFSYSGNPRDISL 1021
Glycine max IIGYLVYANAPLLVNVYPYFSYTGNPRDISL 255
LycopersiconIVGFLRDTRAPLLVNIYPYFSYSGNPGQISL 248
Solanum tubeIVGFLRDTRAPLLVNIYPYFSYSGNPGQISL 248
Triticum aesVARLLASTGAPLLANVYPYFAYKDNPRDIQL 228
Nicotiana taIVGFLRDTRAPLLVNIYPYFSYSGNPGQISL 256
Pisum sativuFIGYLVYAGAPLLVNVYPYFSHIGNPRDISL 224
Medicago satFIGYLVYAGAPLLVNVYPYFSHVGNPRDISL 256
Cicer arietiFIGYLVYAGAPLLVNVYPYFSYVGNPRDISL 256
Consensus l apll n ypyf np i l
Phaseolus vuPYALFTSPNVVVRDGQYG..YQNLFDAMLDS 1050
Glycine max PYALFTAPNVVVWDGQYG..YQNLFDAMLDS 284
LycopersiconPYALFTAPNVVVQDGSRQ..YRNLFDAMLDS 277
Solanum tubePYALFTAPNVVVQDGSRQ..YRNLFDAMLDS 277
Triticum aesNYATFR.PGTTVRDQNNGLTYTCLFDAMVDA 258
Nicotiana taPYSLFTAPNVVVQDGSRQ..YRNLFDAMLDS 285
Pisum sativuPYALFTSPGVMVQDGPNG..YQNLFDAMLDS 253
Medicago satPYALFTSPGVMVQDGPNG..YQNLFDAMLDS 285
Cicer arietiPYALFTSPNVMVQDGQYG..YQNLFDAMLDS 285
Consensus y f p v d y lfdam d
Phaseolus vuVHAAIDNTRIGYVEVVVSESGWPSDGGFGAT 1081
Glycine max VHAAIDNTKIGYVEVVVSESGWPSDGGFAAT 315
LycopersiconVYAAMDRTGGGSVGIVVSESGWPSAGAFGAT 308
Solanum tubeVYAAMERTGGGSVGIVVSESGWPSAGAFGAT 308
Triticum aesLVAALERAGAPGVRVVVSESGWPSASGFAAT 289
Nicotiana taVYAALERSGGASVGIVVSESGWPSAGAFGAT 316
Pisum sativuVHAALDNTGIGWVNVVVSESGWPSDGGSATS 284
Medicago satVHAALDNTGIGWVNVVVSESGWPSDGG.ATS 315
Cicer arietiVHAALDNTGIGWVNVVVSESGWPSDGGSATS 316
Consensus aa v vvsesgwps

```
Phaseolus vuYDNARVYLDNLVRRAGRGSPRRPSKPTETY   1111
Glycine max YDNARVYLDNLVRRANRGSPRRPSKPTETY    345
LycopersiconHENAQTYLRNLIQHAKEGSPRKPG.PIETY    337
Solanum tubeQDNAATYLRNLIQHAKEGSPRKPG.PIETY    337
Triticum aesADNARAYNQGLIDHVGGGTPKRPGLL.ETY    318
Nicotiana taYDNAATYLRNLIQHAKEGSPRKPG.PIETY    345
Pisum sativuYDNARIYLDNLIRHVGKGTPRRPWA.TEAY    313
Medicago satYDNARIYLDNLIRYEGKGTPRRPWA.TETY    344
Cicer arietiYDNARIYLDNLIRHVGKGTPRRPWA.TETY    345
Consensus     na  y   l      g p  p    e y
Phaseolus vuIFAMFDENQKSPEI.EKHFGLFKPSKEKKY   1140
Glycine max IFAMFDENQKNPEI.EKHFGLFNPNKQKKY    374
LycopersiconIFAMFDENNKNPEL.EKHFGMFSPNKQPKY    366
Solanum tubeIFAMFDENNKNPEL.EKHFGLFSPNKQPKY    366
Triticum aesIFAMFNENFKTGELTEKHFGLFNPDKSPAY    348
Nicotiana taIFAMFDENNKNPEL.EKHFGLFSPNKQPKY    374
Pisum sativuLFAMFDENQKSPEL.EKHFGVFYPNKQKKY    342
Medicago satIFAMFDENQKSPEL.EKHFGVFYPNKQKKY    373
Cicer arietiIFAMFDENQKSPEL.EKHFGVFNPNKQKKY    374
Consensus    famf en k  e  ekhfg f p k   y
Phaseolus vuPFGFGAQRD.AKIVVDEFNATY.P.LKSDM   1167
Glycine max PFGFGGKRL.GKVVIDDFNATT.S.IKSDV    401
LycopersiconNLNFGVSER.VWDI...TNSTA.SSLTSEI    391
Solanum tubeNLNFGVSER.VWDISAETNSTT.SSLISEM    394
Triticum aesPIQFH                             353
Nicotiana taNLNFGVSGG.VWDSSVETNATA.S.LISEM    401
Pisum sativuPFGFGGERRDGEIVEGDFNGT.VS.LKSDM    370
Medicago satPFGFGGERMG..IVNGDFNAT.IS.LKSDM    399
Cicer arietiPFGFGGERRNGEIVNDDFNATTVS.LKSDM    403
Consensus     f
```

Figure7. Compare Deduce Amino Acid Sequence of Glu Gene from Phaseolus Vulgaris with Amino Acid Sequence of β-1,3-Glucanase Genes from Other Plant.

The Embody Number of Genbank of Comparing Sequence:

Glycine max (CAA01814), *Lycopersicon esculentum* (Q01413), *Solanum tuberosum* (CAE53273), *Triticum aestivum* (AAY88778), *Nicotiana tabacum* (p27666), *Pisum sativum* (AAB24398), *Medicago sativa* (AAB41551), *Cicer arietinum*（CAA10287）

2.4 Construction Express Vector of β-1,3-Glucanase Gene of Phaselous Vulgaris for Plant

We use high effective express vector pMHL7133-*Gus* of plant which has CaMV of 35S constitutive type strong promoter that can make foreign gene express occur in all position and any development stage of transgenetic plant in order to transformation β-1,3-glucanase gene into plant and study the possibility of its anti- fungi. Furthermore, the upstream of 35S promoter on vector pMHL7133-*Gus* has E7 enhance regulated element which can enhance transcription efficiency of target gene. The downstream of 35S promoter on vector pMHL7133-*Gus* has Ω sequence which can provide the new binding site for ribosome consequently boost up translation efficiency of foreign gene.

Use double enzymes to cutted pMHL7133-*Gusv* and remove phosphorylation, link the reclaimed product from gel of Glu cDNA, obtain recombinant clone pMHL7133-Glu. Double enzymes of BamHⅠ and Sac

Ⅰ cut it, get about 1.1 Kb segment from recombinant clone (Figure 8). PCR of recombinant plasmid also get 1.1 Kb segment (Figure9), thereout testify that construction of high efficiency express vector of β-1,3-Glucanase gene for plant is successful and it is in process of applying in plant transformation.

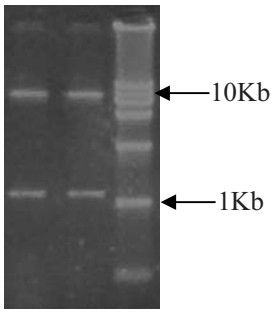


Figure8.Recombinant clone pMHL7133-Glu was cutted by BamHⅠand SacⅠ

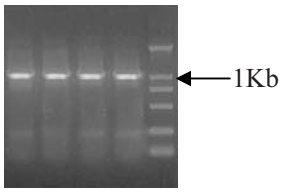


Figure 9.PCRidentification recombinant clonepMHL7133-Glu

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Study on Several Factors Involved in IVF-ET of Human Beings

Lei X[1], Zhuoran W[1], Bin L[1], Huiming L[1], Hongxiu Z[1], Yajuan Z[1], Yingbo Q[1], Guixue Z[2]

[1]The First Clinical College of Harbin Medical University, Harbin, Heilongjiang 150086, China.
[2]College of Animal Science and technology, North East Agricultural University, Harbin, Heilongjiang 150030, China
Email: gxzhang@neau.edu.cn

Abstract: The experiment was designed to study the several relative factors in order to improve the effects of IVF-ET in human beings.108 infertile couples were included in IVF-ET treatment and clinic data were statistically analyzed. The effects of both long and short superovulating protocols were researched on oocyte maturation and embryo quality. The relationships were investigated respectively among woman's age, insemination method, embryo quality, the number of embryos transferred, embryonic culture condition and clinical pregnancy rate. The results show that there are no statistically differences between both superovulating protocol in the number of oocyte retrieved, metaphase-□stage oocytes, fertilization rate, cleaved rate, high quality embryos rate and clinical pregnancy rate. Women of the short superovulating protocol group needed less gonadotropin ampoules compared with those in long one. The clinical pregnancy rate with patient's age ≥35 was remarkably lower and woman's age affected IVF-ET. Fertilization rate and clinical pregnancy rate were not statistically significantly different between routine IVF group and ICSI group. The numbers of 4-cell embryos transferred and high quality embryos were significantly higher in the pregnancy group than non-pregnancy one and embryo quality was related to the pregnancy rate in IVF-ET. [Nature and Science. 2005;4(1):47-53].

Keywords: human being**;** IVF; embryo transfer

1. INTRODUCTION

Assisted reproductive technology (ART) have made great progresses since the first test-tube baby was born in 1978[1-4]. In vitro fertilization and embryo transfer (IVF-ET) have been proved to be an effective alternative for couples who would be unable to achieve pregnancy[5-6]. Even so, there are still some factors which have not well been researched in IVF process, such as superovulating protocol, female age, fertilizating method, uterine receptivity, quality and number of embryos transferred, culture conditions and so on. Therefore the several factors were clinically chosen in order to verify their effects on IVF and provide the practical and theoretic data for IVF of human bings.

2. MATERIALS AND METHODS

108 patients with age of 24-44 underwent IVF programmes were accepted for the study.

The long and the short protocols were used in IVF and intracytoplasmic sperm injection (ICSI) procedures with Gonadotropin Releasing Hormone agonist (GnRHa), Follicle Stimulating Hormone (FSH), Human Chorionic Gonadotropin (HCG) . The long protocol began on the day 21 of the mid-luteal phase with GnRHa, gonadotropin (Gn) was provided

three days later until HCG was administered. The short protocol commenced with GnRHa at day 2 and Gn at day 3. When two or more follicles of more than 18 mm in diameter appeared, HCG was administered at a dose of 10000 IU i.m and oocyte retrieval followed at 35-36h with transvaginal ultrasound-guided puncture. For both IVF and ICSI , Fertilization of ova with cumulus cells lasted for 18h and determined by confirmation of two pronuclei under the microscope. Embryos were cultured for 48h and then selected for transfer on the basis of morphology and score on day 2. One to four embryos were transferred per cycle. Excess embryos with more than 2 cells and less than 50% fragmentation were frozen. After rapid-frozing and slow-thawing, embryos with more than 50% survival cells were regarded as viable embryo and could be transferred after 2 h in vitro culture.

