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Model in General Relativity

Studies on Polyvinyl Alcohol

Highlights

Gravity Lead to Revelations

Strict Proof of the Perfection

Discovering Thoughts, Inventing Future

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Infinity and Reality the Universe is Otherwise - Part 2a

By Paul Schroeder

Abstract- Infinity contradicts current cosmologies Overall understanding of cosmology would be altered, improved, and simplified by redefining the universe as being infinite in space and time.

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Infinity and Reality
The Universe is Otherwise – Part 2a

Paul Schroeder

Abstract- **Infinity contradicts current cosmologies Overall understanding of cosmology would be altered, improved, and simplified by redefining the universe as being infinite in space and time.**

I. Introduction

The issue for discussion here is changing the overall nature of the universe. There are 2 options. The universe is either infinite in time and space or it has boundaries. Accepting an infinite universe is more than looking forward to its future. Will it end in space or time? If you decide it won't end you chose an infinite future. But infinity also implies no beginning in space or time. Choosing complete infinity leads to a revised view of reality. The universe is all space, ie a container for everything else. You either picture the universe as endless without a beginning or you picture it as bounded. The idea of a boundary means there is a beyond, whether in space or time. Bounded theory requires edges where the universe ends. An infinite boundary of infinite edges provides an infinite number of explanations for events at edges. The big bang is a prime example.

There are other mystic and disconnected physical models that have flourished without sufficient concern about what the universe itself is. Space and time lost their reality and multiple dimensions were introduced as somehow being logical. This document is a redefinition of the nature of the universe. The process of redefining physics with a new paradigm requires rethinking and repackaging of all existing knowledge. New experiments and mathematical equations are not the key to a Holy Grail – new perspective of physics.

There are many revelations associated with the infinite view. Acceptance may take significant time. A cosmology based on the infinite and the current one based on the finite universe are incompatible with each other. Comparing them provides a mental exercise. The infinite assigns to gravity a physical nature and the logical physical interaction of pushing. An infinite universe stimulates incentives to restudy rotations, mass, the nature of space, orbiting, gravity, light and EM radiation, and transferring of images. Relativity made headway in those directions. This system further connects space and mass, energy and light, in ways that will clarify physics. Space affects mass and mass affects space similarly as in Einstein's formula that led to the standard model. Numerous looks at Newtonian systems and at Relativity help bring the thinking together. What follows emulates an introductory course/overview of a new science.

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II. Beginnings and Endings – Boundaries

Our local environment is logical and ordinary. Why are our cosmological views about distant space and the universe so mystic? Why should things be so different far away or long ago? We will examine the reasons and build a path that reexamines the beliefs upon which our science stands today. How do we deal with the extremes for our measures of distance, size, time, etc.? The big and small sizes, the close and far distances, and the short and long time frames are either infinite or bounded.

We must reveal that the infinite boundaries provide more places to analyze and thus employ many more researchers. However there will be many new perspectives to pursue with universal infinity as suggested within.

In the bounded view there are end markers and the beyond to deal with. There are beginnings and ends to account for. And then, whatever is beyond the end lines must be defined. Today's theories accept boundaries. For the big bang beginning religion has contributed support in order to retain the Genesis statement "in the beginning". Continued development of the big bang and expansion has dominated cosmology. Within this view continuous new concepts and terminology are encouraged as speculation about new concepts for theoretical physics theory. We all want to understand and address the end lines.

Our alternative perspective based on infinity leads to much simpler views of our cosmos. We simply need to understand why space and time can exist and function eternally. The following analysis of motions and gravity springs forth from an infinite view of the universe.

Infinity cannot be assigned to most things. There is no specific "infinite motion" for example. The infinite is specifically for the universe. What is the universe? It contains all matter and anything else that has form. It is the volume of space as defined by the whole of the X Y Z coordinate system. How far do the coordinates extend? That is the measure separating an

infinite or a bounded universe. Is it bounded at one end with a beginning, bounded at the back end with an end, or bounded in both directions? Does it end somewhere beyond our imagination? Accepting infinity is a hard choice. The choice has been debated over the centuries. The concept of infinity has varied between acceptance and rejection.

Today the big bang theory is the creation of the universe followed by the ongoing extension of existence. As the bounded universe expands an edge exists between that which is the space contained within the universe and what is not space. That boundary must also expand. Likewise, there is also the concept of time. The big bang also assigns time a beginning boundary. Although full of contents, the universe and time are both just concepts, not real physical things. Einstein merged time with space within Relativity theory. He created their virtual form by encasing them in 4 dimensional space time. In that form they lose their ability to serve as measures as well as losing their form.

The dominant boundary is "the beginning". Where did the existence of things start?

Space, as we understand it, is obviously real. Thus it has to contain something that gives reality to its measure. A void in space, cannot exist as it cannot extend any measure of that space. Space provides a place for the transfer of things, and thus assists motion. Motion begins as an action of gravity, an effect that reaches far across space. The identifiable contents, including the force of gravity become bounded in current theory. In the big bang theory, gravity didn't even exist until well into the big bang expansion time and it grew from there. The concept of boundaries establishes a platform for the exercise of mind bending contemplations. There have become very many edges to evaluate in infinite ways. All this exercise inhibits finding an ultimate understanding. Why did a cosmology with limits take hold? Science seeks beyond limits. We keep tracing mankind further back, and we trace more distant components of space. We were expanding imagined limits. Religion also played a part by accepting the big bang as a replacement for its creation. "In the beginning" summarized God's revelations to mankind. The Bible is a presumed history of us and everything leading forward from beginnings. The universe, night and day, and mankind all were given beginnings. Admittedly everything material exists and had a beginning and end, both in time and in space. All real physical phenomena do have beginnings within the overall, the universe. Man and the earth and the sky can have beginnings. It is the universe itself, where measurement resides, that shouldn't be assigned a beginning. Religion doesn't assign a beginning or an end to God! So God is apparently infinite. He is the universe within which all things exist and are contained. Thus biblical ideas are more in tune with an infinite universe than with a big bang universe.

Our universe is infinite in space and time. Infinity also extends to the size measure so things can be infinitely large or small. In a sense infinity makes you give up on defining things beyond the region of common interest. But the payoff is that it allows the assumption that everything beyond the local arena is similar to what we know locally. We can remain in our local neighborhood and still understand the universe by simply extending current and local understanding of matter and effects, ie. matter and motion. Motion is a relationship of the time and distance factors. Unfortunately, time and distance are currently merged into Space time and lose their identity. Someday physics logic and cosmology will revert to and accept a simple infinite universe and extend our measurements and understandings. As a sidelight it is interesting that mathematics has created procedures for eliminating infinities to support boundary investigations.

Acceptance of infinite space will disrupt physics. Today new cosmological ideas consist of ever more extreme and excessive concepts created to describe some region of a boundary. The list is extensive. We will also find little ongoing use for some of our current research and investigation. Most experiments and math formula are used to attach new ideas to existing theory. When that theory is gone the relationship dies. Just as an example, output from the Hadron Collider will always be useful on the detail scale, as we remain interested in finding smaller things. Its findings however diminish for understanding the universe. The Higgs boson wont be a universal particle. Physicists downplay theorizing, but theory reveals understandings while experimentation tests it. We will discuss many concepts of boundaries later on. An example is the fantasy of extra dimensions which lead to the "standard model". Many accepted theories don't hold water if space and time are infinite.

III. Absolutes

Theories are built upon some logic base. That base redefines the ideas that separate one model from other models. We all think differently, some people view the world as black and white while others see things as grey. All physical models have needed to have some type of fixed concept, value or idea to build upon. Relativity demands a fixed basis when it identifies a fixed and limiting velocity for light. That choice has of course led to many debates over the years. Light itself had been assigned a fixed structure of being massless. With the photoelectron Einstein then converted light into a dual behaving flow with fixed structure and fixed photons of mass.

The big bang theory implies an absolute beginning. Mathematics depends upon constants that

are fixed and absolute. Boundaries themselves are absolutes. Newton's model contains the assumption that space is empty. While his 3 laws of motion refute any beginning, within an infinite universe, all contents must have beginnings. It is only the base that extends indefinitely. Newton's motion of orbitals also imply "forever" as an absolute for the motion. But maybe he preferred the weird ideas of some beginning gas clouds condensing into orbitals? Anyway, motion cannot be an absolute.

Relativity accepts Maxwell's views of light velocity c as fixed, dependent upon its medium. No gravity or other causes are allowed to affect light velocity. Thus c fixes the geometry of space for relativity. The theory is then established and sold as if all distance can be measured by the time travel of light. Can a model exist without fixed laws and limits? We do some of this every day in our assumptions about life.

IV. Is Space Empty?

Space itself has to be real. As mentioned, it can't be an empty vacuum or it wouldn't exist. From early times, from Aristotle to Copernicus, to Galilo, to Tycho Brahe, mankind studied space but had little interaction with space. Everything contemplated, such as gravity, was centered to the earth. Galileo provided tests of gravity force and his telescope by which he revealed planet detail. Copernicus identified the orbiting motions within our solar system. Tycho Brahe diagramed the orbits with relation to the earth. Kepler gave a partial explanation of the orbital motions which finally implied a motion source related to the sun. There has been no understanding of why orbits existed or why the motion within orbits continued unchanged. Why don't the bodies fall away or why aren't they slowed by friction? Motion continuing unchanged does imply empty space.

That brings us to the arrival of Isaac Newton. Much of subsequent knowledge and of the science of Physics revolved (pun) around his work. He applied explanations of gravity at work on earth to events in space. His theories lead to interactions of spatial bodies and of all masses. In order to propose an ongoing centripetal gravity force that supported orbital motions, he had to overcome friction. He did so with his 3 laws of motion. A body at rest remains at rest unless externally affected. Motion of a body continues unchanged, (and thus the body is in a form of rest) unless interfered with. And finally, interference (by other moving bodies) imparts a new velocity and direction of motion to the body.

Building a theory based upon an absence of influence by something (friction in his case) was necessary for Newton to build a world system and an absolute space theory. But in today's world of technical and detail knowledge, the absence idea needs to be discarded in favor of an ongoing impetus.

Newtons views competed with and overcame the whirlpool theories of Descartes as a source of orbital motion. A whirlpool representation of motions of space itself didn't match central spin experiments such as controlling fluids in a bucket or rotating within a fluid medium that extends to infinity. In neither example do the velocities or actions of the fluids simulate velocities as calculated using the formula of Kepler,s third law. These examples probably led to disinterest in Descarte,s model. What is needed and provided later in paper 3 is a more extensive examination of the environments in which planets revolved and the variation in effects contributed by the sun as central source. There are different sources of rotations resulting in a different measure of central controlled whirling motions.

Since friction is interference, it was defined away by designation of space as a vacuum. We know today that space is not empty. Therefore space must cause frictional interference. That led science to claim that light radiation has no mass and thus can't cause a pressure of interference nor vary its velocity. But then there are meteorites, solar wind, etc. And actually light does cause pressure upon earth and upon eyes,

Newton could only propose no friction in space in order to propose his super equality in which gravity maintains original motions by attracting planets with a perpendicular offset accorded to the original motion. Somehow everything exactly offset. Without a motive force, imagine the scary thoughts of collapse if the equality is broken.

The history of cosmology over thousands of years has knowledge sourced from a central perspective. Mankind lived on earth so spatial reality has been a function of the relationship with earth. Theory was that matter dominates space. Tom Van Flandern extolled that view by suggestion we imagine the creation of the universe from one universal sphere and gradually add space and more masses. But space is everywhere serving as the container of masses. So in reality space dominates matter. Thus the collected knowledge is oriented incorrectly. It is time for the 180 degree reorientation of perspective.

In a later chapter we will analyze a motive force that creates the motion that is required to offset the centripetal inward gravity effects. That motive force is actually supplied by the same gravity that pulls the bodies together and so stability is guaranteed. Given that space is real, what is it made of? Gravity is a component. We don't view force as a thing that can serve as contents, so gravity must have physicality. with gravity, there is light passing through space. What is light and what makes it travel?

V. EM Radiation

Light became known as a form of radiation from the work of Faraday and Maxwell. Faraday discovered that magnets could distort the flow of electricity. Ultimately he proposed magnetism and electricity as being joined as radiation. Faraday also recognized that space was full of radiation which included the flow of electricity and magnetism. Since light flowed thru space it must be radiated waves. Light became the foundation of the Electromagnetic scale, and the spectrum was formed.

Maxwell believed in Faraday and created some related mathematics. His findings included the idea that radiation has a fixed and maximal velocity from which we get the constant c. Maxwell also proposed that gravity is not instant but has a velocity of its own. Maxwell failed in his attempt to connect EM radiation with gravity but he had some thoughts, ultimately rejected, about pushing gravity.

Faraday and Maxwell had focused on the flows of electricity and magnetism and Faraday found a commonality in their flow. The two forces were joined radiation flows whose waves are differently directed. In the linear view waves are a distortion of flow and jut off line in the XY direction or the YZ direction. The choice of offset plane determines magnetism vs electricity. Three dimensions have a third coordinate direction which happens to be the XZ direction of the flow. They didn't include Gravity. It shouldn't have been hard since gravity effects and magnetism effects are similarly seen as attractions. Gravity must flow.

VI. Light

Matter and the flow of light/EM radiation is a prime focus of cosmology. Mankind has made important discoveries throughout the ages related to light.

The whole EM radiation structure started with the study of light. Clearly light travels through space. The sun and stars prove that. We restate here that light itself had been assigned a fixed structure by being considered to be massless. That feature failed in certain situations including an apparent pressure by light beams when they hit the eye or when beams arrive from the sun. This pressure concept led Einstein to propose a dual structure for light in which light was wave like as well as mass like. Einstein assigned light wave beam structure to include the photon particle.

Prior to that light was massless by definition. But light waves have a nature and move or flow forward. Shouldn't everything that has a nature be subjected to gravity? Letting only massive items be affected is the making of a boundary and leads to a constant speed for light. But let's say that light beams/photons are launched by the source star. A related visual model is a rocket being fired upward. The rocket will probably slow and possible fall back to the surface. Light moves so fast that for efficiency sake the gravitational effect has always been ignored. That allows the velocity base c and limit for Relativity. But it cant be absolute! Light should be affected and no matter how little the gravity effect can muster, the source body remains directly behind the flow of the light for many light years. At some point science must consider the trivial (due to distance) continuing gravitational 'attraction' on a photon against the extensive time continuation of the flow. Isn't red shift a logical sign of some minor slowing of the flow of light? Stretching a wave into a longer beam gives fewer arrivals and thus a slower flow. This is not just a terminology answer. That slowing would be simulate the expansion of space between the source and the destination if light velocity were constant. Expanding this logic, isn't that source gravitational causing slowing of the beam and thus causing a redshift? That redshift is gradually overcome by the gravitational attraction of the destination star. That star pulls the light so it goes faster. The overall speed and appearance of the light beam becomes blue shifter relative to earlier in its flow and recovers its emitted form upon its subsequent arrival. The Pound - Rebka test supports this gravity model. That test is done with light in space near earth which is sent down to earth. The test suggested and proved that the destination pull is occurring for incoming light and is causing a blue shift.

If you accept the gravitational redshift, which would occur during the first half of the light transfer from source to destination, then it serves as an alternate to the Doppler idea of bodies moving apart and thereby causing the red shift. Expansion is no longer a logical model of space and the universe.

We have mentioned that beams of light are continually red shifted throughout their passage across the universe so that, at some distance, the shift exceeds the visible red range. The waves become infrared, microwaves, or radio waves. Appropriately, an isotropic microwave background is observed signifying an approximate distance from which all light from very distant sources is shifted beyond the visible. This background has been given a whole existence of its own and is called black body radiation. Due to science's backward perspectives about the source, this background radiation gives the false impression of a boundary to the universe.

Light is formed when spatial beams initiate interactions with mass particles. Spatial beams gain increased frequency. Heavenly bodies such as our sun convert penetrating flowing beams and create and release light and heat. Nothing is really burned up or used up even by particle conversion within a sun. Its output is simply a converted form of the penetrating paep beams entering it on the opposite side.

In 1826, Olber proposed a paradox in which the night sky should be solid light from an infinite number of stars. He was in fact correct, however the light has continually been red shifted. As the waves extend in length they become infrared, microwaves, radio waves and beyond. The current concept is that space contains a microwave background that is isotropic. All directions reveal a similar amount of starlight shifted into the microwave range. Olber claimed that the night sky should be fully lighted because of the infinite number of stars providing light. The cosmic background radiation is Olber's starlight ablaze allover. Science never convincingly solved the diminishing of light across space. Obviously gravity causes it.

Light beams have properties and thus act in a manner similar to matter. Light is subject to forces such as gravity. There is no need for a dual nature or for the photon. All actions of light such as its impact and penetration can be viewed as controlled by its wave/coil nature.

Since the model we are building removes the fixed value of c, we continue the making of a new model without any absolutes of measure.

VII. Motion

The elementary activity in the universe is motion of celestial bodies relative to each other. Once infinity is addressed, an all-inclusive physical theory should focus next upon spatial motions. The second level of interest becomes the tools for measurement of the motion. A fundamental oversight in relativity theory is the transmission of light dictating the nature of space.

What we have is an entanglement between the motions of bodies and their signals to others. Light/radiation and our goal of external pushing gravity are the two transmissions which convey the nature of celestial bodies. If we assume that what we see is what is, then the light signal dominates. But Einstein pointed out an issue with light where significant motion of bodies relative to light signals distorts their location and time measures.

Light signals likewise can be influenced by motion of the observer, which action is specified as aberration. Our conundrum is that light conveys the picture of motion while the motion influences the transmission of the light beam.

VIII. The Nature of Space

After Newton's gravity work and in his in depth analysis of light, the finding of a transmission system for light and radiation gained importance. The concept of Aether came into use. The Aether was to be the body of space whether it was a solid or more like gaseous. Questions arrived such as Is the Aether the same away from vs near masses? How about within masses? Does it carry radiation as well as matter bodies? Extensive debate continued until Einstein refuted the concept of Aether using the Michelson & Morley findings about the lack of interference with light from the sun by Earth's motion.

Accepting MM as a correct interpretation is an example of improper specification of the base for an analysis. The test was of light relative to us. Our examination of "attraction" gravity tends to be relative to a base mass. For pushing gravity we will seek an improved orientation and view it from the base of space itself. For studying light frequency is affected by equilibrium. Earth exists because of equilibrium of impacting forces. While light will switch frequencies crossing space, it can retain its frequency upon earth. We should recognize that its absence of interference is an output function of its flow through space. In reality, earth and other mass bodies in space are in equilibrium. Equilibrium on cosmic body surfaces is a lateral situation. Gravity removes equilibrium in the vertical direction but that was not what was tested. No net of forces offset local activity parallel to the ground such as running and driving motions. Ultimately the MM test only proves an absence of aberration of the sun's light as it arrives on earth. See the aberration chapter.

The Aether continues to be proposed today as scientists need something to exist as space. Here we decline the Aether in a major revelation! What travels thru the cosmos? Light and thus all radiation emitted from stars and other bodies everywhere. The emissions are all radiation (rays). Given the nearly infinite number of stars all destination points are receiving beams from 'all' directions all the time. The radiation travels rapidly and together the beams join to create a blanket of existence that is simulates a solid. There is no void area.

You may object that in the extremely small points there are empty spaces between the beams of radiation. Such voids would refute continuity. But here we use a similar perspective that Heisenberg used for his uncertainty principal. Recognize that the beams travel at the near the infinite velocity of c. Likewise the beam sources are in constant motion. Although very minimal, displacement continually occurs within any remote point flowing beams can shift perpendicularly relative to all receiving points. In the time it would take to isolate an empty point in space it would be reformed by a further beam angling in at some slightly different direction. Therefore it is radiation alone that defines our space and no Aether is needed. Space is radiation and all space is real and similar throughout. No concocted concepts are needed.

The farther radiation travels from its source the greater the distance between rays. That gap is filled by rays from other sources. With all these rays from every direction defining space there is no need for additional mediums. Space is filled by EM radiation which becomes both the action and the medium. We call this

the fabric of space. Essentially the light waves are examples of the movement of the medium just as sound comes from the movement of air.

Science has observed that light moving in one direction does not affect light moving in other directions when they intersect. The same non-interference could then apply to all EM radiation. While the radiation is moving the interaction of waves from all directions gives the impression of stasis, or no detectible motions. Space can appear void while moving internally in all directions, even at speed c.

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Structure and Gravity the Universe is Otherwise - Part 2b

By Paul Schroeder

Abstract- Once you have read Infinity and Reality you can apply the logic there to gain a finer understanding of gravity. The structure of the universe leads logically to a pushing type of gravity which leads to an understanding of orbiting.

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Structure and Gravity the Universe is Otherwise – Part 2b

Paul Schroeder

Abstract- **Once you have read Infinity and Reality you can apply the logic there to gain a finer understanding of gravity. The structure of the universe leads logically to a pushing type of gravity which leads to an understanding of orbiting.**

I. Introduction

The details of working with space are well analyzed and understood by astrophysics study but big parts are overlooked within most cosmological views. Particle physics is the breaking down of matter into components such as atomic particles. The purpose is to gain understanding of all matter and its place in the universe. Radiation is separated from particle views and simply viewed as in motion serving as lines of flow. Overall views using field and vortex analysis is in sufficient. A detailed analysis of radiation reveals a connection with and a new nature for gravity.

II. Attraction Gravity - A Metaphysical Concept

When mankind's base of reality is the solid earth, then all actions can be related to local masses. Thus gravity, which pulls objects downward toward Earth is called an attraction. Gravity pulling is denoted as an "action at a distance". It is this awkward term that stimulated a need for correction by future gravity theories such as Relativity. "Action at a distance" is the concept that an object can be moved, changed, or otherwise affected without being physically touched (as in mechanical contact) by another object. That is, it is the nonlocal interaction of objects that are separated in space. The term attraction was used most often in the context of early theories of gravity and electromagnetism to describe how an object responds to the influence of distant objects. For example, Coulomb's law and the law of universal gravitation are such early theories.

Attraction is a mystic term that is not treated as a physical action in the study of physics as no motive can cause a pull without some background of pushing being involved. Although it is metaphysical, attraction also found believers as a mystical answer to the Copenhagen EPR paradox. This accepts magic known as "quantum entanglement" to explain how separated atoms can seem to react simultaneously to an action. This would negate the limiting speed of light and all other limits to simultaneous responses. The acceptance of "action at a distance" led science in questionable directions long ago by claiming the failure of early atomistic and mechanistic theories which sought to reduce all physical interaction to collision. That is the same issue we face today. The quantum mechanics of Physics logically wants all actions to be caused by contact and has had to work around gravity to get there. The exploration and resolution of this problematic phenomenon led to all the concepts of the Standard Model physics, from the concept of a field, to descriptions of quantum entanglement and the mediator particles.

III. Pushing Gravity

God created the universe in seven days. Mankind was then left to make sense in some detail, of the universe, its motions, and interactions. We accumulate detailed theories and solutions until the complexity is overwhelming. Then a change of perspective is useful. An example was the change from the geocentric to the heliocentric view of the universe. So many epicycles were needed to determine celestial motions that Copernicus's simpler perspective took hold in the face of a seeming impossible challenge as our senses denied the newfound motion of earth. Understanding of spatial motions today must focus on gravity and related concepts. Current theories tend to be piecemeal, not addressing complete facets of human knowledge. The perspective presented here is all encompassing and simple. What follows uses redefined gravity to restore perspective to our universe. Some building blocks are:

1. Gravity is an external event.
2. Gravity is a 'net effect' force resulting from interacting beams of radiation particles.
3. Gravity is multidirectional, not simply a down force.
4. Gravity particle beams penetrate and exit from masses. The beams are bent by the rotation as they depart the rotating body.
5. Kepler's 3rd law relates planet times to orbital distances. The sun causes Kepler's formula to work. So the center must somehow provide impetus for orbitals.

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a) Introduction

The structure of the universe is a simple concept though mankind continually complicates it. The universe is essentially isotropic within a 3 dimensional framework, allows for motion and structure, and contains a force that holds macro bodies together. That force is of course gravity. In the hierarchy of theories, the view of the universe proposed here is the most basic. It is simpler in its concepts and terminology than is current theory. A complete overall perspective starts via a rationalist view before succumbing to the experimentation - proof requirements of empiricists.

Since gravity dominants action in the universe, a proper focus on gravity as the prime mover provides an optimum perspective of our universe. We have not logically defined gravity. Most concepts and definitions lead to misrepresenting gravity as a metaphysical force. Scientists begin their theorizing with mass and define motions using concepts of fields, forces, charge, and energy rather than begin by relating to a physical form of gravity.

Scientific investigation within physics and astrophysics produce experimental results that lead to new concepts, ad infinitum. But they rarely lead to understanding. Many analyses are designed to alter exiting theories such as relativity. Instead there are advantages to considering a perspective that eliminates many current concepts. We start with gravity.

b) New Perspective

The concept of attraction is not a physical event. It is a perception resulting from the "net" effect of beams arriving at masses. Physics should have dealt with this issue eons ago. Physical events demand interaction via contact so gravity must be a push upon things. We perceive the pressure as gravitational 'attraction' and will see that gravity keeps masses together. As we begin seeking interaction we will relate actions to linear beams which are easier to understand and work with than are fields.

Understanding gravity as an external event is the key to understanding. Consider gravity pushing rather than attracting. Doing so addresses a logical requirement for Physics, the requirement for contact. Push contact occurs between two or more particles. The push is continuous suggesting gravity travels as a beam. The part of the beam associated with the contact is the wave. The varying altitude within a wave gives it impact potential. I had named the wave as a particle called a Paep for ease of discussion. Gravity (however defined) must move in order to create pressure. By default it must move in all directions. Thus, in the void of space, all gravitational push is in balance. To get "gravitation pressure" there must be an imbalance. One way that occurs is by more gravity beams moving in one direction and overwhelming the offsetting gravity from the opposite direction. Understanding that gravity acts as a result of a "net" force is important. Gravitation at a point can be variable depending on the force contained within opposing beams. The common spherical curvature of spheres such as earth hid the variability of gravity throughout the ages. Gravity varies due to modification by masses or by radiation.

Treating gravity as a pressure alters a myriad of concepts. Start with a physical gravity which pushes upon things. A simple corollary defines its opposite, what we call anti-gravity. If gravity is a push, then anti-gravity must be a push in the opposite direction. It is not some mystic situation in which everything disintegrates, born of those who thought of gravity as an attraction and can't reconcile an anti attraction which lacks physical attributes. Anti gravity causes the repelling of 2 bodies from each other, as opposed to attraction. Imagine a mass levitating on earth. In fact we may cause such anti-gravity by interfering with gravity from one direction. We will explain magnetism, the other "attraction force". Magnetism is directional, both attracting and repelling. It occurs only in limited situations. We may someday expand the situations.

To do away with the occult nature of gravity in existing systems we have to have a push source that provides gravity. That observable push is the "net" of all pushes upon any object from all 3 dimensional directions. This statement removes the dependence upon earth itself as the reference point and resets space as the reference for ongoing cosmology. The "Universe is Otherwise" and all gravity exists as pushing forces throughout space. What is it that pushes? The pushing must be done by the radiation beams throughout space as there is nothing else that fills space. In most places, such as remote space, the pushes net out to full equilibrium and no motion happens. The finding of a net pressure and therefore motion within any place in space indicates an imbalance of gravity push upon that place from the various directions. Without gravity providing the basic push there would not be any basic source for motions.

Radiation flows in all directions everywhere. We usually don't recognize that flow in any measure because all motion nets out. We recognize that light beams do not interfere with light from any other direction. So within a point of space, radiation is flowing everywhere at speed c and is undetected.

We can make use of the term attraction only if we recognize we are discussing the apparent motion relative to us. We do measure the downward falling motions in measures such as meters/sec. Extending the time beyond the fixed measure of one second, we create the concept of acceleration as a way to reference the change of the apparent motion over time.

1) Our pushing gravity is the source or cause of the pressure that produces detectible effects. This source is currently undefined and has been since the time of Newton.

2) The term gravity is often used to denote the detectable effects of actions which are caused by the source of gravity. The effects of gravity upon matter bodies results in detectible motions or pressure. The effect is the 'attraction' of matter toward mass bodies. The attraction effect is expanded by Newtonian dynamics to include the potential motion of 2 or more spatial bodies toward each other

Pushing gravity is a result of a push by all the radiation beams traveling throughout space. When no outside influence is involved the net of the pushes is that no motion is created. To have motions there must be an imbalance of gravity beams. Attraction that occurs is dependent upon masses. The center of bodies is considered the cause of attraction gravity. So pushing must be modified relative to the center of mass. That can be accomplished by having mass serve to diminish the push of radiation. Thus beams exist within mass as well as in space. Gravity beams within matter flow forward and are diminished in some relationship with time and distance of travel within. Radiation is everywhere including within masses. The gravity beams penetrate and then exit.

IV. A Proper Analysis of Mass Allows for Pushing

1. Light has no mass. So perhaps light is the source of gravity. Light in motion has no mass even though it causes impact upon arrival.
2. Light travels as a beam with waves. It was finally given a particle component by Einstein to satisfy impact. If we penetrate matter with light it stops near the surface. But other EM radiation with different wave frequency may penetrate further or entirely. Coils are 3D views of sine waves and their shape causes action duplicating mass. Since penetrating EM radiation doesn't incinerate earth, it must provide gravity.
3. Mass evolved from weight measures and can be inversely called the measure of gravity pressure. The property of mass that incurs gravity pressure must be in some degree of perpendicular motion vs the waves of gravity. Then you have interaction.
4. The density of mass is the amount of spin either surficial or internal that crosses gravity waves. A circle in space that does not rotate some way has no mass measure as all gravity beams penetrate straight through.
5. Science has found F-=ma to fail at extreme velocities and allowed Relativity to decree that mass increases with speeds near c. "Einstein was so sure that momentum conservation must always hold that he rescued it with a bold hypothesis: the mass of an object must depend on its speed! If an object at rest has a mass *m*, moving at a speed *v* it will have inertia corresponding to a "relativistic mass"

$$m_{rel} = m/\sqrt{1-(v^2/c^2)}.$$

6. Since mass growing is accepted then we are allowed to claim mass diminishing as a reason F=mv doesn't work for EM radiation.
7. Earth's atmosphere topped by the simplest atoms then down to more complex atoms all remain in space. Gravity would push them down over time so they are being recreated by EM radiation intersections. My section on mass creation is that beam lines with altitude from center intersect similar beam extensions to form electrons so that the intersections remain in place as matter and the beam itself flows onward as radiation.

Math formulas interfere with the freedom of understanding what is going on when they are extended toward extremes.