Statistical analysis: All data were analysed using SPSS version 10.0.

3. RESULTS AND DISCUSSION

3.1 The effect of superstimulation protocol on oocyte maturation, embryo quality and pregnancy rate.

The results showed in table1 that Gn dose was significantly lower and stimulating time was less in the short protocol compared with that in the long protocol one ($P<0.05$). However, there was no significant difference between the long and short protocol in numbers of retrieved oocyte and mature oocyte, fertilization rate, cleavage rate, high quality embryonic rate and pregnancy rate ($P>0.05$).

GnRHa of superovulating protocol improved oocyte quality, synchronized follicle development, increased follicular recruitment and improved IVF effects. The long protocol initiated in the mid-luteal phase with GnRHa resulted in more prompt and profound suppression so that the doses of exogenous Gn had to be increased and the stimulation period was prolonged. The short protocol takes advantage of the “flare up” initially and then the pituitary desensitization effect with GnRHa. With the reduced doses of Gn required and less stimulation periods, the cost of IVF cycle also reduced[7]. San’s reported that retrieved oocyte was fewer and clinical pregnancy rate was lower with the short protocol compared with that of the long protocol[8]. However Our experimental results were quite different. Bstandig[9] found that short protocol with low dose of GnRHa stimulated the development of follicles in the early follicular phase effectively and prevented premature LH surge, as did the long protocol, which especially benefits “poor responders”. This study demonstrates that short protocol can achieved similar effect of hyperovulation as did the long protocol.

3.2 The effect of female age on IVF outcome

A total of 108 patients were divided into three age group: young group (aged ≤29 years), moderate group(range 30-34 years) and aging group(aged≥35years).As shown in Table 2, with the age growing, the clinical pregnancy rate were significantly lower (46.4%, 35.0% and 10.0% respectively). There was no difference about M□ oocyte among aging, young and middle age group. The ovarian reservation decreased with advancing age, while a parallel decrease in the number of mature oocytes and decline in oocyte quality was present. Degressive oocyte quality does not affect fertilization potential[10]. Therefore, there was no significant difference in terms of fertilization rate, cleavage rate and high quality embryo rate in the three group.

It has been noticed that the pregnancy rate for the aging group is 10%. Investigations demonstrated that waning oocyte quality and declining uterine receptivity were the main factors responsible

for the age-related reduction of female fecundity. Oocyte quality declines, due in part to increased aneuploidy because of oxidative damage at meiosis I stage, which cause pregnancy rate decreased while fertilization rate and high quality embryo rate seems normal. Declining uterine receptivity is attributed to a series of endometrial changes in morphology and function, such as decreased content of DNA in matrix cell, reduced estrogen and progesterone receptor,declined vascular perfusion of the endometrium, and some pathological alternation of the uterus. Thus, age is negatively correlated with pregnancy rate in IVF cycles. Female age is an important predictor of pregnancy rate.

Table 1. The effect of both protocol on oocyte maturation, embryonic quality and pregnancy rate

G	cycle	Gn Dose (ampoule)	Stimul-ating periods (day)	Number of retrieved oocyte	Number Of MII oocyte	Fertilizing Rate (%)	Cleavage rate (%)	High quality embryo rate (%)	Pregnancy rate (%)
L	42	31.4± 13.8	12.6± 2.0	13.7± 7.2	11.4± 6.9	71.4± 19.8	91.3± 13.6	68.5± 18.8	33.3
S	66	25.7± 8.5	11.7± 1.6	13.3± 6.0	11.1± 5.9	70.4± 19.9	93.4± 14.3	63.5± 24.3	33.3
P		P<0.05	P<0.05	P>0.05	P> 0.05	P>0.05	P>0.05	P> 0.05	P>0.05

G: group; L: Long protocol; S: Short protocol

Table 2. The effect of age on IVF-ET outcome

G	cycle	Number of MII oocyte	Fertilizatin Rate (%)	Cleavage rate (%)	High quality embryo rate (%)	Pregnant (case)	Pregnancy rate (%)
Y	28	11.4± 6.0	70.6± 20.3	88.8± 17.5	65.1± 22.3	13	46.4**
M	60	12.2± 6.6	72.2± 20.1	93.7± 12.9	65.9± 21.3	21	35.0*
A	20	8.2±4.9	66.8± 18.3	94.6± 11.3	64.6± 26.5	2	10.0
P		P>0.05	P>0.05	P>0.05	P>0.05		

G: group ;Y: Young ;M: Middle; A: Aging;

**compared with aging group P<0.01; *compared with aging group P<0.05;

3.3 The impact of fertilization method on IVF outcome

108 cycles were divided into two groups by two methods of conventional IVF and ICSI.

Table 3. The effect of fertilizing method on IVF-ET outcome

Group	Cycle	Fertilization rate (%)	Cleavage rate (%)	High quality embryo rate (%)	Pregnancy (case)	Pregnancy rate (%)
IVF	51	71.9± 18.7	93.1± 14.1	63.0± 23.7	16	31.4%
ICSI	57	69.6± 21.0	92.0± 14.0	68.1± 20.7	20	35.1%
P		P>0.05	P>0.05	P>0.05		P>0.05

As shown in Table 3, there was no significant difference between the two groups in fertilization rate, cleavage rate, high quality embryo rate and pregnancy rate. It would be concluded that microinjection is a safe procedure for oocyte manipulation and ICSI could achieve satisfactory fertilization rate and clinical pregnancy rate in severe male-factor infertility, such as severe oligozoospermia, asthenozoospermia, positive antisperm antibody , azoospermia, and failure with conventional IVF.

There has no evidence so far excluding that ICSI procedure itself is related to chromosome aberration. Up to now, the two explanation has been reasonable to explain possibility that microinjection lead to offspring malformation. The first is that injection is done with exogenous DNA or contaminative granules into oocyte cytoplasm and further results in parthenogenetic reproduction, cytoplasmic disorder of physiology or biochemistry, and the second one is selection of sperm with abnormal chromosome. So it is important to normalize the manipulation and avoid injecting of exogenous DNA or contaminative granule into oocyte cytoplasm. Mammal oocyte and embryo have the ability to repair DNA damage, which can correct the cellular injury caused by micromanipulation before rounding into embryo developmental abnormalities. ICSI is a safe and effective means for severe forms of male infertility, complying with manipulation regulations.

3.4 The relationship between the quality and number of embryos transferred and pregnancy outcome respectively

The quality and number of embryos transferred in pregnancy group and non-pregnancy group are listed in Table 4.

Table 4. T embryonic quality, numbers transferred and pregnancy outcome

Gruop	case	Number of 4-cell embryos transferred	Number of high quality embryos transferred	Number of embryos transferred
Pregnancy	36	2.28±0.78	2.44±0.61	2.97±0.45
Non-pregnancy	72	1.89±0.94	1.88±0.87	2.82±0.68
P		P<0.05	P<0.05	P>0.05

Outcome of IVF cycles is significantly correlated with the quality and number of embryos transferred. It has been shown that embryo quality is an important predictor of pregnancy rates. Embryo developmental

stage, proportion of anuclear fragments and even state of blastomere are the main parameters to assess embryo quality. Normal embryos usually develop to 4-cell stage 48h after retrieval[11]. Giorgetti[12] found that 4-cell embryos gave rise to significantly higher rates of implantation than did other cleaving stage embryos in the study of embryo morphology with single embryo transfer cycles. It has been demonstrate that 4-cell embryos are more easy to implant compared with early- and late-cleaving embryos on day 2. Pregnancy rate increased with the increasing of 4-cell embryos transferred[13]. Our study also found that 4-cell stage is an optimal cleavage status, with more 4-cell embryos transferred in pregnancy group than that in non-pregnancy group, indicating that the number of 4-cell embryos transferred is correlated with pregnancy. It is also infered from the Table 4 that the total number of good quality embryos is related with pregnancy rate positively.

According to the report by Elsner[14], pregnancy rate was significantly higher when 3 embryos were transferred with increasing embryo number and did not, however, increase further more when transfer 4-6 embryos. Most patients were transferred with 3 embryos and no more than 4. Statistical analysis showed no significant difference in number of embryo transferred in the two groups.

This study demonstrates that the quality of embryo transferred has a close relationship with pregnancy rate. Selecting good quality embryo on the basis of morphology and cleavage stage help to raise pregnancy rate, reduce number of embryo transferred and reduce multiple pregnancy as a result.

3.5 The effect of embryo culture condition on frozen-thawed embryo transfer (FET) outcome

From January 2003 to October 2003, and July 2004 to December 2004, 54 FET cycles were divided into non-controlled environment group and controlled environment group. Embryos were manipulated at super-clean bench in ordinary lab and laminar flow room, respectively. Cryopreservation were performed at super-clean bench in ordinary lab with non-controlled environment.

The thawing principle is that three embryo be thawed if frozen embryo>3, and thawing the remaining embryos until get 3 survival embryos to be transferred if embryo dead in the procedure. Frozen embryo should be thawed at the same time when it≤3 and all survival embryos should be transferred. This study showed that the number of embryos thawed and dead is significantly lower in controlled environment group than that in non-controlled environment group. The pregnancy rate is, however, significantly higher than that of non-controlled environment group. With decreasing of dead embryo, the number of FET cycles increased and pregnancy chance increased as a result. Culture conditions play an important role in the outcome of IVF. In vitro culture of embryos should be performed at laminar flow room.

Table 5. The effect of embryonic culture condition on frozen embryo transfer result and pregnancy rate

group	cycle	Number of embryos thawed	Number of dead embryos	Pregnancy (case)	Pregnancy rate(%）

non-controlled environment	30	3.53±0.94	0.67±0.88	8	26.7
controlled environment	24	2.96±0.55	0.25±0.44	13	54.2
P		P<0.05	P<0.05		P<0.05

4. CONCLUSION

The long and short protocols of IVF-ET have the similar effects in numbers of retrieved oocyte and MⅡ oocyte, fertilization rate, cleavage rate, high quality embryo rate and pregnancy rate, but using dose of Gn is much lower in the short protocol.

The clinical pregnancy rate of IVF become significantly lower in the women aged ≥35 years.

IVF and ICSI can produce the same effects in fertilization rate, cleavage rate, high quality embryo rate and pregnancy rate.

Number of 4-cell embryos and quality of embryos transferred is positively correlated with pregnancy rate.

Correspondent to
Guixue Z
College of Animal Science and technology,
North East Agricultural University,
Harbin, Heilongjiang 150030, China
Email: gxzhang@neau.edu.cn

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Absolute Globalization

Hongbao Ma

Department of Medicine, Michigan State University, East Lansing, MI 48823, USA, 517-432-0623, Email: hongbao@msu.edu

Abstract: Globalization is the integration of the Earth human societies and it offers extensive opportunities for worldwide development. Globalization contains three aspects: economic globalization, cultural globalization and political globalization. Four aspects of globalization can be classified into four aspects: (1) Trade; (2) Capital movements; (3) Movement of people; (4) Spread of knowledge and technology. General to say, everyone should be equal in the world, especially in political aspect. The Earth should have the World Government and the global human society should be a unified entity. [Nature and Science. 2005;4(1):54-57].

Keywords: culture; economics; democracy; globalization; politics; society

1. Introduction

Up to July 2005, there are 6,446,131,400 people distributed in 192 countries of the world (World Factbook, 2005). The interest connections and conflicts among countries have existed in the whole human history. Wars never disappear in the world and global wars happened many times in history. Particularly, as the military development with the high tech, especially nuclear weapon's power, it is really danger for the Earth human civilization to be completely wiped out by the conflicts among countries. Even the conflicts inside a country, such as civil wars, killed millions of people in human history and the domestic problems like human right violations are problems in everywhere of the world, and even the terrorism is the common enemy of the human society, the biggest possibility to complete remove all the civilization of the Earth is the fighting among countries. The absolute globalization is the best way to save the human civilization from the dander of destroying.

The nature of human society is to produce products, sell the products, and buy materials for the further production and living. Everybody has some abilities but nobody has full abilities. As an integrate, it is powerful, and it is benefit to the whole human society.

2. We need the Absolute Globalization

Globalization is a positive tendency in our Earth world. And, globalization is the integration of the Earth human societies and it offers extensive opportunities for worldwide development. We need the Absolute Globalization in the world. Some countries are becoming integrated into the global economy more quickly than others. Countries that have been able to integrate are faster growth and less poverty. As the civilization advanced, it became possible to make the world be more democracy absolute globalization.

Globalization refers in general to the worldwide integration of humanity and the compression of both the temporal and spatial dimensions of planet wide human interaction (Harris, 1995). Globalization contains three aspects: economic globalization, cultural globalization and political globalization. Right now, most debates and public concerns are concentrated in the economic globalization.

There are four aspects of globalization: (1) Trade: Developing countries as a whole have increased their share of world trade–from 19 percent in 1971 to 29 percent in 1999. For instance, the newly industrialized economies of Asia have done well, while Africa as a whole has fared poorly. The strongest rise by far has been in the export of manufactured goods. (2) Capital movements: Direct foreign investment has become the most important category. Both portfolio investment and bank credit rose but they have been more volatile, falling sharply in the wake of the financial crises of the late 1990s. (3) Movement of people: Workers move from one country to another partly to find better employment opportunities. The numbers involved are still quite small, but in the period 1965-90, the proportion of labor forces round the world that was foreign born increased by about one-half. Most migration occurs among developing countries. But the flow of migrants to advanced economies is likely to provide a means through which global wages converge. There is also the potential for skills to be transferred back to the developing countries and for wages in those countries to rise. The board control of developed countries is an obstacle to the globalization. For the absolute globalization, it should completely open all the boards. (4) Spread of knowledge and technology: Information exchange is an integral, often overlooked, aspect of globalization. For instance, direct foreign investment brings not only an expansion of the physical capital stock, but also technical innovation. More generally, knowledge about production methods, management techniques, export markets and economic

policies is available at very low cost, and it represents a highly valuable resource for the developing countries.

Worries about globalization exist in all countries. Someone concerns if globalization harm workers' interests. I want to say that it does not. But for the different countries the effectives of globalization are different.

All government should represent the interest of its people but not hurt the interest of other country's people. The economy as a whole will improve globalization by promoting an open economy. All the countries in the world will get benefit from the globalization. Government policy should focus on two important areas: education and vocational training, to make sure that workers have the opportunity to acquire the right skills in dynamic changing economies.

The succession of crises in the 1990s (including Russia, Korea, Thailand, Indonesia, Mexico and Brazil etc) suggested that financial crises are a direct and inevitable result of globalization. But I want to say this economic crisis did not come from the globalization.

Indeed, globalization does not reduce national sovereignty. At the national level, even some countries want tjo be independent from outside of the world, they cannot do this. At the international level, the whole worl is a united thing. No country can keep itself from the internationalization.

National and international institutions play an important role in the process of globalization, such as the United Nations.

Right now, most people are talking about economic globalization, a few people are talking about cultural globalization, but very few people are thinking about political globalization. Our Earth is unique in the universe. Everyone should be equal in the world. To keep in world from the totally destroying, we need to make the world as one country. World government must be set up. There is no reason to distinguish the people from different citizenship.

3. Discussion

As globalization has progressed, people living conditions have improved significantly in all countries. It is the natural right for everybody in the world to enjoy the achievements created by people. We admit the private property ownership, but we nobody can claim the public properties are related to citizenship. For example, if the public property of a country belongs to all the citizens of the country, how the new immigrants can get the same share of the property and how if the people immigrate to another country they will lose the ownership of the property? So that, the conclusion is that the ownership of the public property belongs to the whole human community of the Earth. All the people are living in the single Earth Village!

Correspondence to:
Hongbao Ma
B410 Clinical Center
Department of Medicine
Michigan State University
East Lansing, MI 48823, USA
Telephone: 517-432-0623
Email: hongbao@msu.edu

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Appendix

196 Countries and Districts in the World

1. Afghanistan (Kabul) (AS)
2. Albania (Tirane) (EU)
3. Algeria (Algers) (AF)
4. Andorra (Andorra la Vella) (EU)
5. Angola (Luanda) (AF)
6. Antigua and Barbuda (St. John's) (NA)
7. Argentina (Buenos Aires) (SA)
8. Armenia (Yerevan) (EU)
9. Australia (Canberra) (AU)
10. Austria (Vienna) (EU)
11. Azerbaijan (Baku) (AS)
12. Bahamas (Nassau) (NA)
13. Bahrain (Manama) (AS)
14. Bangladesh (Dhaka) (AS)
15. Barbados (Bridgetown) (NA)
16. Belarus (Minsk) (EU)
17. Belgium (Brussels) (EU)
18. Belize (Belmopan) (NA)
19. Benin (Port-Novo) (AF)
20. Bhutan (Thimphu) (AS)
21. Bolivia (Sucre) (SA)
22. Bosnia and Herzegovina (Sarajevo) (EU)
23. Botswana (Gaborone) (AF)
24. Brazil (Brasilia) (SA)
25. Brunei (Bander Seri Begawan) (AS)
26. Bulgaria (Sofia) (EU)
27. Burkina Faso (Ouagadougou) (AF)
28. Burma/Myanmar (Yangon) (AS)
29. Burundi (Bujumbura) (AF)
30. Cambodia (Phnom Penh) (AS)
31. Cameroon (Yaounde) (AF)
32. Canada (Ottawa) (NA)
33. Cape Verde (Praia) (EU - Portugal)
34. Central African Republic (Bangui) (AF)

35. Chad (N'Djamena) (AF)
36. Chile (Santiago) (SA)
37. China (Beijing) (AS)
38. Colombia (Bogota) (SA)
39. Comoros (Moroni) (AF)
40. Congo (Brazzaville) (AF)
41. Congo, Democratic Republic of (Kinshasa) (AF)
42. Costa Rica (San Jose) (NA)
43. Cote d'Ivoire/Ivory Coast (Yamoussoukro) (AF)
44. Croatia (Zagreb) (EU)
45. Cuba (Havana) (NA)
46. Cyprus (Nicosia) (AS) and/or (EU)
47. Czech Republic (Prague) (EU)
48. Denmark (Copenhagen) (EU)
49. Djibouti (Djibouti) (AF)
50. Dominica (Roseau) (NA)
51. Dominican Republic (Santo Domingo) (NA)
52. East Timor (Dili) (AS)
53. Ecuador (Quito) (SA)
54. Egypt (Cairo) (AF)
55. El Salvador (San Salvador) (NA)
56. Equatorial Guinea (Malabo) (AF)
57. Eritrea (Asmara) (AF)
58. Estonia (Tallinn) (EU)
59. Ethiopia (Addis Ababa) (AF)
60. Fiji (Suva) (AU - Oceania)
61. Finland (Helsinki) (EU)
62. France (Paris) (EU)
63. Gabon (Liberville) (AF)
64. Gambia (Banjul) (AF)
65. Georgia (Tbilisi) (EU)
66. Germany (Berlin) (EU)
67. Ghana (Accra) (AF)
68. Greece (Athens) (EU)
69. Grenada (St. George's) (NA)
70. Guatemala (Guatemala City) (NA)
71. Guinea (Conakry) (AF)
72. Guinea-Bissau (Bissau) (AF)
73. Guyana (Georgetown) (SA)
74. Haiti (Port-au-Prince) (NA)
75. Honduras (Tegucigalpa) (NA)
76. Hungary (Budapest) (EU)
77. Iceland (Reykjavik) (EU)
78. India (New Delhi) (AS)
79. Indonesia (Jakarta) (AS)
80. Iran (Tehran) (AS)
81. Iraq (Baghdad) (AS)
82. Ireland (Dublin) (EU)
83. Israel (Jerusalem) (AS)
84. Italy (Rome) (EU)
85. Jamaica (Kingston) (NA)
86. Japan (Tokyo) (AS)
87. Jordan (Amman) (AS)
88. Kazakstan (Astana) (AS)
89. Kenya (Nairobi) (AF)
90. Kiribati (Bairiki) (AU - Oceania)
91. Korea, North (Pyongyang) (AS)
92. Korea, South (Seoul) (AS)
93. Kuwait (Kuwait City) (AS)
94. Kyrgyzstan (Bishkek) (AS)
95. Laos (Vientiane) (AS)
96. Latvia (Riga) (EU)
97. Lebanon (Beirut) (AS)
98. Lesotho (Maseru) (AF)
99. Liberia (Monrovia) (AF)
100. Libya (Tripoli) (AF)
101. Liechtenstein (Vaduz) (EU)
102. Lithuania (Vilnius) (EU)
103. Luxembourg (Luxembourg) (EU)
104. Macedonia (Skopje) (EU)
105. Madagascar (Antananarivo) (AF)
106. Malawi (Lilongwe) (AF)
107. Malaysia (Kuala Lumpur) (AS)
108. Maldives (Male) (AS)
109. Mali (Bamako) (AF)
110. Malta (Valletta) (EU)
111. Marshall Islands (Majuro) (AU - Oceania)
112. Mauritania (Nouakchott) (AF)
113. Mauritius (Port Louis) (AF)
114. Mexico (Mexico City) (NA)
115. Micronesia (Palikir) (AU - Oceania)
116. Moldova (Chisinau) (EU)
117. Monaco (Monaco) (EU)
118. Mongolia (Ulan Bator) (AS)
119. Morocco (Rabat) (AF) (including Western Sahara)
120. Mozambique (Maputo) (AF)
121. Namibia (Windhoek) (AF)
122. Nauru (no official capital) (AU - Oceania)
123. Nepal (Kathmandu) (AS)
124. Netherlands (Amsterdam, The Hague) (EU)
125. New Zealand (Wellington) (AU)
126. Nicaragua (Managua) (NA)
127. Niger (Niamey) (AF)
128. Nigeria (Abuja) (AF)
129. Norway (Oslo) (EU)
130. Oman (Muscat) (AS)
131. Pakistan (Islamabad) (AS)
132. Palau (Koror) (AU - Oceania)
133. Panama (Panama City) (NA)
134. Papua New Guinea (Port Moresby) (AU)
135. Paraguay (Asuncion) (SA)
136. Peru (Lima) (SA)
137. Philippines (Manila) (AS)
138. Poland (Warsaw) (EU)
139. Portugal (Lisbon) (EU)
140. Qatar (Doha) (AS)
141. Romania (Bucharest) (EU)
142. Russian Federation
143. (east) of the Ural Mountains (AS)