V. The Concepts and Components of External Pushing Gravity

a) Radiation

Radiation has provided the advancements of science in the last 100 years. But it has not been properly assigned its place within our universe structure. Radiation arrives everywhere from all directions. Likewise it comes from all 3 dimensional directions throughout the universe. A point in remote space exists because radiation continuously passes through from all directions. There is no void in the universe. Though one might imagine that nothing exists between lines or between particles, our reality stems from continuous motions changing all the time. Should one seek void space within a point, that void would vanish to the ongoing radiation flow coming from continuously shifting angles. The structure of the universe is defined by flowing lines of radiation. There is no need for an Aether to carry light and EM radiation.

Radiation is called rays as it departs a source and beams as it travels and arrives. What we called a source, such as a lamp or a gravitational body, is but a modifier changing the characteristics of existing radiation. All radiation travels at velocity c depending on its medium as defined within physics. The prominent characteristic of radiation is wavelength and frequency. The wave altitude is also important. Light is the predominant radiation and serves as a central focus of a scale of all possible radiation. The EM spectrum, detailed by wave length, describes the various radiation effects which depend on the wave frequency.

EM waves in space are known to be transverse in form. They are pictured as sin waves on a document which is a 2 dimensional representation. Unlike water waves, radiation waves are 3 dimensional. We would

see the sin wave by inspecting the flow from the side from all directions, be it side, top, or bottom. Being three dimensional we must picture a wave as a coil. A sequence of coils emulates the spring in a pen. The whole spring is moving rapidly at speed c suggesting its forward flow of the waves/coils. We may use the terms coil and wave interchangeably.

Radiation has the ability to push matter. This violated early physics laws and led to the duality of wave/particle nature of light. Light is known to push in order to cause vision and X-rays are known to push from the Compton Effect studies. Pushing is a transfer of motion and does not depend on light having photon particles. Comptons x ray charts support radiation push but science has missed the proof of pushing gravity within.

b) Penetration

The whole EM spectrum of radiation is available for us consider as gravity beams. The gravity waves are coils whose frequency determines whether a wave impacts matter mostly at the surface or within the mass. A beam with low frequency waves arrives more like an arrow and penetrates the mass. High frequency impacting waves may apply greater surface pressure. However, the total of surface pressure is minor relative to the penetration pressure of long waves which continues contact throughout the mass. Penetration contact applies throughout the internal field of mass. Matter is considered as mostly empty except for the nucleus. Gravity beams that exit the mass must be less potent than unblocked incoming gravity beams that did not penetrate any mass yet. The "net" pressure then becomes a downward push on and near the body's surface. It is that simple to create the "attraction". Remember the word "NET"'.

Since matter modifies the push intensity of gravity, mankind should also ultimately be able to modify it. A simple case suggests inserting sufficient gravity beam blocking material above some something in order to cause a reduction of earth's gravity downward. If the reduction were extensive it may overcome the total push in the original direction. The result would be anti-gravity, a net push in the opposite direction. If spinning causes blockage, maybe spinning by propellers or rotators is actually a blocking of gravity?

Long wave radiation has more potential to penetrate matter than does higher frequency short waves. Long straight beams are like arrows and lack the wave that impacts and stops the flow. The penetrating long wave beams both push masses and are modified by the masses.

c) Gravity Modification

The modifying action within masses has atomic particles interfering with the beams. Two parallel beams may wrap together into one wave without quite doubling the frequency. Wave merging continues throughout any penetration of masses and results in fewer beams of higher individual frequency. But what remains is less total frequency, and thus less energy. The longer the path of merging, the fewer beams remain to exit. Thus the exiting beams cannot offset the incoming downward beams and a 'net' downward pressure occurs. The mass center is the average pressure/force point causing the reduction process rather than creating attraction. The diameter determines the path length. By time of exit the remaining penetrating beams have higher frequencies and exit on average as radio beams for example from earth and as light beams from the sun. The new frequencies upon exiting depend on the celestial body size.

The reduction process outlined here is unique. The net pressure idea replaces Newton's model in which motion in space continues without change unless impacted by other matter. The concept of prior unchanging motion in space solved the friction issue with space defined as void. We know today that space is not empty. A driving force is needed to explain continuation of orbital motions. For orbital motion that driving force must relate to the center body in some way. Orbiting is revolution relative to the center, actually the relative rotation of the center.

That center, which rotates relative to an orbital body, is ejecting the diminished gravity beams while pushing them in its rotation circle. Solar beams arrive at an orbiting planet from the right causing pressure toward the left. We accept that planets are pushed toward the sun by a net amount of the inward gravity. Now we recognize that the orbital is also pushed counterclockwise around the sun. The two "net" force directions, inward and leftward, achieve balance. Both light and gravity beams from the sun curve in toward earth avoiding any appearance of earth overtaking the beams. Rotation is the highly overlooked source motion maintaining the universe.

Physics could never work with their gravity source as it is a linear pull to an unattainable center. Switching to an external incoming source opens a whole new chapter for modifying the gravitational effects of gravity beams. We can work with it. We can try to block it. The common 'attraction' force of magnetism can be seen as a redirecting of gravity beams by the spinning of matter, ie electrons. There is no reason this can't be done on larger scales. We spin propellers such as helicopter blades. They raise up a big carriage/cockpit attached below. Propeller The theory is that the spinning air pushes downward, but isn't it easier to view the motion as being caused by the blades pushing aside the incoming gravity beams. Then the push from below can equal or exceed the push from above. By extension, how did the ancients move the huge blocks forming pyramids and stones such as those at

Stonehenge and Easter island? Clearly the blocking of gravity would be a logical method?

d) Non Linear Force

Pushing gravity can act upon a body from all directions. Current "attraction gravity" is simply a linear effect. The force acts in only one direction, straight downward toward the center of mass. Now consider all the beams arriving at a spherical body, planet. They create a net downward push in all directions. They become the force that gives bodies structure. In sum they are the "nuclear" force. That force is claimed to be much stronger than gravity, but that is because attraction gravity is linear while a nuclear force as well as any pushing gravity is spherical. Pushing has a nearly infinite number of additional lines of force. That same nuclear force extends to masses of any size and in the atomic region it provides the nuclear force that causes the structure of atomic particles such as nuclei. All spheres receive a similar surface pushing force of downward gravity on their surface. A difference in the attraction is the "net" force which includes the force caused by exiting beams from the opposite direction. The smaller a spherical particle is, the less penetrating gravity beams will be diminished.

A side issue is that the binding upon nuclear to cosmic particles can be broken by interfering with or redirecting incoming gravity beams. Such event leads even to nuclear bombs.

e) Chemical Compound Weights

The mass of 2 elements is known and yet when combined the resulting mass is less than their total. The reason has been confusing. Pushing gravity rather than internal attracting gravity answers this issue.

1. gravity is a physical pushing force. 2. Since gravity's source is not centered, its holding things together from nuclei to celestial bodies. 4. Mass is the capacity to diminish gravity beams as they penetrate matter. 5. The capacity of matter to do that originates with its spins both at the surface and within its nuclear particles. 6. The measure of mass is the measure of the total 'net' gravity force acting on the surface of the matter piece. 7. Given any 2 matter particles, the gravity beams that align directionally so that they penetrate 1 of the 2 pieces of matter, then exit and then penetrate the other matter will apply less force there (particle 2) than unimpeded beams would apply. 8. thus matter 2 now has less pressure applied to it and is thus less massive. Conversely the same applies in reverse to particle 1.

As an aside, the gravity discussed here is mostly long wave EM radiation and it both penetrates matter and pushes matter.

f) Pushing and Bending

As external gravity particle beams penetrate and exit masses their beams are slightly bent as they depart the rotating body. They absorb the rotational motion. There never can be a concept of straight up in our universe due to rotating sources and revolving observers. Absolutely all radiating beams in the universe curve and the universe itself is curved throughout for all relationships. Upon arriving at orbital distances some pressure is parallel to the central body surface. Bent gravity beams essentially push orbitals in their orbits. Gravity thus provides both the centripetal force and the perpendicular motion offset called centrifugal force. The common source provides unprecedented stability and rejection of any doomsday collision concerns.

VI. Orbiting

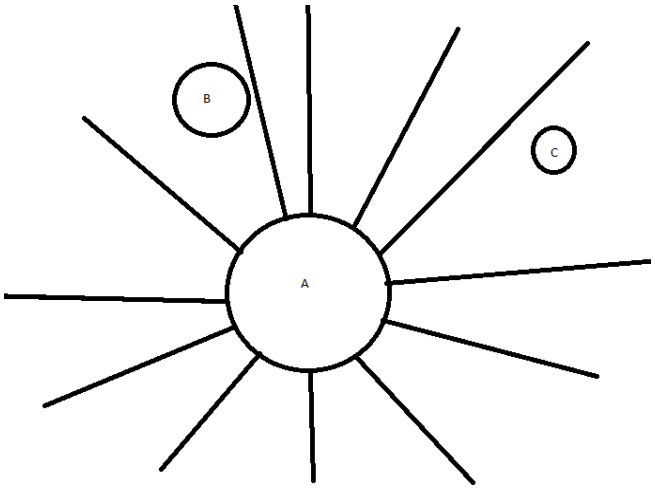


Fig. 1: Radiation exiting the sun

Our goal here is to emphasize rotation controlled orbiting with a diagram showing how a rotating body can cause motion for a second body.

Consider first a two-dimensional picture of two equatorial circles A and B. Circle A is larger. It spins counterclockwise and has lines radiating out from it. The lines are attached to and rotate with the circle. The key question is what will the lines do when encountering matter in their path?

They may:

1. Not interact with the matter
2. Push and carry the matter along with them.
3. Partially push on the matter

If they don't interact with matter we have no orbiting.

Assume the lines to be massive so that they can push upon and carry with them anything they encounter in their path. A line encounters and pushes circle B to the left, somewhat like the force we call centrifugal. This

push will also cause motion by B angularly away from A as B rolls out further along the line. There is no retaining wall.

We can't have circle B moving away from A in our analogy. Our example produces a linear motion, and we need an attraction toward center as a partial offset. We need something to attract/push B toward A with exactly the right force to balance the leftward motion caused by the central body spin. This attraction is a centripetal force, the attraction of gravitation. The source for this is the net amount of push along the lines where the outward push is diminished by body A. The result is an inward pressure from pushing radiation beams.

We have developed the beginnings of an external gravity system. Netting the sideways pushes with the attraction pushes in concert results in orbiting. But in the example given, the left pushing radiation beams will push any object around the center in the same time frame. If a second body such as circle C is located further than B is from A, it will travel faster but its rotational velocity will be the same. That assumes the pushing beams likewise dominate motion at all distances, that the original radiation lines retain the same leftward carry ability at all distances. The model needs to be modified so a partial push occurs due to a weakness of the lines.

At this point we have orbital angular motion for B which corresponds with the surface spin of A. But this is not how orbiting works as we know that spatial objects usually do not retain their position in space over the same surface point permanently. In this example the period of revolution would be independent of the distance *R*. There does happen to be an example to this unusual relationship as the earth nearly retains its position over a point on the moon's surface. This can only occur due to the moon being a minimal source of earth's motions.

Orbiting has remained somewhat mysterious and its function is often related to particle spinning. What Kepler sought and we here are seeking is a relationship between orbital motions that varies somehow depending on the distance from a central body - sun. This relationship has been quantified in a complex formula for the closest 6 planets by Kepler's third law.

Kepler's formula can be simplified to $KT=R^{3/2}$ for each planet, where

T is the period of a full orbit cycle,

R is the distance of the center of the planet (B) from the surface of the (A) sun,

(for elliptical orbits, R is the major axis.)

K is constant for every planet connecting their periods to a central body action.

We called the lines coming out of the sun (A) radiation beams. With current logic they would be unable to push sideways if we assume they are like light moving rapidly outward at the speed of C. Theoretically light beam has no mass. But we do know light creates some pressure upon impact. Light has waves that emulate a particle upon impact. Light is only considered massless if at rest. For our radiating lines to push, they must have some sideways motion toward the mass being pressured. Radiation traveling at speed C is usually considered linear motion. If the waves bend a bit sideways a miniscule amount of their push can be in the lateral direction. One might call the sideways impact glancing blows. So any bending of the radiation line toward the impacted mass should provide motion to the mass. Bending of the beam relative to circle B must occur given our definition that A is spinning relative to B. For a radiation line to move up against B it has traveled to our left. That leftward motion L occurs while the beam moves outward at speed C. So L/C is the amount of sideways push delivered to B. This is a very small portion of the speed of light.

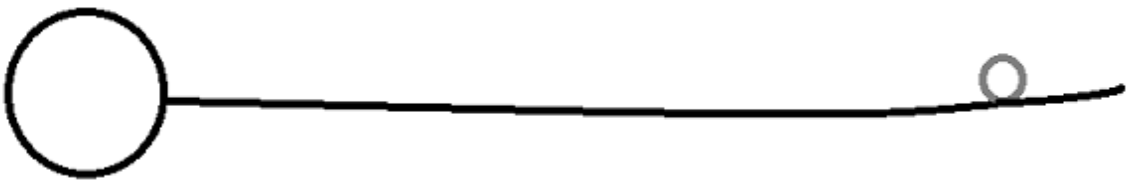


Figure 2: Bent transmission beams from the sun that push earth

What happens as beams exit rotating massive bodies?

We have pictured orbiting. Here we analyze in more detail the issues involved in orbiting.

Exiting solar beams apply less outward pressure upon planets than do incoming beams from outer space. Gravity thus nets out to form "attraction" of planets toward the sun. Then we are interested in planetary direction of travel.

Picture a straight line through the center of the sun. A gravity beam will not quite remain straight as it approaches center. The sun is rotating (spinning). The beam is being pushed in one direction by the atomic particle contents of the sun into a slightly curved path. It passes very near center, after which the pushes impact the beam from its opposite side. By the time it exits the entry point and exit point may connect directly through

the center as a straight line. It is upon exit that the beam is maximally shifted to the left. Describe the bend. Is the shift of the wave found by dividing the surface rotation velocity by the speed of light or 2/ 300,000 for the sun? But this is the linear offset. In fact it is the angular lateral push due to the circular motion of the sun that is carried along. It is awkward to relate angular motion to linear motion. The angular offset varies with distance of departure as the circumference increases. It requires a flow of continuous recalculation.

The beam continues on in its most recent direction which appears to observers as bent from the straight up direction. The bend is at a maximum at the surface. As the beam rises it mixes with ever more perpendicular non-penetrating beams. An intersecting motions and the mixing of irregular beams are greatest at the surface. We see this activity at the sun as solar flares. The lateral impact upon exiting beams suggests we first view them as two dimensional transverse waves since two directions, up and left, of force were applied to them. They become coils with interactions in space over time.

Beams flow thru the sun in all directions and exit with various distortions. Most as they aren't directed toward earth. Some beams that exit very near the equator we do see. We receive fewer beams from off the orbital plane. Beams penetrating at higher latitudes and passing by the polar axis will have traveled less distance thru the sun and encountered a slower moving surface. Waves passing thru but not near the axis acquire irregular wave lengths relative to observer. The waves creating our rotation are primarily two dimensional as we might view them on a piece of paper.

Any motion of matter causes exiting radiation beams to bend. The micro world has EM waves traveling at speed c being impacted laterally by matter particles traveling much slower at the rotation rate of the spatial body. The particles are discreet and the beam is essentially continuous. Therefore the beam will not be cut when impacted by atomic particles, but part of the flow will be pushed to the side by each particle impact. The impacts are repetitive and cause the wave nature of the beam. At the same time the overall flow has been redirected.