144. Russian Federation (Moscow)
145. (west) of the Ural Mountains (EU)
146. Rwanda (Kigali) (AF)
147. Saint Kitts and Nevis (Basseterre) (NA)
148. Saint Lucia (Castries) (NA)
149. Saint Vincent and the Grenadines (Kingstown) (NA)
150. Samoa (Apia) (AU - Oceania)
151. San Marino (San Marino) (EU)
152. Sao Tome and Principe (Sao Tome) (AF)
153. Saudi Arabia (Riyadh) (AS)
154. Senegal (Dakar) (AF)
155. Seychelles (Victoria) (AF)
156. Sierra Leone (Freetown) (AF)
157. Singapore (Singapore City) (AS)
158. Slovakia (Bratislava) (EU)
159. Slovenia (Ljubljana) (EU)
160. Solomon Islands (Honiara) (AU - Oceania)
161. Somalia (Mogadishu) (AF)
162. South Africa (Pretoria, Cape Town, Bloemfontein) (AF)
163. Spain (Madrid) (EU)
164. Sri Lanka (Colombo) (AS)
165. Sudan (Khartoum) (AF)
166. Suriname (Paramaribo) (SA)
167. Swaziland (Mbabane) (AF)
168. Sweden (Stockholm) (EU)
169. Switzerland (Bern) (EU)
170. Syria (Damascus) (AS)
171. Taiwan (Taipei) (AS)
172. Tajikistan (Dushanbe) (AS)
173. Tanzania (Dodoma) (AF)
174. Thailand (Bangkok) (AS)
175. Togo (Lome) (AF)
176. Tonga (Nuku'alofa) (AU - Oceania)
177. Trinidad and Tobago (Port-of-Spain) (NA)
178. Tunisia (Tunis) (AF)
179. Turkey (Ankara) (AS) & (EU)
180. Turkmenistan (Ashgabat) (AS)
181. Tuvalu (Funafuti) (AU - Oceania)
182. Uganda (Kampala) (AF)
183. Ukraine (Kiev) (EU)
184. United Arab Emirates (Abu Dhabi) (AS)
185. United Kingdom (London) (EU)
186. United States (Washington D.C.) (NA)
187. Uruguay (Montevideo) (SA)
188. Uzbekistan (Tashkent) (AS)
189. Vanuatu (Port-Vila) (AU - Oceania)
190. Vatican City (na) (EU)
191. Venezuela (Caracas) (SA)
192. Vietnam (Hanoi) (AS)
193. Yemen (Sana) (AS)
194. Yugoslavia (now Serbia & Montenegro) (Belgrade) (EU)
195. Zambia (Lusaka) (AF)
196. Zimbabwe (Harare) (AF)

(Abbreviations of above: Africa – AF; Asia- AS; Australia – AU; Europe – EU; North American – NA; South American – SA).

A Few Responses of Visitors in the Museum of Art & Science of Ben-Gurion University of the Negev

Abraham Tamir

Chemical Engineering at Ben-Gurion University of the Negev, Beer-Sheva, Israe

Abstract: This paper is the expression science and God by professor Abraham Tamir in Chemical Engineering at Ben-Gurion University of the Negev, Beer-Sheva, Israe, which shows a few responses of visitors in the Museum of Art & Science of Ben-Gurion University of the Negev. [Nature and Science. 2005;4(1):58-59].

Keywords: exhibition; God; science

* "A unique and fascinating exhibition. Thank you Professor Tamir." Aaron Klug, Cambridge, England (**Nobel Prize Laureate in Chemistry**)
* "If only school science had been made this interesting! A fascinating trip with the brain". **David Elliot, Director, the British Council**
* "As one who is coming from art, the idea of combining Art & Science is wonderful. The introduction of art to the "temple of science" is a positive action, especially in our era"
* "Excellent! This is how an academic institute should look like"
* "Wonderful, too good to be true"
* "Wonderful exhibition relating two different worlds"
* "Fascinating exhibition. So nice that there is somebody who does something to arouse the thinking of students above the taught subjects, taking the soul, thoughts and logic to other worlds"
* "Very special, full of taste and very elegant"
* "Fascinating and broadening the knowledge of the pupils - your future students - either in Art and in Science"
* "Good luck on the innovative exhibition in its ideas and avenues"
* "The exhibition adds to the university. It is absolutely interesting to observe the pictures during the intervals between the lectures..."
* "It is not a regular exhibition. We will visit again"
* "I received new dimensions to old subjects"
* "Very interesting. I don't think that the artists thought scientifically while painting"
* "Eventually you found what to do with art, to explain in a simple way most important concepts in science. Until today I did not understand why and what is art for, but to sale pictures and sculptures"
* "To bring Art & Science to the crowd"
* "Dear Abraham! You succeeded in transforming a classroom building to a colored, aesthetics place which is full of life"
* "I was always thinking that people are divided into two: those who are engaged in science in a dry and precise form, and those who are engaged in art. By observing the exhibition and your explanations, I was happy to reveal that it is possible to unite the two entities"
* "I found my self revealing dimensions and movements in places I did not realize. All respect to the creators who succeeded to transfer to the paper difficult and abstract concepts"
* "Simply fascinating! To someone who studies humanities, there is no significance to scientific concepts. But the interaction between Art & Science is so strong. It is wonderful to see surrealist artists, which I like, given to a different interpretation, different from what I have seen"
* "Dear Abraham! We were impressed of your scientific-artistic contribution and your interpretations. Good luck on the opportunity you give visitors of the university and particularly the students to enjoy aesthetics of art and the interaction between Art & Science"
* "Of all exhibits, I was most impressed by the Visitors Book. So many wishes and nice words. So if all are wishing so highly, I don't have any other choice but to join them"
* Creates an excitement! It is the best proof that Science is much but not certainly all. After all this it is much easier to believe that there is God.

ABRAHAM TAMIR

Abraham Tamir is a full professor in Chemical Engineering at Ben-Gurion University of the Negev, Beer-Sheva, Israel. In the course of his administrative career he has been also Rector of the University (1986-1990), the highest academic position.

Abraham Tamir is the author of 165 scientific articles and 10 books. He developed an efficient gas burner, which may save about 25% of the gas consumption when applied to domestic gas stoves and outdoor cookers. In 1990, the largest manufacturer of camping equipment in Israel, launched the market with a new product, the *Rotoflame Camping Cooker*, which applied successfully the new burner. In 1984 he was awarded The Michael Landau Research Prize for "Development of a New Gas-Saving Burner for

Domestic Stoves" and in 1991 The Bergman Prize for contribution in the development of the subject "Combustion Processes in Swirling Flows"

Abraham Tamir is considered as world expert on “Impinging-Stream Reactors”, a method for intensifying technological processes. A reviewer described him once as the father of impinging streams. His achievements are summarized in his book ”Impinging-Stream Reactors”, published by Elsevier in 1994, which was translated also to Chinese.

In 1998 he founded the Museum on Art and Science in his University, the first of its kind in the world. He also established about 40 exhibitions on Art&Science in Israel and abroad. During 2000-2005 he acted the Associate Editor on Art and Science in the Canadian Journal of Chemical Engineering. From 2003 he is editing a column on Art and Science in the Scientific American published in Israel. In recent years he has been teaching a new course, entitled, The Interaction Between Art and Science at Ben-Gurion University of the Negev, Achva College and the Interdisciplinary Center in Herzliya.

Interaction between Art & Science

Through Chemical Engineering

MonStein = 1/2 Mona + 1/2 Einstein

LeMonStein = Leonardo + Mona + Einstein

MoNardo = 1/2 Mona + 1/2 Leonardo

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art & science

Cheng-Dau Lee, Nobel laureate in physics, said : "Science and Art are not separated from each other. They assist us in observing nature. With the help of Science we can discover the routines of nature. Through Art we can describe the emotions of nature."

The major aim of this exhibition is to bring to the attention of the observer the fact that Science can also be observed through the "eyes" of Art. In this way, an additional dimension is given to Art, to demonstrate Science via Art.

The following subjects in Chemical Engineering are demonstrated in this exhibition through Art: Newton laws, Thermodynamic functions, Laws and behaviour of solutions, Fluid flow, Processes and Biotechnology.

The interaction between the two "cultures", Art & Science, is demonstrated in this poster by different combinations of the faces of Mona Lisa, Albert Einstein and Leonardo Da Vinci. As seen, each combination creates one totality, as the interaction between Art & Science.

The creator of this exhibition is Abraham Tamir, a Professor in Chemical Engineering at Ben-Gurion University of the Negev, Beer-Sheva, Israel. In 1998 he founded in his university the Museum of Art & Science, the first of his kind in the world. He is also setting up exhibitions on Art & Science in Israel and abroad. He is the Associate Editor for Art & Science in the Canadian Journal of Chemical Engineering and co-Editor for Art & Science in the Research Journal of Chemistry and Environment.

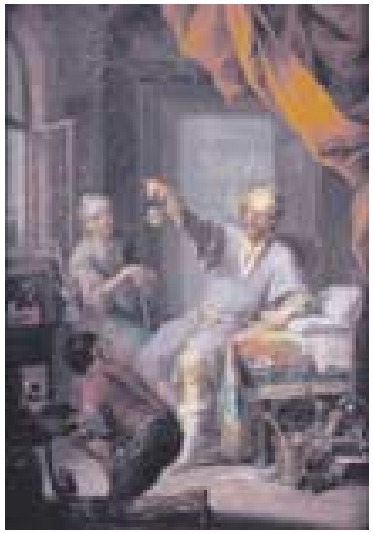
Design: Hadas Design

What is Chemical Engineering?

Charles Sheeler

The chemical plant

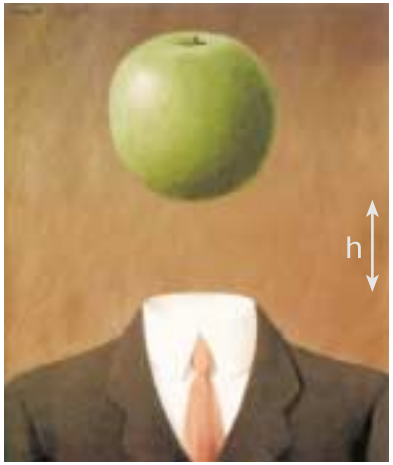
The scientific discipline engaged with transformation of laboratory achievements to manufacture of a product in a chemical plant



Franz C. Janneck

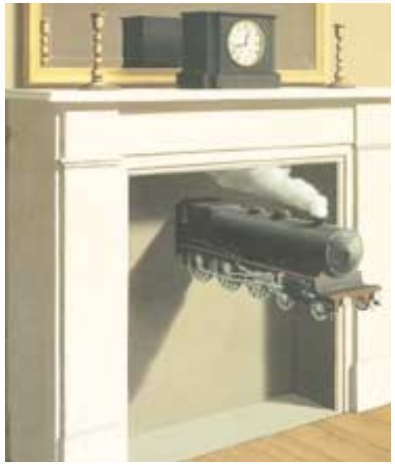
The laboratory

Thermodynamic Functions



Rene Magritte

Potential energy = mgh > 0



Rene Magritte

Kinetic energy = $mv^2/2$

Rene Magritte

Enthalpy H

Hanoch Piven

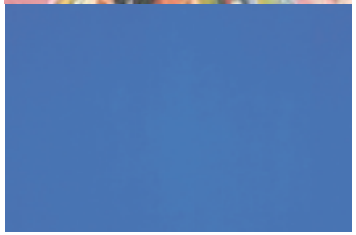
Pressure P

Leonardo Da Vinci

Temperature T

Damien Hirst

S=Smax
maximum disorder



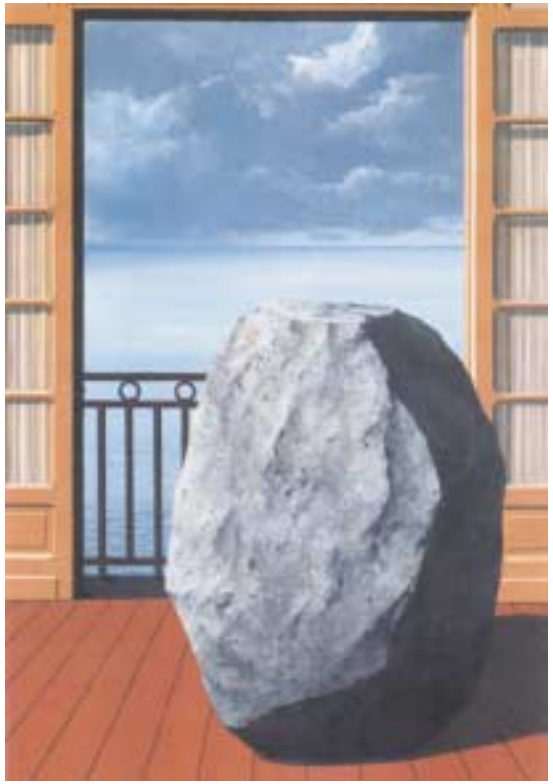
Yves Klein

S=0
maximum order

Entropy S

Thermodynamic Functions

Newton's First Law



Rene Magritte

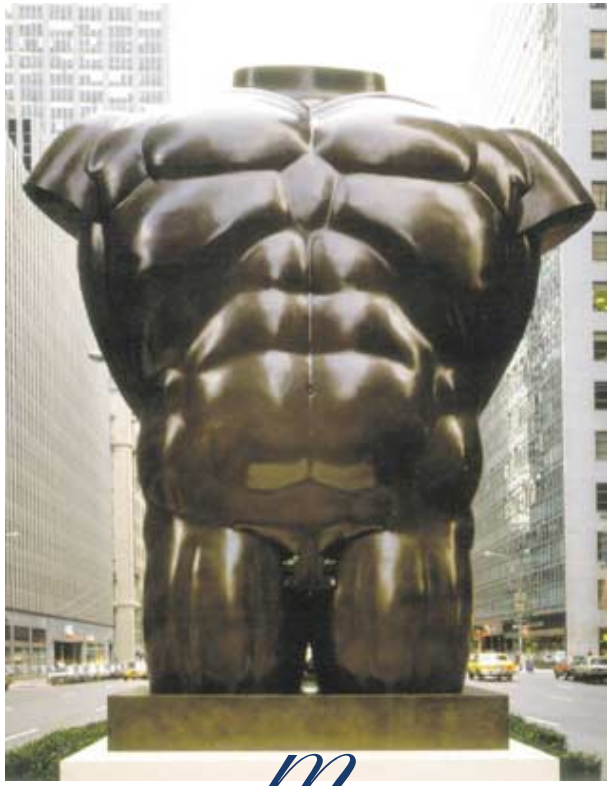
Jacek Yerka

"A body in motion at a constant speed in a straight line tends to stay at that constant speed in a straight line, like in Yerka's artwork. If the body is at rest, it will remain at rest, like in Magritte's artwork"

Newton's Second Law

Franz Von Stuck

$$F = m \cdot g$$



Fernando Botero

Fernando Botero

"A force F acting on a body of mass m accelerates it with an acceleration a.
When a body falls in vacuum, the force acting on it is its weight; this force will accelerate the body at an acceleration of $g=9.8\ m/sec^2$"

The Zeroth Law of Thermodynamics

"When two systems are independently found to be in thermal equilibrium with a third system, $T_1=T_3$ and $T_2=T_3$, they are also in thermal equilibrium with each other, $T_1=T_2$"

Rene Magritte

Newton's Third Law

Botero's couple is transposed on Ron Miller's view

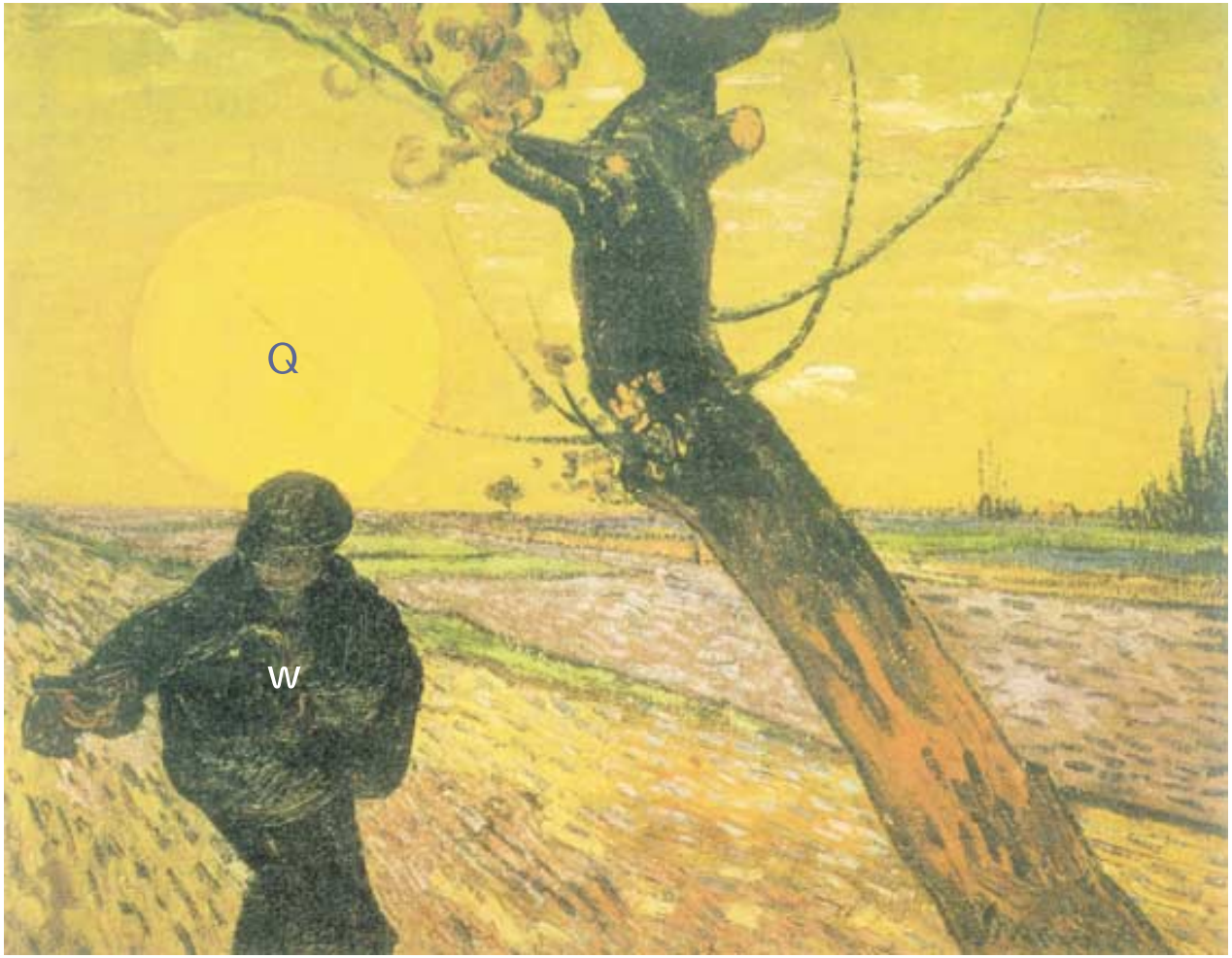
Ron Miller

"For every action there is an equal and opposite reaction"

Einstein's special relativity: "Laws of nature are equal in all systems moving one relative to the other at the same speed." Consequently, Newton's 3rd law is valid on Callisto and Jupiter

Fernando Botero

What is Thermodynamics ?



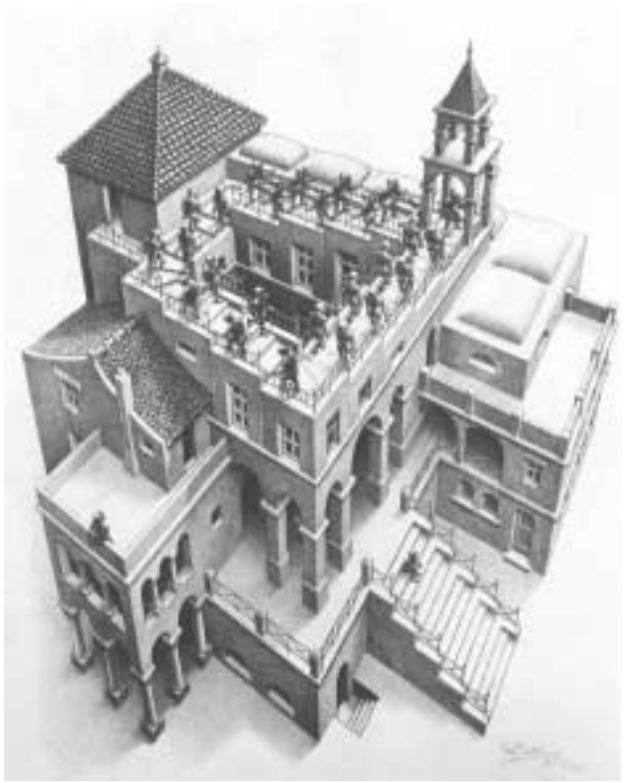
Vincent Van Gogh

The science of the transformation of heat Q to work w

What is Thermodynamics ?