VII. Aberration

Light/radiation and external pushing gravity are the two transmissions which convey the nature of celestial bodies. While the linear motion of sources is insignificant the transmission of that light signal is subject to the orbital revolution motion of the observer body.

In order to understand the aberration for light etc. one inspects the relative motions of the bodies involved in the transmission of the EM waves. The motions of relevant bodies are especially important within the solar system such as sun to earth transmission.

There are four relative motions between two bodies. The first motion of interest is the motion of earth around the sun. Analyzing this we first imagine two circles and a straight line connecting the two circles and serving as a beam of light. The paper we draw on is static space and ignores the revolution motion. Given the beam takes 8 minutes to transmit, and earth moves to the left, counterclockwise, during that time, the beam will pass behind earth. To correct for this we select a beam aimed ahead on earth's path which we intend will hit exactly the center of earth in 8 minutes. That straight line beam will appear to bend slightly backward to earthly observers upon arrival pitting earth's motion of 29.8 KM/sec against the outward velocity C of the beam. The bending is called aberration.

The next, and most important motion, is the rotation of the sun. Consider an observer on the sun and the launch of the light beam. Say a beam is launched straight up like an arrow toward a chosen point. After 8 minutes is the beam still straight up from the solar observer? Since the sun has rotated a bit (its period of rotation is 24 days), it is above and somewhat behind the observer and the point of origin. The beam has not gone straight up! What does straight up mean? What is static space? The motion should be represented by a curve drawn to compensate for the rotation of the solar surface. Then the arrow can be pictured as straight up at some future times. In fact this representation does occur in some form as the launch site was moving sideways while the beam headed upward. The first assumption about the form of the sideways motion is that the beam will move toward the left at the sun's rotation rate, which is 2 km/sec pitted against the upward velocity of C. But this offset, at 2km/sec vs 29.8km/sec. of earth's revolution velocity, is insufficient to explain earth's revolution; it bends the beam only $1/15^{th}$ as much as needed. Note that we are considering only the lateral effect of the perpendicular push in a static space. The other offset perspective is that of angular velocity, a much more significant factor. The sun rotates in 24 days, which is 15 times faster than earth's revolution. Applying this rotation to an EM transmission throughout would have the beam arriving at earth from behind. This would suggest a large reverse aberration.

Essentially there is gradually fading lateral equilibrium at the surface of both earth and the sun. Space is not a static medium. The angular velocity is the initial offset to C at the surface of the sun. But the angular velocity applied to radiation beams diminishes as the beam departs the source. To understand source to receiver (sun to earth) transmissions vs the motions of earth we must consider the real condition of space.

External gravity is long wave radiation beams traveling at velocity C. These beams are the fabric of

space. Gravity beams behave as does other EM radiation. The exiting beams acquire the rotation of the sun. If we assumed the solar rotation angularly pushed these beams throughout they might push earth 15 times as fast its actual revolution rate. The sun rotates in 1/15th of our year. But intensity diminishes with distance. The density of the original beams and of space itself diminishes with distance. Think of master beams as continually modifying themselves by absorbing beams angling inward.

The solar atmosphere which rotates with the sun's surface gradually loses its connection with increasing altitude and its rotation contribution slows to that of the planets orbit speed. That happens because the sum of the master beam representing our gravity beam absorbs increasing portions of beams that did not originate at the sun but angled in. In any case, there is no aberration in gravity as it is the motive force of the planet's motion. The whole explanation to Kepler's third law comes from netting together the beams that have gained bending by exiting from the sun.

External gravity and light are both EM radiation beams. The absence of gravity aberration applies similarly to light. Gravity is also the cause of the whirling space in which light beams follow the flow and arrive without aberration.

VIII. Mass and Radiation

a) Looping Intersections

A family connection between gravity radiation and mass is the spectrum of existence. Everything is waves from very long to so dense they become mass. The wave length variation across the whole spectrum dictates the penetration ability. The shorter the wave, the less it penetrates and the more it mimics mass. Short wave radiation such as gamma or X rays usually perform mass creation adjustments upon approaching the unbalanced gravitation near spatial masses.

Short wave coils are most prone to intersecting with adjacent waves in their beams when the beam is bent. The bending and wave nature cause beam line intersects or crossings. The interactions become electrons. The interior of the coils becomes protons and/or neutrons similarly as magnetic beams are created within electrified coiled wires. While motion continues within the beam lines, the overlap location remains in place as unmoving mass. Matter occurs when beams bend sufficiently to create a loop within itself or when intersecting other beams.

So, a mass is the action of coils which constantly repeats and remains in place. Mass is composed of intersecting and looping beams. The amount of mass within a volume of space is the density of the beam crossings which are also spins in physics terms. Mass is the existence of spin relative to a local equilibrium of space. The spin of internal components of a body and of the body as a whole, taken together, defines the density of mass and ultimately the existence of mass.

Mass is created by unbalanced intersections of Paep gravity beams at points in space and creation continues very gradually in accord with the equation $m = E/c^2$. This inverts Einstein's energy release equation.

Masses exist as rotation relative to the local equilibrium. The rotations can be of the components such as protons and electrons, and/or of the whole mass. Non-spinning mass doesn't exist.

Since the particles of matter spin their surface becomes somewhat perpendicular to arriving or penetrating waves thus creating interaction. The interaction becomes a push relative to the matter particle. It can create a wave or shorten and bend the gravity wave.

b) The Universe

Since gravity is only variable upon interaction with mass it must be infinite in range. The gravity beams define all infinite space. The universe is space fully defined as beams like radiation and can exist without mass. It is the actions of radiation beams that build matter over time creating hydrogen on up to the largest suns.

Interacting bent radiation beams that bend enough to loop back such as gravity or EM radiation are what creates mass and matter. We can discard concepts that have planets created by condensing of gasses, which gas could never mimic all the various orbital revolutions.

Mass as a build up over time can occur in space where we identify the simplest existence of hydrogen everywhere. Repetitious intersecting of waves in space occurs primarily when beams bent by different sources interact. An optimum location is where streams from the sun and from Jupiter interact and build masses called Trojan asteroids in the Lagrangian L4 and L5 points of Jupiter's orbit. Mass buildup also occurs within masses where gravity beams bend and interact with existing mass particles. The output of such interactions in the sun provides light and heat. These are radiation because gravity, the source, is essentially radiation.

The same events occur within earth where minor heat and light originates. Likewise earth's mass gradually grows. Continental drift with shifting tectonic plates over time is a current scientific theory. But we expect a slow expansion of earth. The plates, separations, earthquakes and volcanism are products of interior expansion pressuring the surface. Analysis should extend back to the planetary beginning. Early features of the surface are replaced by newer ones as the earth grows. As gravity beams penetrate, such

things as water and oil are continually recreated below the surface. Unbalanced gravitation forces pushing down vs up collide and form matter. The penetration is what leads to earthquakes, volcanism and rifts separating sections of land. All the elements and types of mass that we identify are created and constantly rebuilt over long time periods.

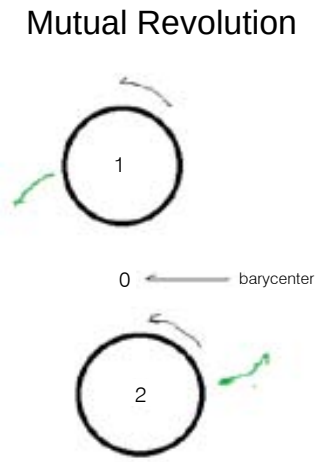
c) Charge

There is a concept called charge, a defining concept of electricity and current. Charge is labeled positive or negative and assigned to nuclear particles. But to me, charge is simply a magnetic effect that emphasizes the 'direction' of gravitational push. Charge has one constant value, and the amount of charge depends on the number of gravity beams that aren't offset by opposites. Science however classifies charge as attraction and repulsion of oppositely charged particles. Simplicity suggests dropping the charge concept, replacing it with a sum of effects of interacting push motions arriving from various directions.

d) Curvature

The universe exists and all fits together based on the curvature of a single force. Even with vector analysis, extra dimensions, or calculus as tools we can't numerically outline curvature within the universe. Curvature varies with place distance and time. In a view to be included, the motions of space are counterclockwise for all bodies relative to the center of their space. It also depends on the local Z axis.

e) Similar masses



Since we reside in the solar system where the motive for orbiting is controlled by the sun, it is not often we consider the effects of similar masses on each other. But now that we understand that the motive force for orbiting is contained within the rotations of a central body, we can consider the dual centers situation. In the picture of mutual revolution, the rotation of body 1 causes body 2 to move and ultimately attempt to orbit body 1. That pusher body 2 initially backward in the picture. Simultaneously body 2 is rotating and pushes body 1 toward our left to ultimately orbit body 2. The center of the orbiting becomes a barycenter external to both masses.

The picture shows counterclockwise rotation and that is the norm for the universe. With all rotation being counterclockwise the universe retains stability. If one of the masses in the picture were orbiting the opposite way the pushes would bring them together and a crash would occur.

IX. Planetary Rotation and Atmospheres

Besides pushing orbitals in their orbits, solar originated bent gravity beams cause the counterclockwise rotation of the orbital by penetrating, in average, to the right of center as they approach from the right. For Venus's clockwise rotation, the majority of bent streams pass just left of center.

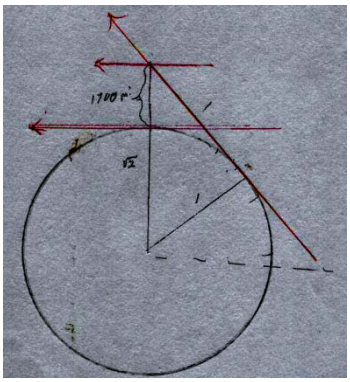


Fig. 4: Gravity pushing the atmosphere

The effect pictured above shows solar beams that pass through earth's atmosphere. This is the source of winds. The beams don't penetrate, but do cause atmospheric rotation. These upper beams surround the earth and push the atmosphere from West to East, causing our flow of jet streams and clouds. The top of the picture shows the westerly pressure at the equator at midnight directly opposite the sun. The bent gravity beams here pictured in exaggeration to arrive bent 45 degrees thus tangent to the surface at 1:30 per clock diagram. The atmosphere - 1300 miles up is pushed by solar bent gravity and earth's bent gravity and travels faster than earth does.

Note also that external gravity beams together come as a blanket of beams approaching all latitudes of earth. Toward the poles the flowing velocity will be greater as the bent beams have less distance to travel around while still providing the same worldly velocity of push as at the equator.

Drawing pictures of the upward exiting gravity beams helps relate to the overall concept of external gravity. A picture below shows beams exiting earth and those exiting the sun interacting near earth. The

magnetosphere consists of solar and earthly bent beams. Beams exit the sun and bend left due to solar rotation. Some of those beams bending across the face of the earth rather than striking earth are seen from the back by earthlings and are labeled as solar wind. That term apparently came from the observation of variable and directional pushing by solar gravity beams. The earth also bends exiting paep beams to its left. Picture a region between the sun and earth where the beams from the sun and earth interact, each bent counterclockwise relative to their origin body. There will be turbulence surrounding a small region of equilibrium which is the focus of the magnetosphere. Such an effect has I believe been detected for Jupiter. The solar wind concept somewhat misrepresents the motion. Diagrams showing the disturbed atmosphere occurring near earth such as the one below miss much of the bending activity.

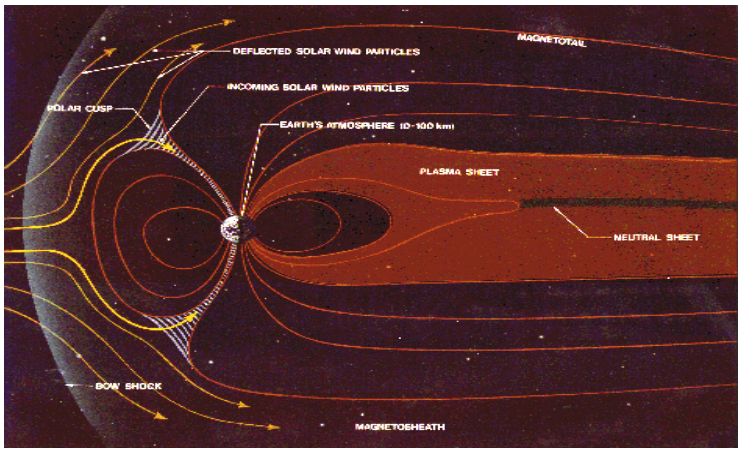


Fig. 5: Magnetosphere

X. Now Mass Rotation Controls Orbiting

a) Background

Prior to the development of physics as a science it was sufficient to have motion that offsets a perpendicular gravitational force and continues forever. A total absence of any friction was attributed to the "'void"' of space. But perpetual motion and empty space are now seen as fallacies. Continuous motion needs a driving force for impetus.

An elementary activity in the universe is motion of celestial bodies relative to each other. An all inclusive physical gravity theory must address spatial motions. We provide the reason that Kepler's third law worked for the first 6 planets.

A function of physics is to want to understand fields and matter better by searching for their components in the atomic universe. Particle theory is the search within three dimensional space for one dimensional pieces such as molecules, atoms, protons, electrons, photons, etc. Similarly the view of a whole field can be broken into linear pieces much like physicists break it into particles. Consider string theory which is the search for two dimensional linear connections or flows. This model introduces Paeps as one-dimensional particles, which serve as individual waves when in motion. That motion is the linear two-dimensional piece called a beam. This External Gravity model implies joining particle theory and string theory with emphasis on longer strings, i.e. spatial beams moving throughout space. "External Gravity" says:

1. The universe is infinite and isotropic.
2. Actions are the motions of matter. There is no perpetual motion of matter without a perpetual source causing the motion. Gravity is the perpetual source.

b) Newton

Our ideas of space develop from Newton's system of celestial mechanics. Essentially Newton applied gravity to Kepler's third law and realized that the mass of each body would then be a factor. Newton's orbital control infers that orbiting occurs because nothing interferes with the linear forward component of motion. So, to him, the linear component of motion is perpetual, devoid of outside influences such as friction. By extension the rotation of bodies themselves, like the orbital motion of revolution, lack outside influence and would also be perpetual. We now understand that space is not a void.

Physical science today depends on cause and effect and must come forward and correct these ideas. The cornerstone of attractive forces and of frictionless space comes from application of Newton's laws. But: A discussion of gravitational force by Newton follows:

> "For here I design only to give a mathematical notion of those forces, without considering their physical causes. –Wherefore the reader is not to imagine that by those words, I say where take upon me to define the kind, or the manner of any action, the causes or the physical reason thereof, or that I attribute forces, in a true and physical sense, to certain centers (which are only mathematical points); when at any

time I happen to speak of centers as attracting, or as endued with attractive powers". "You sometimes speak of gravity as essential and inherent to matter. Pray do not ascribe that notion to me; for the cause of gravity is what I do not pretend to know."

In addition, Newton had said "he would not refute gravity as a motive particle is it didn't hinder the motion of orbitals."

Building a theory on an absence of influence by anything was necessary to build a world system and an absolute space theory. But in today's world of technical detail knowledge, the absence needs to be discarded in favor of an ongoing impetus.

Newton's views competed with and overcame Descartes' whirlpool theories as the source of orbital motion. A whirlpool representation of motions of space itself didn't match central spin experiments such as controlling fluids in a bucket or rotating within a fluid medium that extends to infinity. In neither example do the velocities or actions of the fluids simulate expected planetary velocities as calculated using the formula of Kepler's third law. These examples probably led to disinterest in Descartes' model.

c) Pushing Gravity Theories

Previous pushing gravity theories suffer from concern about particles inhibiting the flow of orbitals. One recent alternative pushing gravity theory suggests an ultra high speed for pushing gravity particles. This was probably not part of LeSage's original pushing gravity theory, but comes from LaPlace, Van Flandern, and others as incorrect solutions to pushing gravity theories, all of which ignore curvature. The proper solution using bending/curvature of space is entirely new here.

XI. The Cycle of Gravity

As we stress infinity, we see that gravity itself is also an infinite force. It is infinite because it is continually transported across space as radiation. All radiation is continually sourced as rays originated as light and other EM transmissions. As we reject the absolute speed c for light, we can say that the time of transmission along with the mass of the source determine how the radiation will gradually expand its wave length. What starts as light becomes red shifted into microwaves, sound waves, and ultimately long wave gravity beams. As mentioned all waves provide some gravitation but the greater force is from the longer wave. As they lengthen, the total gravitation increases. But, while this paragraph focused on discussing the increase of gravitation across the universe, there is an offset.

The whole offset is what we have examined here as the "netting" out of gravity forces when beams penetrate masses. We lose total local gravitation as weaker beams exit earth and fill the surface and nearby space with weaker force.

Pushing gravity beams recycle. Light from distant stars gradually fades out as the wave lengths get longer. The lengthening is caused by the retention pull of the source and the forward pull of the destination body. Light stretches into infrared, microwaves, sound waves and finally gravity waves. This gravity rebuilding is needed as the beams that penetrate matter locally lose some of their energy. That energy loss is the gravity we recognize here on earth and for other planets.

So gravity force diminishes as beams pass through matter and increase as beams flow across space! The situations offset and the total gravity force in the universe remains constant!

Physics theories mistakenly view gravity forces as different in galaxies. Theoretically the cause is missing mass. To compensate for the "needed" mass they invented dark matter and dark energy. Nobody promoting that understands our solar system. The orbiting is a function of the central body sun, which is essentially 99% of all the mass. The central body is the motive for orbiting.

The galaxies, as we examine them, are regions of similar mass stars throughout. Therefore no star is the central body and all stars affect others depending on their distance of separation. There is no missing gravity in galaxies. The section on galaxies details that issue. There is no dark matter due to galaxies and no dark energy for a bounded universe.

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Infinity and Pushing Gravity Lead to Revelations the Universe is Otherwise - Part 2c

By Paul Schroeder

Abstract- The two preceding papers set the stage of the new perspective for science Continuing forward here we investigate how the changes in perspective apply to numerous situations and provide value to these new perspectives. The revelations are detailed in a number of papers that provide views of what is really happening in space and cosmology. This document provides a few summaries of many of my key papers that reveal better perspectives. The many components of the whole system follow. Finally new laws of motion are provided.

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I. Summaries

a) Magnetism

Magnetism is the other attraction action. It is also a pushing action. Free electrons serve as a cause. When the electrons are flowing they redirect gravity beams by up to 90 degrees so the direct flow of gravity is lessened the sideways redirected gravity flow simulates and becomes and a flowing magnetic field created perpendicular to the gravity flow. The example is the electromagnet. The field is outside while the flow is within. The increased push is at one end, the diminished push at the other end. Reading my magnetism is suggested.

b) Creating Matter

Creation is partly addressed in these papers. The details within the nuclear structure are involved. Matter is built by intersecting coils of the bent beams. The number of coils within the beams and the degree of bending influence the creation and the number of electrons. Matter remains in place while beams flow onward. Reading my creating matter paper is suggested.

c) Rotation – local effects

When beams penetrate a rotating sphere and exit, their direction is changed, bent. The maximum bending occurs at the equator. Further from the equator, at higher latitudes, the weaker the rotation control becomes. Planets around the sun and moons around planets would lose containment. The energy to drive orbitals decreases with the diminished bending. The decrease continues by latitude to the poles. A beam exiting in Antarctica will mostly wrap around itself and not cause any lateral drive. The polar exiting beams do not offset the incoming beams well and holes can be created. Does the net speed of radiation vary there? Is space travel differently affected by gravity above or below the solar system?

d) The Sun

The sun is simply larger mass which diminishes penetrating gravity beams more than planets do. When penetrating gravity beams exit, the difference in force between exiting and incoming beams is so great that intense heat and light are the result along with the intense net downward pressure. The difference in force down vs up causes pressure by the dominant beams on the lesser beams which interaction becomes the definition of heat. Light is then the flow away spark from the heat creation. Scientists have been surprised upon recently finding that the maximum heat of the sun is in the corona at the surface rather than being internal. Original thought of nuclear internal reactions are disproved as is the concept that the center is a very dense source. At the center the gravity beams from all directions are in equality and thus there is no heat. Pushing gravity requires that it be that way.

e) Continental Drift

The creation of matter begins in the nuclear environment and increases over very long time. Earth and other bodies are growing such that the history of any ERA can be investigated if the surfaces that cover it can be removed. Rather than drift explanations, the surface changes are functions of expansion. Growth is gradual and all matter, by size, nuclear structures and types that are created increase in complexity. Oil and water began to accumulate at some size of earth and continue to form today.

f) Gravity bumps during eclipses

Solar gravity force upon earth is expected to diminish during an eclipse of the moon. Instead it diminishes just before and just after an eclipse of the moon. Why didn't the decline occur at the exact time of eclipse? As explained, gravity beams from the sun arrive at earth from behind as they push us in orbit. Thus they are blocked by the moon just before it arrives at eclipse line. Then when the moon has passed total eclipse it blocks those other gravity beams that earth is about to experience by overtaking them. All are surprised that that the diminishment before the eclipse and the diminishment after the eclipse need separate explanations. Gravity's pressure is not simply straight down.

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g) Galaxies

The mistaken idea that gravity is different within galaxies ignores the fact that the solar system is central body dominated and galaxies have no such central body. We have shown that space structure is under the control of rotation. The apparent flow of star positions over time is a function of the rotation of all nearby stars. The picture here shows a series of rotations affecting a series of suns and creating the curves that causes arms. The paper addressing this is somewhat involved but the simple ideas can be seen in the laws of motion section that follows here.

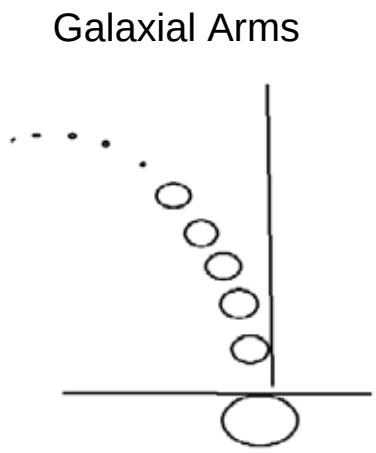

Figure 1

h) Kepler's laws

No issue was ever raised that the rotating surface of the sun did not fit with Kepler's formula for planetary time and distances in which the first 6 planets are coordinated. Note that although clouds and the atmosphere circle earth faster than earth rotates; celestial bodies revolve earth slower than earth's rotation. The revolution reversal applies to all planets and extends to a geosynchronous point for earth at which the orbital motion matches our rotation. The sun has such a synchronous point also, maybe at 11R, which serves as the focal point of orbital drive. Then calculating the 2 dimensional push as it expands outward to reveal the diminishing push by solar radiation as radial distance grows gives an approximate but insufficient total. There is more solar push from the suns rotation sourced from greater solar latitudes. Gravity beams exiting the sun just above or below its equator may influence a nearby planet orbit but angle above or below further orbits and have no effect there. The analysis is complex.

i) Einstein and Compton

a) Regarding general relativity, there is a lack of simplicity in the space time: four dimensional base of relativity theory. The elimination of time as a factor fogs any understanding of motion. At some level mysticism did fade away with a formula leading to a unified field theory. It states that space causes matter to move and matter causes space to curve. The unified field theory was to unify the general theory of relativity with electromagnetism, A "theory of everything" is closely related to unified field theory, but differs by not requiring the basis of nature to be fields, and also attempts to explain all physical constants of nature The formula is

$$Gn + Ag_w = 8_{pi}G/c^4xT_m$$

For my contrary statements: I say: Space is a flow (caused by its radiation contents interacting with matter bodies which transfer their revolution and rotation motion), so given space is flowing it moves matter. Matter allows space to flow through during which the penetrating space beams become modified and redirected so that its overall flow becomes curved.

Space causes matter to move and matter causes space to curve

b) Einstein proposed photon particles within light waves and an x-ray test by Compton where the waves are deflected supposedly confirmed the photon as a bundle of energy. The thought was that the energy of photoelectrons should increase with intensity. The frequency shouldn't matter. Red and Blue signals were compared and surprisingly intensity didn't matter but frequency did. Supposedly that confirmed the photon. But it doesn't. The different penetrating and rebound action by different frequencies confirms that the variable coil separations of our pushing EM radiation beams are the source.

The graphs, where Compton deflected X-ray beams, show dual waves of different frequencies and variable heights. No reason is known. Using wave coils the bending results in 2 arrivals at different angles and perfectly explains the graphs.

j) Electricity-lightening

As mentioned earlier, bent that bent gravity beams from the sun form the winds upon earth beginning at points of arrival mostly near evening time. The amount of wind varies due to fluctuations in earth's revolution motion and in solar sunspots etc. Similar fluctuations occur for vertical incoming beams that intersect each other as they focus inward. If the intersecting is unusual, the fabric of the downward push of incoming beams is exposed as lightning or as centers of rotation such as tornados.

k) Ancient Aliens

When searching through the history of mankind we find the ancients have left us scrolls, cave pictures, pyramids, upright monoliths and circular and linear landscapes. It seems what was really happening was a system of documenting their capabilities to show to

other tribes or civilizations and to us in their future. We haven't understood the messages! They are telling how they could deal with gravity! Just the huge blocks forming the pyramids could never have been created and moved, even by armies of millions.

Even more difficult to understand are the upright stones of Stonehenge where hundreds more upright monoliths have been found somewhat buried. How were they raised? The "simple" way to move such mass is by blocking the downward push of gravity! Once gravity is blocked you can even move the mass elsewhere. Also there is a pattern of 2 miles of 8 across stones in Thailand. It matches the pattern of 2 miles of holes in Peru. Possibly the stones were transported half way across the world. Then there are the Easter Island stone figures. They are all similar. A monolith is created by slowly detaching and raising sections of granite. Something is needed to help separate the monolith from its laterally attached ground while lifting. The finding of liquid Mercury in significant places suggests Mercury could serve the blocking gravity role that electrons do for magnetism.

l) Black Holes and Other Fantasies

Since much of Astrophysics focuses on light, many bad theories abound. The idea that there are things with mass and things without mass led to the massless nature of light and EM radiation. That led to photons which caused the wave particle duality which becomes an impediment to physics.

Science chose the 'rate of travel of light' to map the universe. That led to establishing a constant velocity for light, at least within a given medium. Then came the red shifts which gained the Doppler function assuming stars move away and cause expansion. Given that model even some red shifts exceeded theory and we gained white and neutron stars which held back light via gravitation. Expanding that model led to black holes as the ultimate retention of light. Such stars/holes had to have nearly infinite mass and thus density. Thus anything became possible such as time tunnels and worm holes. All of this would not have happened if light was allowed a variable velocity, no matter how small the deviations might be. The basic ignored argument is that if black hole gravity could stop light then what about a mass that almost could stop light T. We would get gravitational red shifts rather than Doppler red shift from stars depending on density etc.

This reveals the idea that both the mass of the source and the distance of the source work together to determine the red shift. Since External Gravitation removes fixed light speed it opens up the universe to logical interpretations. We are seeing some relevant interpretations about Quasars for example.

Other fantasies include dark matter due to misunderstanding galaxies. Also dark energy was needed for universe boundaries. Extra dimensions are illogical as are worm holes.

II. Summary of Theory Components

By resolving my gravity concepts with relevant physics issues I have developed different views about numerous concepts including how rotating centers cause orbiting as measured by Kepler's third law of planetary motions. Fundamental concepts include:

a. The term gravity can refer to the source or to the detectible effect of the action of the source. The effects are motion and the existence of matter.
b. Gravity is a push rather than an attraction. As such it solves 'action at a distance'.
c. The push implies the source is external from matter. The source is beams with velocity. Motion of beams is confirmed by waves within the beams.
d. Gravitation pushes as if it contained moving particles - Paeps – 'particles applying external pressure'. But gravity particles can't be particles. They would cause too much heat upon impact and would interfere with orbiting. So paep is a generic term for gravity source. It's form is as waves or coils within beams.
e. Gravitation is best pictured as lines rather than fields. Beam lines help analyze and contemplate a linear push. Pressure gradients that summarize the situation inhibit analysis.
f. Gravitation functions as beams pushing from all directions upon every point of space. Thus matter takes on spherical shapes. Attraction gravity is linear and is insufficient to understand the universe. We need transverse radiation wave/particles that strike matter with impact. The amount of impact depends on the wave amplitude/energy. Light and EM radiation are composed of waves/coils which can apply pressure like particles can. This removes the separate concept of photons and solves science's wave/matter conflict.
g. EM radiation such as light slightly penetrates masses due to its wave structure. But longer wave gravity radiation theoretically penetrates more and extends its push throughout masses. Thus gravity beams replicate long wave EM radiation.
h. Gravity beams, like radiation rays, move at velocity 'C'.
i. The universe is infinite and isotropic. Space primarily contains EM waves. Gravity beams are the structure of space simulating the aether others refer to. Like-wise gravity is the undetectable background.
j. Gravity interacts with matter. Matter exists as rotation/spins relative to the local equilibrium. The spin may be of the atomic particles such as protons and electrons as well as spin of the entire mass. The amount of spin determines the density of

masses. The lack of relative spin signifies the absence of matter.

k. Equilibrium is the net balance of horizontal pushes, yet with an imbalance of vertical pushes -gravity. Structural equilibrium causes equivalent light speed in both directions. A better answer than Einstein's time dilation.

l. Gravity beams mostly penetrate matter. Atoms are mostly empty space. Paep waves interacting with atomic particles both modify each other.

m. Penetrating gravity beams exit the mass and are modified. Beam amplitude is diminished, beam wavelength modified into shorter waves as heat and light radiation, and the beam's motion is redirected.

n. The gravitational push at a mass surface offsets diminished exiting beams with undiminished incoming beams resulting in a 'NET' downward push often called attraction gravity.

o. R^2 laws apply for attraction gravity because it is centered at a central point of matter. Pushing gravity also requires a mass to centralize the modification of the beam. Thus identical central points of reference correspond for equations.

p. During gravity penetration some impacted matter particles are modified into radiation or different matter. The sun's eternal power is caused by continuous penetration and exiting of modified gravity beams.

q. Paeps can be redirected by spin of atomic particles or by the spin of the whole mass. As noted in point 10, spin defines matter because the moving mass particles intersect incoming gravity beams.

r. Redirected paep beams exit in a bent path relative to both the source and the observer. They curve throughout their travels. We draw as lines and curves but can view as a mean average line. These curves have 3 velocity components, the long up line - C, the minor sideways rotation value and a diminishing component reducing the value of the line vs local space as it travels.

s. Space is 3 dimensional but its contents flow and distort linear analyses.

t. Undiminished gravity beams flow in all directions across earth's surface, not just downward. They mostly net out. A minor extra counterclockwise flow of exiting beams bent by the rotation of the mass occurs. The flow matches the mass's rotation yielding local equilibrium.

u. Counterclockwise motion relative to our Z axis north and to orbital centers dominates the spin and orbital motions of the universe. Antigravity would result from a clockwise flow.

v. Newton said orbital motion continues absent external forces, thus no friction. The implied void of space can't exist given radiation, meteors, and solar winds. A motive force is needed.

w. Newton's "motive" external force was centrifugal force, subsequently inertia, a force with no source. Newton's inertia is more properly defined as 'adhering to the local flow of gravity'. The application of inertia saved Newton from explaining the source of motions.

x. Planets incur lateral pushes of gravity caused by the bent beams from the rotating sun, and moons incur pushes from the sun and their rotating planet. This is the motive force causing orbiting. The revolution push by spinning bodies upon their orbitals is maximum at their equator and decreases with altitude. So Bode's law finds planets to exist at the extension of the solar equator and not at significant altitudes.

y. Orbital revolution rates must be less than their central body rotation rate. Multiple centers complicate the analysis. Rotation of the master (sun) adds to the local central body (planet) push upon moons.

z. The lateral pushes on orbitals causes the rotation of the orbital as well as the revolution. The rotation rate is dependent on how far to the right of the 12 o'clock/6 o'clock axis the push is centered.