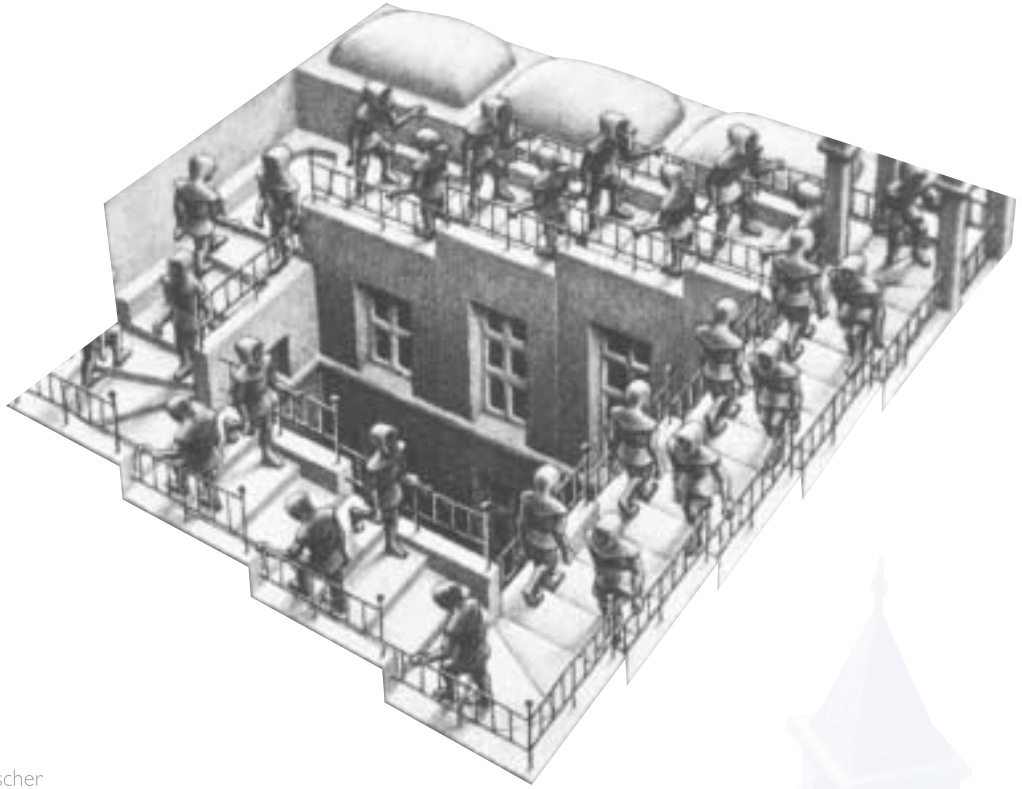
The Third Law of Thermodynamics:

"The absolute zero T=0 K is unattainable"



M.C. Escher

"Ascending Descending"



The endless staircase

The above statement of the third law is demonstrated in Escher's sophisticated staircase on which monks are descending (or ascending) endlessly and the end of the staircase is never achieved, like the absolute zero

Vortices and Flow Over and Around Bodies

Vincent Van Gogh

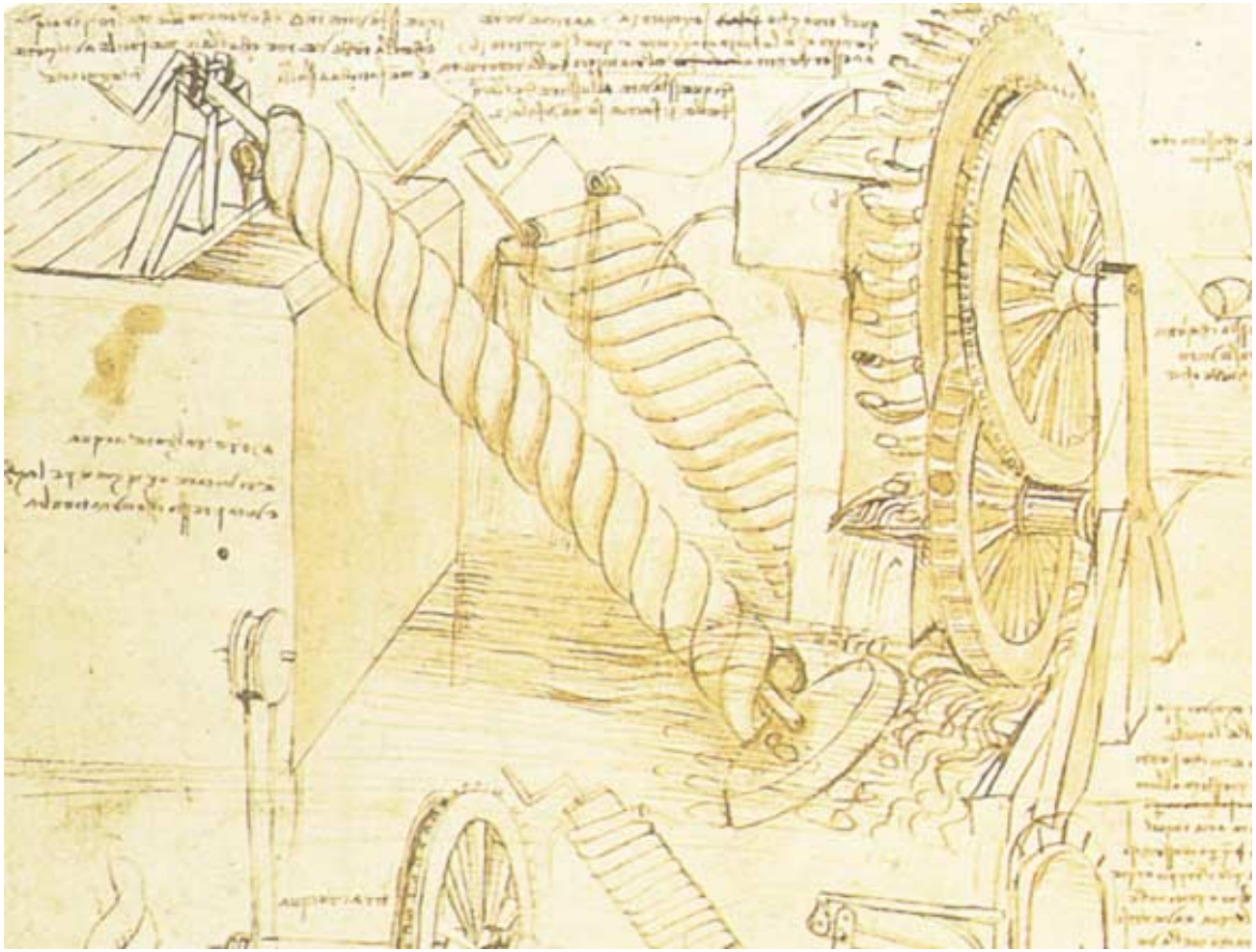
The picture of Van Gogh, who was not a fluid flow man, demonstrates the characteristics of the following kinds of flow: flow around bodies – 11 moons, vortices in the center of the picture, and boundary flow over a sleeping village

Sublimation Processes

Rene Magritte

A sublimation process is characterized by the direct transition from a solid to gas phase. Magritte's artwork demonstrates this process where half of the bridge sublimes. However, a deep observation reveals that the artist created an illusion of a sublimation process by covering half of the bridge by a cloud

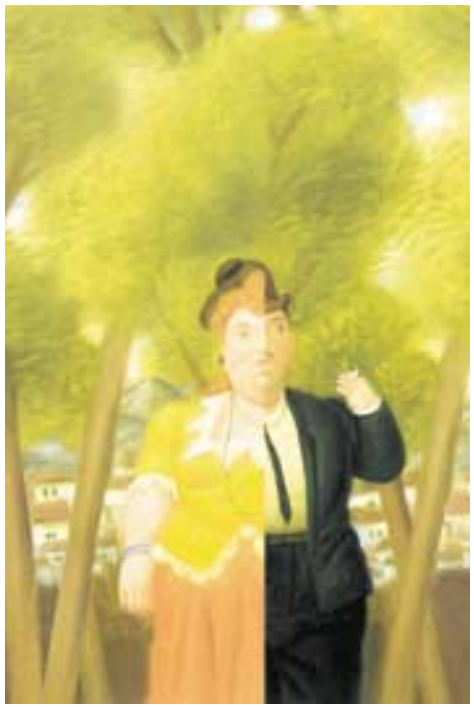
Pumping Processes



Leonardo Da Vinci

Pumping processes are used to transfer fluids from one place to the other by an appropriate device. Leonardo's artwork of 1480 describes a combination of "Archimedes Screw" developed about 2000 years ago and a pump, as device for transferring water upwards

Law of Conservation of Mass



$0.5m_2 + 0.5m_1$

+

$0.5m_1 + 0.5m_2$

=

$m_1 + m_2$

Fernando Botero

In any change of state the total mass is conserved

The First Law of Thermodynamics

Heat

De Es Schwertberger

$Q - W = \Delta U$

Work

Vincent Van Gogh

Internal energy

Tamara Lempica

"Energy is always conserved. It is impossible to destroy energy or to create it out of nothing.
It is possible to transform energy from one form to the other"

The interaction between heat Q and work W causes a change in the internal energy ΔU of the system according to the equation $Q-W=\Delta U$, where the internal energy is a property related to the inwardness of the system as demonstrated by Lempica's artwork.

Gibbs's Phase Rule: F=C+2−P

Yves Tanguy

solid-gas: F=1+2−2=1

Jaime Galicia

Ice-water-vapor: F=1+2−3=0

The number of variables F that can be varied without causing a change in the number of phases (in a system in which no chemical reactions occur) is given by F=C+2−P, where C is the number of components and P is the number of phases

Avogadro's Law

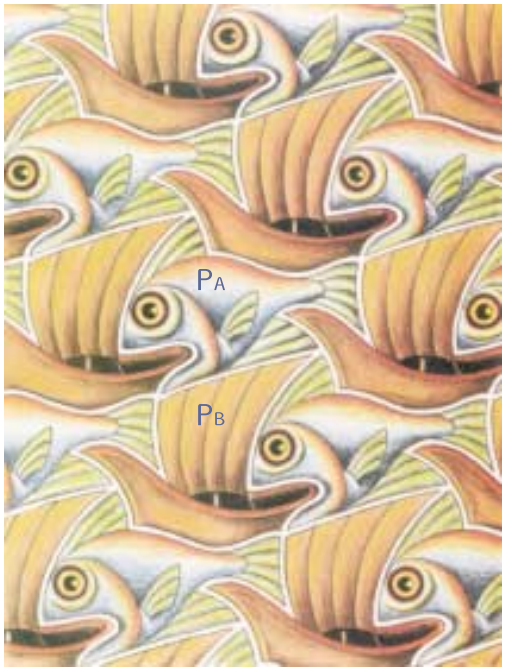
P, V, T; n=6

M.C.Escher (modified)

Equal volumes of different ideal gases contain equal number of molecules n under the same T, V and P

Dalton's Law: $P=P_A+P_B$

P_A, V, T



M.C.Escher

P, V, T

The total pressure P is equal to the sum of the partial pressures P_A and P_B of the gases A and B.

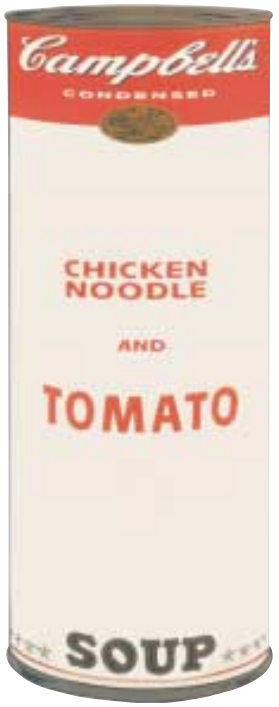
The partial pressure P_A is the pressure that component A will exert if it occupies the entire volume of the mixture at the temperature of the mixture

Law of Additive of Volumes through Andy Warhol

V_1

V_2

$V=V_1+V_2$
for immiscible
liquids



$V=V_1+V_2$ for an
ideal solution
of miscible liquids

V not equal V_1+V_2
for a non-ideal solution
of miscible liquids

The Second Law of Thermodynamics:

"There is No Free Lunch !"