1. Rotating bodies usually rotate counterclockwise relative to their central body. Central body bent gravity beams add to atmospheric rotation as well as the masses 'rotation' for orbitals. The sum of bent gravity beams from earth's rotation and from the sun causes winds on earth.

2. Solar gravity beams are the solar wind when passing by earth. Magnetosphere pictures are attempts to represent bent gravity beams. At a point between planet and the sun, bent beams from each source collide, creating a small chaotic region.

3. Sufficient bending of radiation beams and interaction with other beams creates mass. Electrons are beam crossings.

4. The nuclear – strong force is simply the sum of gravitation beams pushing from all directions.

5. Magnetism is the 'net' push of gravity beams when beams from one direction are redirected.

6. Charge is simply the direction of flow. As noted in point 21, anti-gravity is pushing in the opposite direction.

7. A spectrum of existence associates waves from the longest Paep gravity beams, thru EM radiation, and extending to mass itself. All relates to the wave structure in the spectrum of EM radiation.

8. Three dimensional waves are best pictured as coils. Consider a flowing beam wrapping around inside a straw like a counterclockwise screw.

9. Diminished gravitation occurring locally within the sun or stars is replenished by the gravitational stretching of light beams into microwaves, then radio waves, and further into paep gravity beams as

they travel from very distant stars. The gravity source is continuously recycled

10. Rotating bodies cause orbitals to encircle them. Kepler detected this and determined orbital times for our solar system with a large central body. More nearly equal rotating bodies are not similarly studied. Given their joint revolution action forcing each to orbit the other significantly changes/decreases the orbital times calculations. Proper calculations would override Kepler's third law. In galaxies.

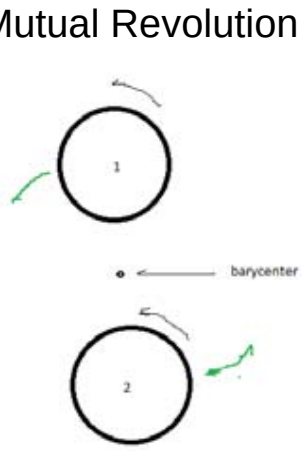

Figure 2

11. Kepler's third law is that the inner planets revolution period is a constant times the 3/2 power of the solar distance R for each planet. Thus the central body sun has to be the source of their orbital times. It is the push by bent solar gravity beams that forms this relationship as the orbits increase by R^2. The factor R is the 2 dimensional component and R^1/2 is the Z axis contribution.
12. The bent flow of gravity defeats any exact linear calculations of gravity effects in large geometric analyses. The difficulty increases when multiple rotating masses contribute to the flow.
13. Actions within our solar system contend simultaneously with the linear flow of gravity at speed C (300,000 Km/sec) and the perpendicular flow from the solar rotation of 2 Km/sec.
14. Gravity beams condense together approaching mass bodies and the beams interact such that crossings are electrons, regions are protons and neutrons. Thus the higher frequency waves can create matter.
15. Regions of optimum matter creation occur when beams from 120 degree angles interact. The Trojan asteroids are such a place where solar and Jupiter EM radiation beams interact.
16. A proper picture of gravity beams diminished by the sun and traveling toward earth shows them bent inward from the right. The motion of earth causes unbent beams to arrive from our left as if bent by earth's motion. Thus beams from both sides show the bending flow of the magnetosphere.
17. The mentioned bending of gravity beams produces both sides of the bumps of gravity detected during a lunar eclipse. Refer to discussions of the Wang eclipse. The causes of the two bumps are different for each one.

III. The Laws of Motion

Rotations, Revolutions and Apparent Motions of Heavenly Bodies

Summarizing my views of galaxies suggests outlining a preliminary set of motion laws, and corollaries.

We first step back to the Copernican revolution ending the Ptolemaic, Earth centered sun revolving, view. Earth centric worked with sub orbitals, but sun centered requires less adjustments. Are revolution vs rotation in two body systems interchangeable? Impressions are that it is the outside issues from which one decides what is right.

Revolution vs Rotation

That the planets most logically orbit the sun is what led Copernicus to propose the sun centric system. But given enough subsystems, could we go back to earth centric system? There is even a third workable two body system in which earth circles the sun daily.

It takes the Paep pushing gravity systems to lock in the sun centric system. Paeps become the outside component, like planets, that define the center.

a) The relativity of rotation

Law 1.

Rotation and revolution are interchangeable concepts between two bodies in a vacuum which are in relative motion while retaining the same distance. Neither is a privileged non-rotating or stationary body.

Corollary 1.

Specifying rotation vs revolution motion depends upon our determination of apparent motions of other relevant bodies

Rotation 2

Corollary 2.

Specifying rotation vs revolution may alter if a determination of other relative motions is changed. For example, ignoring other motions allows converting the Copernican revolution, in which earth revolves counterclockwise around the sun, back to the sun circling the earth.

Rotation 3

Law 2.

Paep gravity is the "other relevant motion" negating law 1.

Law 3.

Specifying the nature of spatial motion is deeded to an outside observer stationed, or imagined to be, north of the defined platform/plane containing the motions. A participating observer makes assumptions by becoming a virtual outside observers in order to theorize the nature of motions.

Law 4.

Orbital directions in space may be labeled clockwise or counterclockwise relative to an outside observer. That corresponds to our usual view of earth's activities from the north Z axis. All larger planes such as the ecliptic and galaxy planes have a Z axis whose north is 'by definition' within 90 degrees of earth's north. So revolutions are counterclockwise.

b) "Otherwise" Laws of Space

Law 1

Space serves as the container for substance and provides the forces which create motion among the substances. Space provides the gravitational mechanism we call attraction. Space, distorted by rotating mass, provides the "drive motive" which offsets the attraction force by providing the rotational impetus for motion.

Corollary 1

Rotations within space insure continual separation of bodies.

Corollary 2.

There is no absolute vacuum region, as suggested by Newton, where motion continues for lack of potential interference such as friction. Such a void would not exist as space nor have dimension.

Corollary 3.

Two bodies in space neither collide nor separate permanently because of the way their relative rotations modify space locally.

law 2 of Space

Any body, such as the sun, serving as the center, and as the cause of revolution for other bodies/orbitals, is likewise influenced by each orbital and attempts to revolve around the orbital. The small quantity of force generated, along with the motion of the orbital results in the suns motion approximating rotation rather than revolution. The related force calculations upon the sun and upon the planets are separate and result in a barycenter of gravity around which each body revolves.

Corollary 1.

Most centers of gravity lie within the sun for our solar system because of the extreme differences in size. The multiple centers each form a rotation center for the sun.

Law 3 of Space

The more equal in size two masses are, the more central is their theoretical revolution point. Given two equal masses, each mass serves as origin to a revolving coordinate system of which the other body is a part. The revolution periods are ¼ or less of that determined by Kepler's formula. Choosing which mass to consider as the center of revolution is optional.

Corollary 1.

Two bodies revolving around a central point provide optional views of relative revolution. One body may be thought of as stationary in which case the center of mass and the other body revolve around it, both in the same time period. Equivalently one body may be stationary and rotate such that the other body and the center of mass are stationary relative to it. The relative action of outside bodies determines which motions are assumed.

Law 4 of Space

When equal sized adjacent bodies are rotating in similar directions, their rotations drive each other into orbital motions.

Corollary 1.

A body #2, orbiting another and approaching others may be driven and passed from one orbital center to the next rather than completing its original orbit. The more bodies supplying the drive, the more linear becomes the appearance of body 2s line of passage.

Law 5 of space

Were there 2 adjacent bodies rotating oppositely (clockwise vs counterclockwise) along a common plane, they would push each other in the same linear direction and create swirls that violate the continuation of separation. Picture them occupying 2 ends of a figure U, moving down together, and eventually colliding at the bottom center.

Corollary 1.

Opposite rotation can occur in a plane only when radial separation of the orbitals is immense. Overlapping push causes turbulence that leads to inclined orbits. Collisions are avoided throughout space

Law 6 of Space

If body 1, originally driven by body 2, passes between body 2 and a body 3, the body 1 orbital must follow an inclined path to avoid the center of revolution vortex and to avoid body 3.

Law 7 of Space

Assume all equal sized bodies in a group are rotating counterclockwise. An outside or a participating observer will determine that all bodies are revolving relative to their adjacent bodies. The relative revolutions along a line of bodies are cumulative so that the farther

the observer looks in any direction; the more rapid the orbital motions measure relative to him on their circumferencs.

Corollary 1.

Apparent linear motion velocity depends on the angular motion of the line of sight. Apparent velocity of distant bodies increases up to 90 degrees of cumulative angles of revolution. Higher angles curve motion back toward the observer, limiting the apparent speed and ultimately the distance of separation between observer and target.

Law 8 of Space

It is the spin of a central body that determines the action and existence of its orbitals. The quantity of effect varies with the tilt of the orbital plane. The maximum rate of spin occurs at the equator and diminishes as you approach its poles.

Corollary 1.

In the solar system, most orbital bodies exist near the ecliptic, on the spin line of the sun, because that is where the sun supports them by its maximum rotation velocity.

Law 9

Orbits are elliptical rather than circular because there is a secondary force of attraction centered at a second focus which represents the summary influence of all outside forces.

Corollary 1.

The real body being orbited supplies the revolution impetus. The secondary/imaginary focus provides no revolution impetus and interferes with the ongoing revolution. That causes an orbital to redirect toward perigee, incur less swirling and lose some of its forward motion pressure.

c) Laws of motions within galaxies

Galaxy Law 1.

A series of equally spaced stars in a line, rotating counterclockwise, will each swirl their adjacent star into orbit so that the line may gradually bend to the left. The bending establishes the apparent speed of rotational motion. Observers will view a nearby rotating body as revolving and will calculate that more distant bodies in linear sequence move faster. The relative revolutions add up. The maximum linear speed occurs when the revolution angles sum to 90 degrees.

Galaxy Law 2

Bent lines of stars form arms and stars far from a galaxy center form arm ends. As the angle of bending approaches or exceeds 90 degrees at arms end, the distant stars apparent motion will either: 1. Appear about to escape. 2. Achieve the exact velocity to continue orbiting the galaxy center. 3. Further increase the angle thus falling back toward the galaxy center.

The actual motion depends on the length of the arm, the distance of adjacent stars and the stellar concentration within the center and within the arm.

Galaxy Law 2 Corollaries

Corollary 1. Fall back/returning stars, in arms which bend 180 degree, will probably not complete orbiting their neighbor nor pass between two stars. They will be passed from one mainline star's control to another and 'slide' along the bottom of the arm.

Corollary 2. A dense bunch of stars will bend an arm more than a sparse region does. Stars sufficiently departed from dense regions have a linear motion which reduces the bending relative to the center.

Galaxy Law 3

The gravitational retention and the velocity of an orbital depend on the rotation speed of a dense galaxy center. Rotation speed is maximum at the equator and lesser at higher latitudes. The greater the angle above or below the galaxy disk, the less the center will retain lines of orbitals. The shortened lines will suggest a dome above and below the center.

Galaxy Law 4

Orbits of stars near the galaxy center or a cluster center are tilted relative to the disk of the galaxy. The highest declinations occur nearest the galaxy center. They display polar regions to the galaxy plane presenting a different look. Thus they appear different, giving us the impression of being older stars.

Galaxy Law 4 Cont.

Corollary 1.

Stars along the galaxy disk rotate approximately in our plane so their makeup appears similar to our sun. We see their brightness and call them younger.

IV. Galaxies

a) Gravity and Revolution Rates within Galaxies

Mankind did not understand the motions of planets and moons until Copernicus, Kepler, and Newton defined the structure and workings of the solar system. Our understanding of galaxy motions is in that early stage today. There is a mystery surrounding the constant rotation rates observed for stars orbiting within galaxies unlike the solar system where more distant planets orbiting the sun do so more slowly than inner planets. Some suggest there something different about gravity in galaxies and they invented dark matter, dark energy and MOND to explain it. But proper analysis of gravity finds it is constant though its environment may vary. So the answer is otherwise.

b) Introduction

Galaxies consists of stars that are somewhat similar to each other in size, while in the solar system we

have the large central body sun and small planets. Though galaxies have a dense central dome, it is not a central body. Our challenge is to investigate galaxy revolution at its circumference vs. internally. My External Gravitation model helps by concluding 'the rotation of central bodies pushes other bodies gravitationally'. Two rotating bodies drive each other in their orbits. You can arrive at similar perspectives by applying the inertia and centrifugal force terms to suggest that two adjacent bodies in space must orbit relative to each other or they will crash together due to gravitation.

Our discussions of gravity are about the physical mechanism, not the 'net' amount which is commonly identified as 'attraction'.

c) Direction

Communicating here requires a common perspective about directions in space. Revolution and rotation are two angular motions and for ease of communication here, they will always be assumed counterclockwise. When considering revolution/rotation it matters whether you view the event from the top or the bottom as they give opposite results. Using the three dimensional coordinate system with three axes, those viewing the event from the north Z axis, which defines up and down, can relate to clockwise direction. But not all observations are from the due north point and viewers with different positions have different perspectives and even assign different coordinate systems. We inherently draw the solar system as viewed from the solar north because we define earth's North Pole as north, the top for our top down view. If the galaxy plane was tipped more than 90 degrees relative to the ecliptic, then we would naturally draw it upside down and the arms would flare out in the opposite direction. As it is, there is a significant tipping of the galaxy plane relative to ours but it can never be greater than 90 degrees or we would just call its bottom north without thinking about all this perspective business. So it is valid to make references to counterclockwise revolutions in this analysis.

There is a preponderance of curvature in space. All motions in space are curved rather than linear. Things launched from earth are subject to, and acquire, some of the original motions of their launch site. Those motions are the rotation and the revolution motions of earth. The interchanges between bodies such as light/appearance, and gravity also must be somewhat curved. The curvature of light is sometimes referred to as aberration. That is where the direction from which images arrive is offset by motion of the observer. To consider the motion of the source, my 'pushing' gravity particles called Paeps penetrate a body such as the sun and leave the other side acquiring an angular component of motion due to the rotation of the sun. They don't go straight up. At an orbital, such as the planet earth, there is then an excess of paeps to the right of the planet pushing it counterclockwise in its orbit and also causing its rotation.

d) Motion geometry

Rotation and revolution are interchangeable in any two body system where you exclude external considerations. Consider 2 equal sized bodies, call them stars. For them to coexist near each other they must be moving or revolving relative to each other. The bodies orbit each other. The speed of revolution is necessarily constant, so an outside observer sees their joint orbiting as having a continuous velocity. As we expand this view we see many interacting sources in galaxies. Note that the center of revolution, called the barycenter, is between not inside the two bodies participating in mutual revolutions.

Consider next 3 equal sized bodies along a line with 1 and 3 equidistant from 2. So, 1 and 2 would try to orbit each other and while 1 would pretty much succeed, 2 would be affected by the outside influence of 3. Similarly 2 and 3 try to orbit each other, and while number 3 pretty much succeeds, 2 is interfered with by 1. Essentially 1 and 3 motivate 2 to orbit in exactly opposite directions. So, 2 becomes stationary while 1 and 3 revolve around it. The lesser influence of 1 and 3 on each other additionally motivates them to revolve around each other essentially increasing the velocity of their joint revolutions around 2. Bodies cause both revolution and rotation in others via pushing gravitation. Body 2 gains rotation and now spins at twice speed of the other two bodies. The rotation increases the mass by increasing the density for body 2. Conveniently, body 2 acts a bit like a central body. The appearance of this system to an outside observer like the 2 body system above except the barycenter now has mass.

The galaxy revolution picture is more like the sun, earth, moon system where we recognize significant mutual gravitation, than it is like the overall solar system where one central body causes the gravitating.

For relating to a four equal sized bodies system, interactions get much more complex. With 2 bodies there was 1 interaction. With 3 bodies there are 3 interactions. With 4 bodies there are 6 interactions. For analysis, place the 4 bodies along a line at distance marks 1,2,3, and 4 with 1 at the top end of the line. Consider their line to suggest 2 clocks, where 1 is 12 o'clock and 2 is 6 o'clock on clock 1, while 3 is 12 o'clock and 4 is 6 o'clock on clock 2. Then 1 is being pushed left by 2 while 4 is pushed right by 3. When 1 reaches 11 o'clock, 4 reaches 5 o'clock on his clock. Because 2 and 3 influence each other, while being influenced by their clock mates, they move less on their clock. Now 2 might be at 5:50 while 3 is at 11:50. The lesser revolution of 2 and 3 relative to each other might cause gravity to pull them together a bit. Pushing gravity stabilizes systems containing multiple bodies. If

we allow random collapses, the galaxy would never have existed in the first place.

Following the revolutions onward, I suggest next time locations might be 10 o'clock, 5:30, 11:30, and 4 o'clock. Then come 9, 5, 11, and 3 o'clock. Given approximately another time period and the 4 spheres now serve as the corners of a rectangle. Note, there is always an equal balance relative to the original barycenter point. However upon assigning one of the stars as a center, the system revolves counterclockwise relative to it. Also the system shows a relatively consistent velocity along it's circumference to outside observers.

The 5 body system has 10 interactions. Much net attraction between each suggests cluster formation. Any odd number linear system has a central body around which all other bodies rotate. The 6 body system has 15 interactions and more complications. In the solar system, planets essentially do not coincidentally orbit each other, unlike stars in galaxies. The concern that stars far from the center of galaxies have much higher velocities than predicted, indicates current theory assumes the center provides the velocity source and ignores the velocity sources spread across the galaxy. As we add more bodies, the back and forth motions are less distinguishable than is the overall forward orbiting of all the bodies around the center. This forward motion helps picture the creation of galaxy arms.

Galaxial Arms

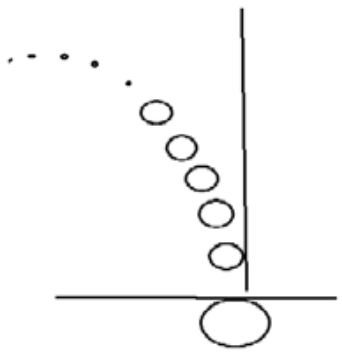

Figure 3

If all bodies are the same, every body/star over the long term achieves the same 'average' distance from the galaxy center. Most will move in and out and back and forth in sub-orbits, but their average distance will be the same. Thus over the long term they will all take the same average time to orbit the center. Kepler's law, where velocity depends on distance, suggests that objects at the same 'average' distance take the same average time to orbit. The time for revolving around the galaxy center must account for the sub-orbiting. The average orbit time for all Milky Way galaxy stars may take many cycles for all revolutions to equal out. Our sun is orbiting around other star groups within the galaxy besides the center itself.

e) Spiral arms, domes and other features of galaxies

As you keep adding bodies, you can choose to view any one as a center. In reality they are all orbital centers while all orbiting the galaxy center. Given 100 bodies in line on the north and on the south of center, something like body 7 from center on the north line has a line of bodies both to the north and to the south that wish to orbit it and also wish to push it into orbit. The north line bodies push body 7 to an outside observer's right, the southern line bodies push it left. The difference is that there are more total bodies to the south so they will win in the long term. They will force body 7 to revolve counterclockwise around center. By comparison, they will force body 14 north to revolve even faster because of the greater south vs north imbalance it experiences. Likewise body 1 north will revolve slower than any other northern body.

The actual rotation of the line depends on the separation of the bodies along the line. With bodies equally spaced, the farther from center the body, the more its proper motion will exceed the inner bodies. The greater proper motion causes more bending so galaxies form arms.

Consider a body # 0 as center. Then consider a Y axis line of many stars numbered 1 - 100 equally spaced north of center. Say the innermost star in a line is gravitationally caused to rotate 1 degree counterclockwise relative to the Y axis. There is a sequence of counterclockwise forces by it and by each star further out upon the next star in line. In that single time period further out stars are multi-shifted causing higher angular motions. That creates the arm in this single shift. The further out the star the faster it moves to its new position relative to the original line. Each star orbits its predecessor so all move/orbit at the same speed and the same 1 degree of angular shift relative to their prior star.

As we continue out the line of bodies, the degree of angular offset increases and may reach 90 degrees. Those star's motions have become perpendicular to the original line. They suggest the spiral arm of the galaxy. Note that the arm extends leftward in a direction that appears to an outside observer as the direction opposite presumed the galaxy rotation. This motion occurs naturally from the counterclockwise pushing of all gravitating bodies within the system.

The reorientations relative to the line discussed thus far occur within a single time unit. Additional time units lead to higher angles of the revolutions relative to the original line. A star may cycle back and cross between the two stars prior in the line or perhaps the

whole line spiral in on itself like octopus arms. If star 100 wraps back around and cross between stars 99 and 98, then each will intersect its next lower body in a cascading effect. Extend the revolution sequence so the outer arm stars motion perpendicular to the Y axis give or take. As stars continue to revolve beyond that perpendicular direction, they start heading more toward the galaxy center. Do they continue their orbit of their adjacent star, or is the galaxy center gravity strong enough to pull them downward and gradually roll up the whole arm? Or do the stars from the arm end begin to slide back along the under side of the arm more like a chain saw blade?

Do orbiting stars complete orbits around their original partners or are they passed along. Stars get to the underside of an arm either by sliding back down or via some giant midway orbit. Either our sun is part of the upper line extending and growing outward or it is part of the series of stars sliding back toward center, being forced there by the upper arm stars. Sol is core side (underneath) on its spiral arm - Orion. Per my geometry, that means sol should perform in one of two ways. It is core side because 1. It is orbiting something central on the arm so that its local orbital radius is the distance to the arm center, or 2. Sol is rolling back toward the galaxy center underneath its arm. In either case we are orbiting backward relative to the rest of the arm. Questionable theory says we are currently orbiting the galaxy center clockwise at 226 million years per revolution. Thus most of the rest of the outer galaxy orbits slower or oppositely - counterclockwise. My construction suggests a counterclockwise motion. Only a base picture of most all local motions can yield an overall motion. How do we define a stationary, non rotating observer who can make these judgments?

Given its rapid relative motions, is Barnard's star one that is wrapping back downward? To successfully pursue analysis of motions requires data, sort of like what Tycho Brahe provided for Kepler. A lot of data has been collected by a Danish study.

f) Proximity – system stability concerns

Stars balance their local environment by both 'attracting' nearby bodies and guiding them into orbital motions. Otherwise, with all the stars in the galaxy 'gravitationally pulling' on each other, some would ultimately collide. We could try saying the original speeds, distances, and sizes are just right to prohibit collapse. But there is more to it.

Gravity tidal ripples form in the gravitation field between two stars. The ripples interfere with the passage of star X between them. That star is forced to, travel above or below the tidal action, bringing the 3rd dimension into consideration for the motions within the galaxy.

Gravitation revolution support is greatest along the extension of the central body's equator and is less as the latitude angle increases. So star X drifts up or down when passing between and it does so sufficiently to decrease the attraction effects of each. Its orbit around either body is therefore inclined. This reveals that galaxial orbitals must follow paths inclined relative to the galaxial plane during their orbit. Similar reasoning extends to moons crossing equatorial planes.

Galaxies are sometimes described as domed pinwheels. Essentially the inclinations must increase as bodies are closer in to the galaxy center. The higher the orbit latitude relative to the center body, the less net gravitational push is applied to it. Bodies in inclined orbits experience less of the central spin due to latitude. In a galaxy stars, ever closer to the central body, must travel in planes increasing in latitude relative to the center. As more and more bodies are visualized near the center of the galaxy, there is increasing inclination to the orbits to avoid the tidal action of many bodies passing through the region, and to minimize the pull of the center. The closer in toward the center the body is, the greater the angle of inclination that is required. There becomes a 3rd dimensional build up called a dome around the center, and to a lesser extent near other suborbital centers within the galaxy.

For another perspective about the necessity of domes, picture a line of stars from the center. Angle the line above or below the galactic plane. The length of the line must be shorter. The length of the line is dependent upon the angle of inclination because the central body provides less revolution support as the latitude angle increases. Also less spin is applied to revolve the orbitals.

Regarding potential system collapse, gravitation as the medium provides the potential of system self adjustment to compensate for local disturbing events. There must be attraction variations due to the role spin plays in determining density and therefore in determining mass. Expected circular orbits within systems are affected by pulling of a nearby system which causes the internal orbits to become oblong/elliptical, rather than circular. Such interaction mathematically defines the second focus of an ellipse as being a virtual center. Then the reason the orbital motion is slower in the vicinity of the second focus is that its source provides 'attraction' but none of the orbital push that the central body does.

The sun's rotation also provides more gravitational support to orbitals along its equator than it does in other directions. The greater the latitude, the less the revolution support. Solar system orbits can be inclined and may be elliptical rather than circular. We may fully understand both solar system planetary inclinations and their elliptical second (virtual) focus if we can determine the location and motion of secondary centers of gravitation outside our solar system.

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Physico-Chemical Studies on Polyvinyl Alcohol in Aqueous Media

By Richa Saxena & S C Bhatt
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Abstract- Density, viscosity and speed of sound of aqueous solution of polyvinyl alcohol of different concentration range from 0.3% to 1% have been measured using ultrasonic interferometer at 1MHz frequency in temperature range 30^0C-65^0C. Using these values different acoustical parameters like adiabatic compressibility, acoustic impedance and have been calculated.

Keywords: *ultrasonic velocity, adiabatic compressibility, acoustic impedance.*

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Physico-Chemical Studies on Polyvinyl Alcohol in Aqueous Media

Richa Saxena [α] & S C Bhatt [σ]

Abstract- **Density, viscosity and speed of sound of aqueous solution of polyvinyl alcohol of different concentration range from 0.3% to 1% have been measured using ultrasonic interferometer at 1MHz frequency in temperature range 30^{0}C-65^{0}C. Using these values different acoustical parameters like adiabatic compressibility, acoustic impedance and have been calculated.**

Keywords: ultrasonic velocity, adiabatic compressibility, acoustic impedance.

I. Introduction

The study of thermodynamic properties of binary mixtures contributes to an understanding of behavior of different liquids and their functional group[1-6].This information is very useful in the design of industrial processes and development of theories for the liquid state and predictive methods. Further, the study of excess thermodynamic properties of liquid mixtures is a subject of great interest because it gives information about molecular interactions and packing phenomenon or structural contributions. Polyviylalcohol is one of the simplest of the synthetic water soluble polymers[7]. They also provide substantial information on the processes involving polymer production and their uses[8,9]. Polyvinylalcohol is interesting from several aspects. It is one of the simplest of the synthetic water soluble polymers. Commercially polyvinylalcohol, is synthesized by hydrolysis of polyvinyl acetate, since the hydrolysis is difficult to take to completion a number of partially hydrolysed polymers containing residual acetate groups carry the name of PVA[7, 10, 11].

The speed of sound, intermolecular free length and relaxation time are the properties sensitive to different kinds of association in the pure components and mixtures and often they are related to local order. They have been used to investigate the molecular packing, molecular motion and various types of intermolecular interactions and their strength and chemical nature of components molecules[12].

II. Experimental Details

In the present investigation polyvinyl alcohol in solid form of molecular weight approximately 140,000 is used. The solutions were prepared by adding known volume of polyvinyl alcohol to fixed volume of water and stirring under reflex, until a clear solution was obtained. The concentration range studied in the solution is 0.3%-1.0% (v/v). Different acoustical parameters like, intermolecular free length and relaxation time were calculated at different concentration like 1.0%, 0.8%, 0.6%, 0.5%, 0.4% and 0.3% and at different temperatures 30°, 35°, 40°, 45°, 50°, 55°, 60° and 65°C at 1MHz frequency by using variable path ultrasonic interferometer with reproducibility of ±0.4m/s at 25^{0}C. The temperature of the solution has been kept constant by circulating water from the thermostatically controlled (±0.1^{0}C) water bath. The densities at different temperatures were measured using 10ml specific gravity bottle and single pan macro balance. The uncertainty in density measurements was found to be about 0.5kg/m^3. The viscosity of the mixtures was determined by using Ostwald's viscometer, which was kept inside a double-walled –jacket, in which water from thermostat water bath was circulated. The inner cylinder of this double-wall-glass jacket was filled with water of desired temperature so as to establish and maintain the thermal equilibrium. The accuracy in the viscosity measurements is within ±0.5%. These parameters are calculated by using standard relations[13-17].