M.C. Escher

Water flows downwards spontaneously.
However, their flow to the top of the waterfall
is impossible without a pump

Vincent Van Gogh

Heat flows spontaneously from sun to earth.
However, the opposite is impossible without work

DNA – Deoxyribonucleic Acid

Salvador Dali

DNA – long thread-like molecules found in chromosomes and some viruses, consists of two interwound helical chains of polynucleotides. The structure of a DNA molecules has been linked to a twisted rope-ladder, the sides of which consist of sugar-phosphate chains. DNA determines all the inherited characteristics of the organism

DNA Molecule

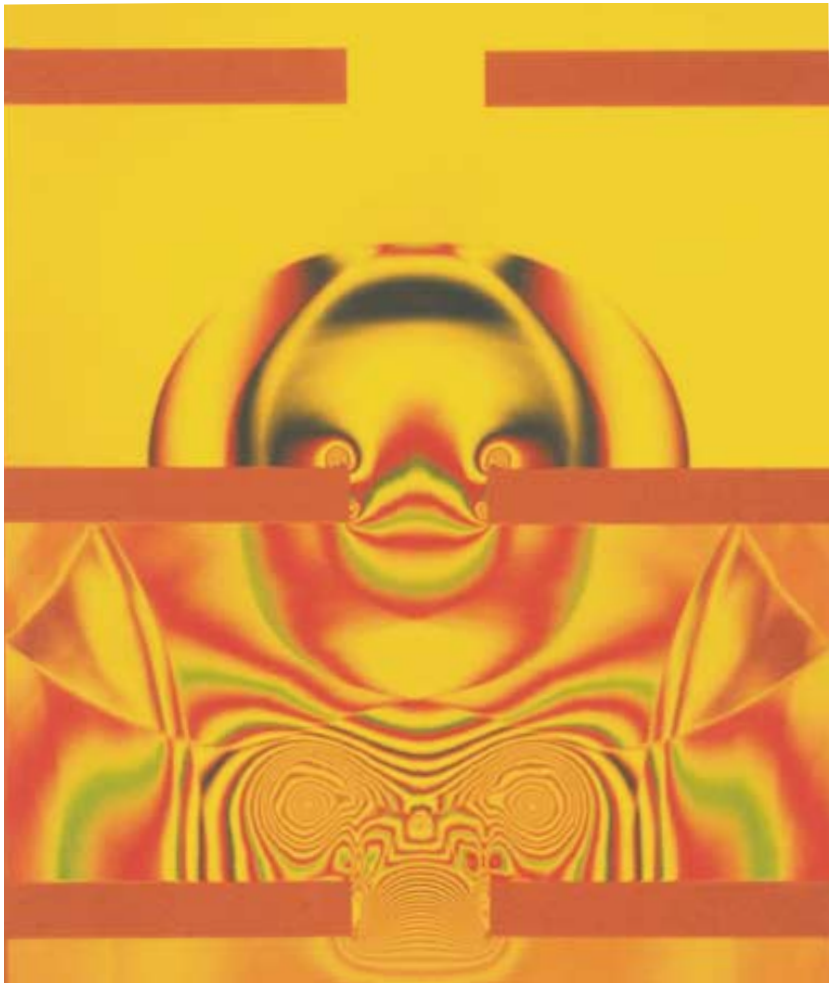
Smashing Wave

Katsushika Hokusai

This is a dramatic picture of a water smashing wave, one of a collection of 36 pictures painted during the years 1823-1830, entitled "View Over Fuji Mountain", also seen in the picture

Smashing Wave

Motion of a Shock Wave

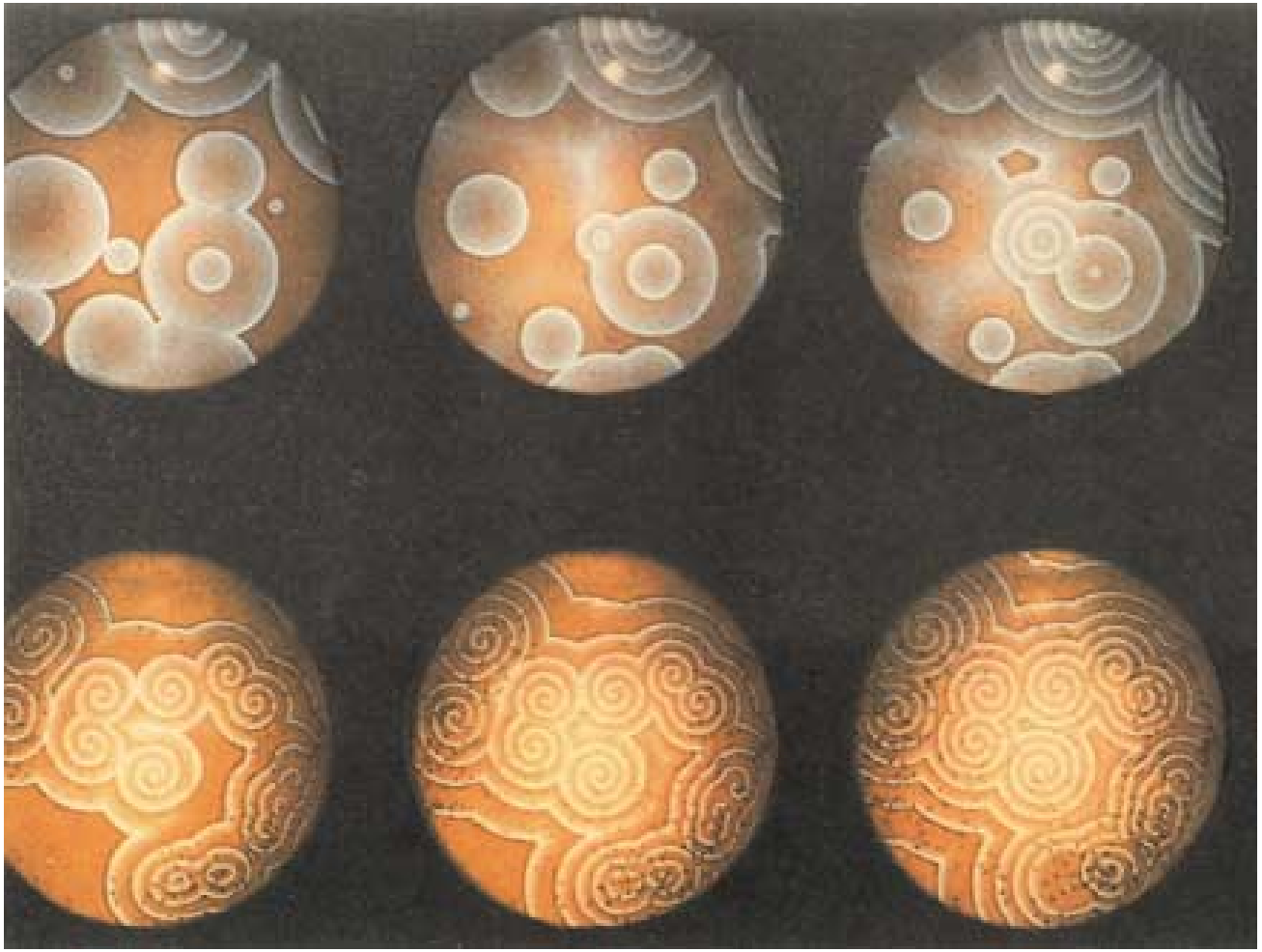


Heintz Reicherback

The colored picture demonstrates interference of a shock wave passing through a set of partitions in a two-dimensional flow in a shock tunnel. In the picture the portrait of a woman is revealed where her breast are, practically, vortices. In its passage through the partitions, the plane shock wave is transformed to cylinder creating the face. The eyes are, again, vortices where the mouth is equal density lines

Motion of a Shock Wave

The Belousov-Zhabotinskii Periodic Reaction



Top views at different times of a vessel in which the periodic reaction takes place

Biotechnology

Jacek Yerka

Biotechnology is the combination between Biology and Technology for the industrial Implementation of the achievements of these sciences. The artwork of the Polish artist Yerka demonstrates this combination

Impinging-Stream Processes

M.C.Escher

The essence of the method of impinging streams is the flow of two streams towards one another along the same axis.
In the impingement plane the required process takes place.
Escher's artwork demonstrates a mixing process of two different particles flowing one towards the other to obtain their homogeneous solution as result of penetration of the streams one into the other

Combustion Processes

Jacek Yerka

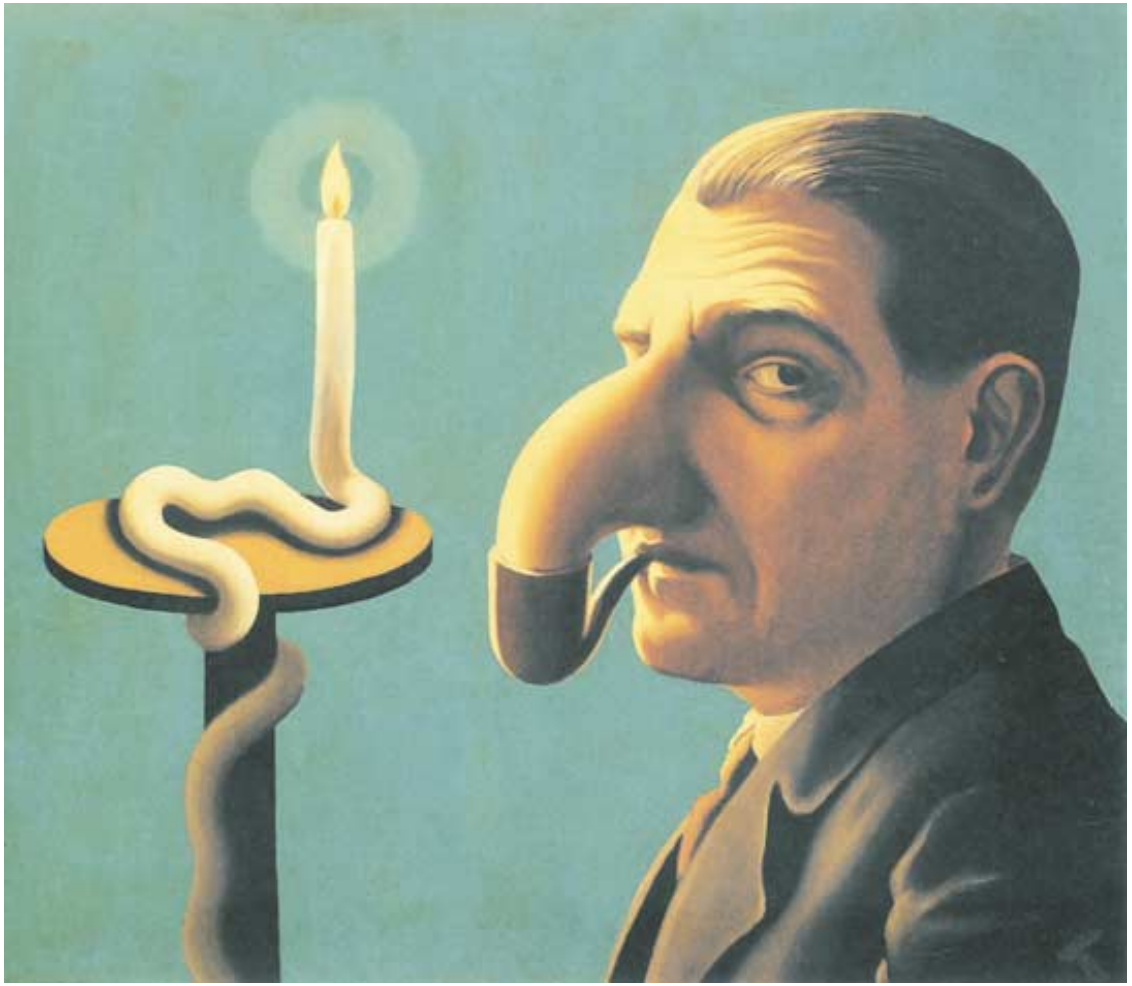
Combustion, a widespread processes in industry, is a fast chemical reaction between reactants generating heat and light in a form of a flame. In most cases, one of the reactants is oxygen. The heat is utilized, for example, for production of electricity in power plants

Diffusion Processes

Walter Wick

Diffusion is a random motion of molecules, which creates a net motion of matter from a high to a low concentration. In the picture, a blue colored droplet is introduced into pure water. The molecules of the color undergo a diffusion process, causing, after some time, a solution of uniform color

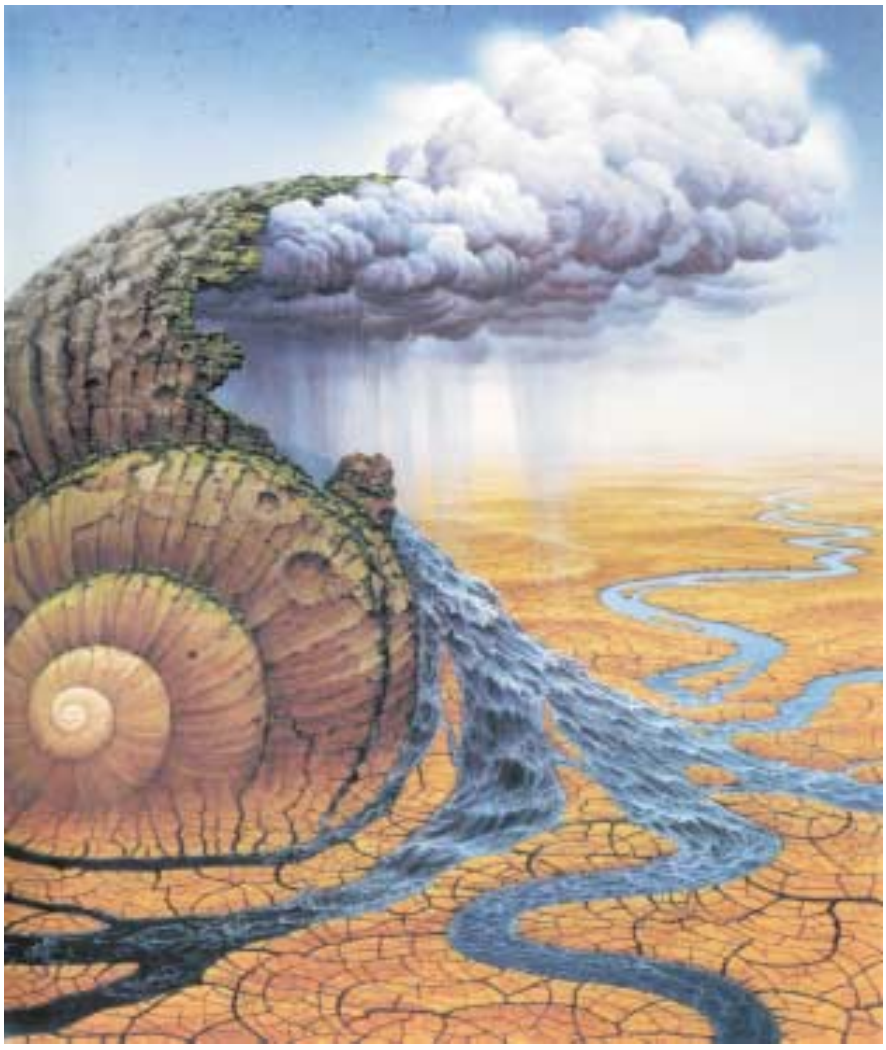
Cyclic Processes



Rene Magritte

A cyclic thermodynamic process is a combination of processes in which the initial and final states are identical.
The most famous cyclic process is the Carnot cycle in which the efficiency of transformation of heat into work between two given temperatures is the maximum

Free Flow & Flow in Channels



Fluid flow is engaged with the laws of flow and the kinds of flow. The artwork of the Polish artist Yerka demonstrates free flow of the rain and afterwards its flow in channels

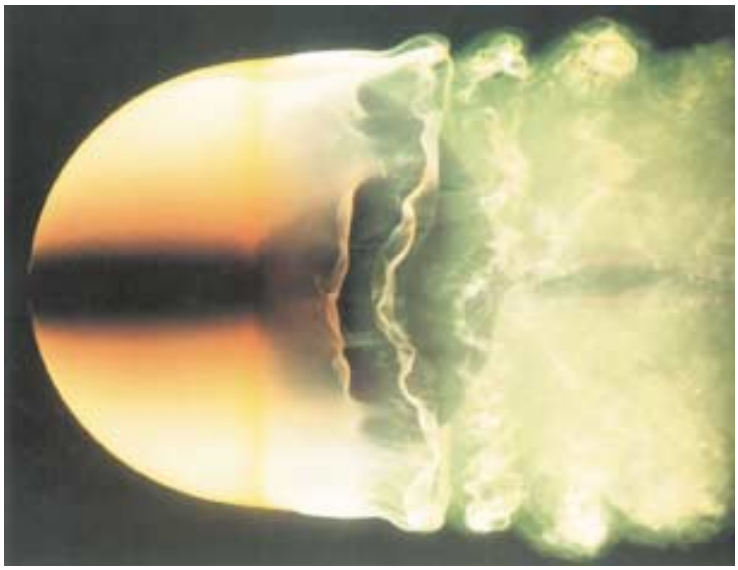
Jacek Yerka

Mixing Processes

Mixing processes are used for the preparation of a homogeneous mixture of two or more materials

Diego Rivera

Flow in Wind Tunnel



Optical photograping of flow with axial symmetry around a body in a wind tunnel

Office National d'Etudes de Recherches Aeros-particles, France

Flow of a Viscous Lequid

This is an artwork of a Russian Scientist-Artist, Professor of Mathematics, showing a viscous liquid dripping in a huge space where people are randomly running.
The characteristic of the viscous flow is demonstrated by the continuous deformation of the fluid without its tearing

Anatoli Fomenko

Nature and Science

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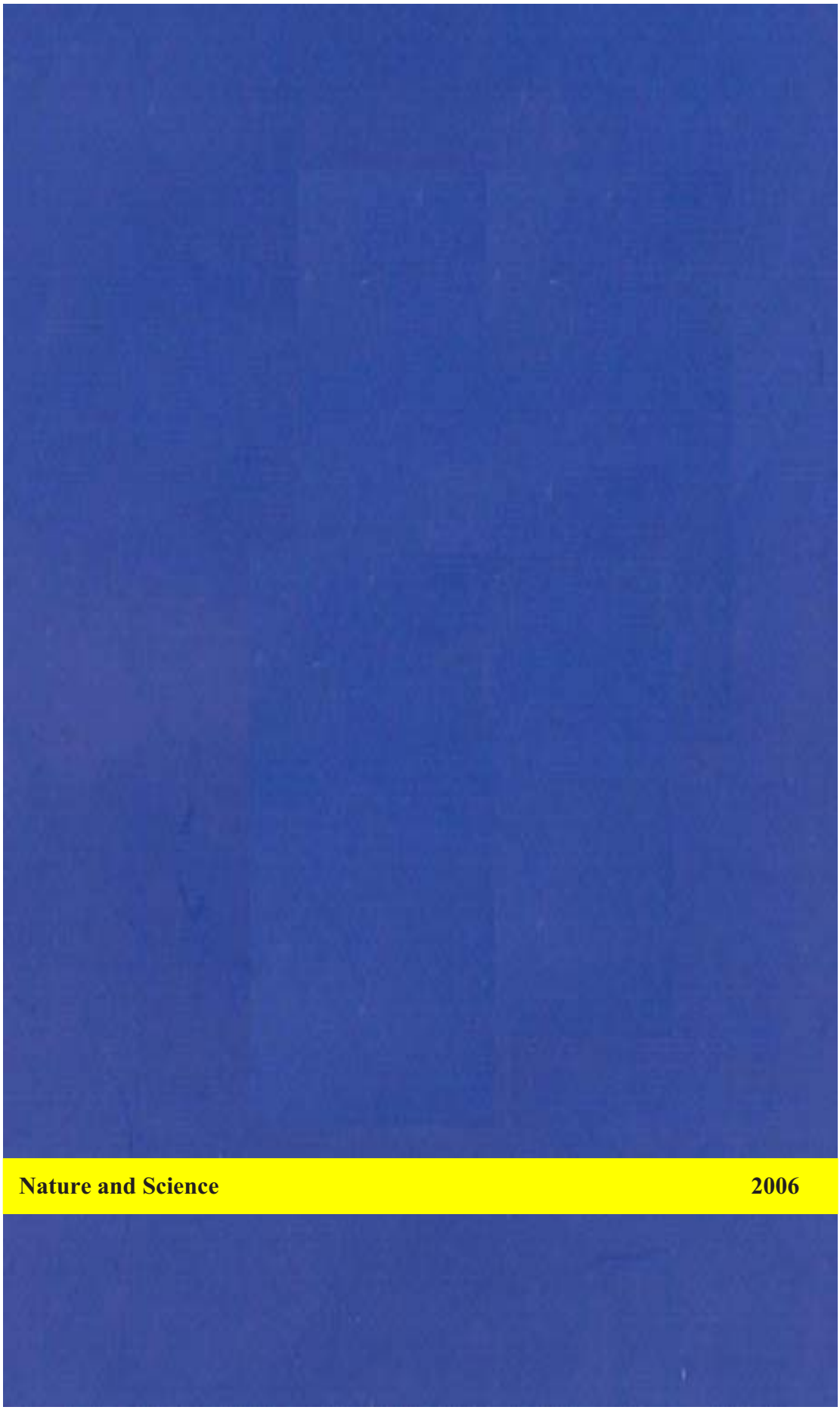

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