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Table 1: Density(x10^{3}kg/m^3) of polyvinyl alcohol (PVA) at different temperature and concentration at 1 MHz frequency

Temperature Concentration(v/v)	30	35	40	45	50	55	60	65
1.0%	1.020	0.996	0.992	0.988	0.983	0.979	0.974	0.968
0.8%	0.985	0.983	0.981	0.979	0.977	0.972	0.964	0.956
0.6%	0.981	0.978	0.974	0.972	0.968	0.96	0.954	0.948
0.5%	0.978	0.975	0.971	0.968	0.963	0.958	0.946	0.937
0.4%	0.976	0.973	0.969	0.965	0.955	0.950	0.939	0.934
0.3%	0.974	0.970	0.967	0.962	0.951	0.944	0.931	0.926

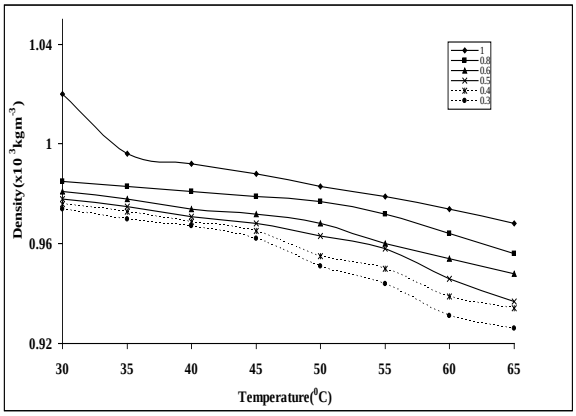

Fig. 1: Variation of density with temperature at different concentration of PVA

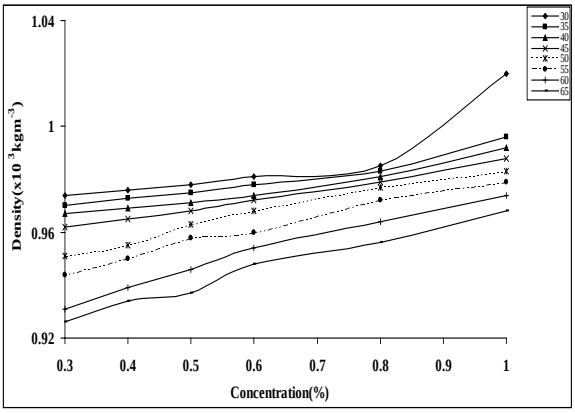

Fig. 2: Variation of density with concentration with at different temperature of PVA

Table 2: Viscosity (x10^{-1}Pa.s) of polyvinyl alcohol (PVA) at different temperatur and concentration at 1 MHz frequency

Temperature Concentration	35	35	40	45	50	55	60	65
1.0 %	0.092	0.089	0.087	0.085	0.082	0.079	0.062	0.058
0.8 %	0.09	0.086	0.084	0.081	0.0781	0.069	0.059	0.056
0.6 %	0.089	0.077	0.067	0.061	0.056	0.052	0.044	0.041
0.5 %	0.087	0.074	0.065	0.059	0.054	0.047	0.042	0.038
0.4 %	0.083	0.073	0.064	0.057	0.051	0.043	0.38	0.035
0.3 %	0.078	0.072	0.060	0.054	0.048	0.042	0.033	0.031

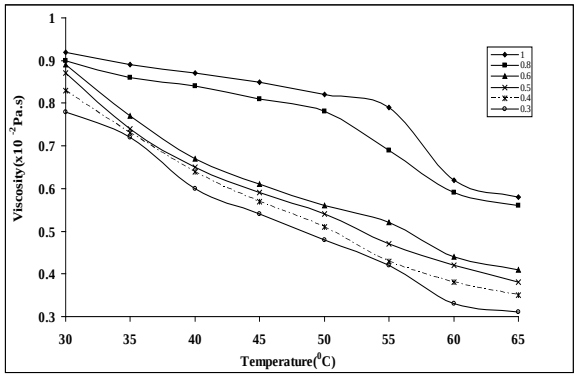

Fig. 3: Variation of viscosity with temperature at different concentration of PVA

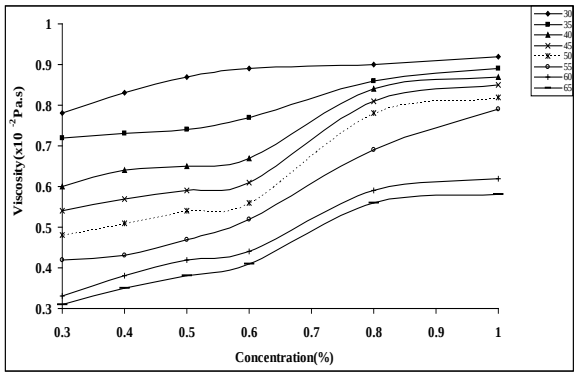

Fig. 4: Variation of viscosity with concentration at different temperature of PVA

Table 3: Ultrasonic velocity (m/s) of polyvinyl alcohol (PVA) at different temperature and concentration at 1 MHz frequency

Temperature Concentration (v/v)	30˚C	35˚C	40˚C	45˚C	50˚C	55˚C	60˚C	65˚C
1.0%	1512.2	1509.9	1504.2	1501	1495.6	1482.5	1476.5	1472.3
0.8%	1507.6	1503.2	1500.1	1498.8	1488.7	1473.4	1470.6	1467.7
0.6%	1505.1	1501.3	1497.5	1484.4	1472.7	1468.3	1463.6	1461.8
0.5%	1502.4	1495.9	1482.3	1476.7	1468.9	1466.8	1462.7	1460.9
0.4%	1496.5	1483.8	1480.8	1473.5	1466.7	1464.6	1460.3	1458.9
0.3%	1493.7	1482.5	1478.4	1472.3	1462.6	1459.0	1456.2	1454.8

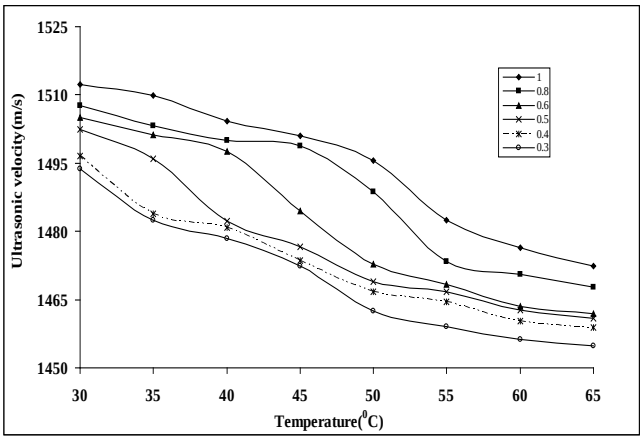

Fig. 5: Variation of ultrasonic velocity with temperature at different concentration of PVA

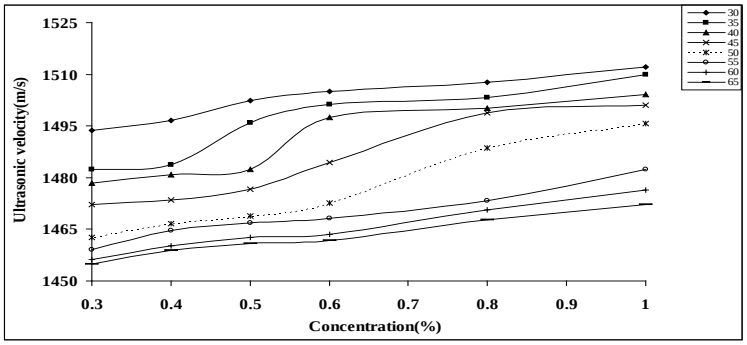

Fig. 6: Variation of ultrasonic velocity with concentration at different temperature of PVA

Table 4: Adiabatic compressibility($x10^{-10}kg^{-1}ms^2$) at different temperature and concentration at 1MHz for polyvinyl alcohol (PVA)

Temperature Concentration(v/v)	30˚C	35˚C	40˚C	45˚C	50˚C	55˚C	60˚C	65˚C
1.0%	4.287	4.404	4.455	4.492	4.548	4.648	4.709	4.766
0.8%	4.467	4.502	4.53	4.547	4.618	4.739	4.747	4.856
0.6%	4.5	4.537	4.578	4.669	4.763	4.832	4.893	4.936
0.5%	4.53	4.583	4.687	4.737	4.813	4.852	4.934	4.994
0.4%	4.575	4.668	4.765	4.773	4.868	4.907	4.994	5.03
0.3%	4.602	4.691	4.766	4.795	4.916	4.976	5.065	5.102

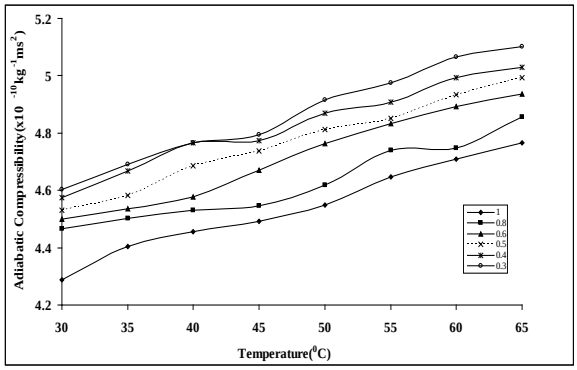

Fig. 4.13: Variation of adiabatic compressibility with temperature at different concentration of PVA

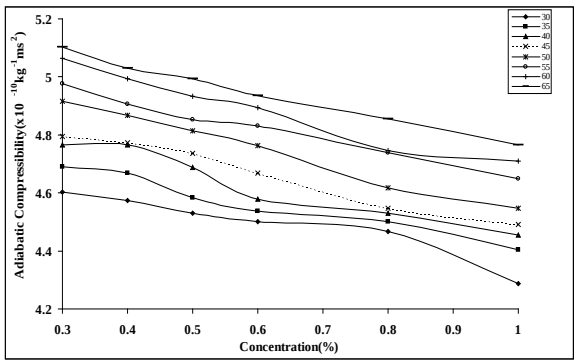

Fig. 4.14: Variation of adiabatic compressibility with concentration at different temperature of PVA

Table 5: Acoustic impedance ($x10^3 kgm^2s^{-1}$) at different temperature and concentration at 1MHz for polyvinyl alcohol (PVA)

Temperature Concentration(v/v)	30˚C	35˚C	40˚C	45˚C	50˚C	55˚C	60˚C	65˚C
1.0%	1542.4	1503.9	1492.2	1483	1470.2	1451.4	1438.1	1425.2
0.8%	1485	1477.6	1471.6	1467.3	1454.5	1432.1	1417.7	1403.1
0.6%	1476.5	1468.3	1458.6	1442.8	1425.6	1409.6	1396.3	1385.8
0.5%	1469.4	1458.5	1439.3	1436.5	1414.6	1405.2	1384.7	1369.8
0.4%	1460.6	1443.7	1436.1	1421.9	1400.7	1391.4	1371.2	1362.6
0.3%	1454.9	1438	1429.6	1416.4	1390.9	1377.3	1355.7	1347.1

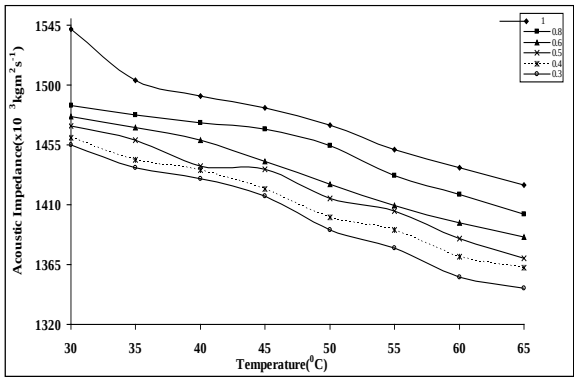

Fig. 4.15: Variation of acoustic impedance with temperature at different concentration of PVA

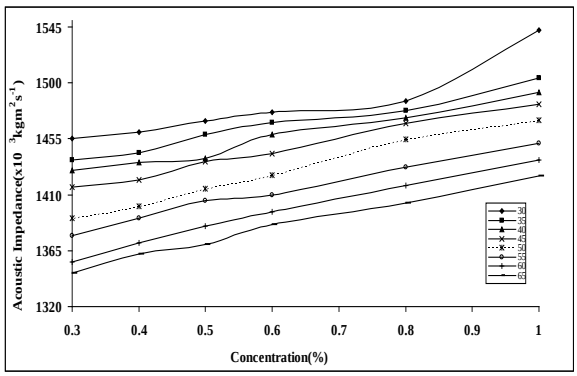

Fig. 4.16: Variation of acoustic impedance with concentration at different temperature of PVA

III. Result and Discussion

In the present work density, viscosity and ultrasonic velocity have been measured at different temperature and concentration of polyvinylalcohol, which is shown in Table-1, 2, and 3 respectively. By using these values for PVA, intermolecular free length and relaxation time have been calculated by using well known relations and the results have been presented in Table-4 and 5, respectively. The variations of these parameters with temperature and concentration have been shown in Fig.1-Fig.6 respectively.

Polyvinyl alcohol in solid form of molecular weight 140,000. Solution were prepared by adding known weight of polyvinyl alcohol of molecular weight approximately 140,000 to fixed volume of water and stirring under reflex, until a clear solution was obtained. Table-1 and Fig.1& 2 represent the variation of density with temperature and concentration respectively. Density decreases with increase in temperature and increases with increase in concentration. These are in agreement with earlier workers[18]. It may be due to electro striction in that solution. This electro striction decreases the volume and hence increases the density

as a number of solute molecules increase the electro striction and density. It is evident from Table-2 and Fig.3 & 4 that, viscosity decreases with increase in temperature and increases with increase in concentration of PVA. This is showing similar trend as reported by earlier workers[19]. The variations of ultrasonic velocity with temperature and concentration have been shown in Table-3 and Fig. 5 & 6. Ultrasonic velocity decreases with increase in temperature and increases with increase in concentration of PVA. This indicates interactions between PVA and solvent molecules. The results are in good agreement with earlier workers[20.] Table 4.5 and Fig. 4.13 reports the variation of adiabatic compressibility with temperature. It is clearly seen that adiabatic compressibility increases with temperature. Variation of adiabatic compressibility with concentration is shown in Table 4.5 and Fig. 4.14. It is evident that adiabatic compressibility decreases with increase in concentration of polyvinyl alcohol in solution. Similar results are reported by other workers[21]. This decrease in adiabatic compressibility indicates the enhancement of the bond strength at this concentration. Variation of acoustic impedance with temperature is shown in Table 4.6 and Fig. 4.15. It is observed that it decreases with increase in temperature. Table 4.6 and Fig. 4.16 depict the variation of acoustic impedance with concentration. It is seen that it increases with increase in concentration of polyvinyl alcohol in the solution. This is in agreement with the requirement as both ultrasonic velocity and density increase with increase in concentration of the solute and also effective due to solute-solvent interactions. These results are in agreement with earlier workers[22].

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Bounce Behavior of Kantowski-Sach Cosmological Model in General Relativity

By H. R. Ghate & Yogendra D. Patil
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Abstract- Kantowski-Sach cosmological model has obtained in the general theory of relativity. The source for energy-momentum tensor is assumed a perfect fluid. The field equations have solved by using special form of the average scale factor $R(t)=\left((t-t_0)^2+\frac{t_0}{1-\beta}\right)^{\frac{1}{1-\beta}}$ proposed by Cai et al. The physical properties and the bouncing behavior of the model are also discussed.

Keywords: *kantowski-sach space-time, bouncing universe.*

GJSFR-A Classification: *FOR Code: 020103*

Strictly as per the compliance and regulations of:

Bounce Behavior of Kantowski-Sach Cosmological Model in General Relativity

H. R. Ghate [α] & Yogendra D. Patil [σ]

Abstract- Kantowski-Sach cosmological model has obtained in the general theory of relativity. The source for energy-momentum tensor is assumed a perfect fluid. The field equations have solved by using special form of the average scale factor $R(t)=\left((t-t_0)^2+\frac{t_0}{1-\beta}\right)^{\frac{1}{1-\beta}}$ proposed by Cai et al. The physical properties and the bouncing behavior of the model are also discussed.

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I. Introduction

Astronomical observational data obtained from high *red shift* surveys of Supernovae (SnIa) by Riess et al. [1], Perlmutter et al. [2] and Bennett et al. [3] indicated that our universe is expanding with acceleration. Also, observations such as Cosmic Microwave Background Radiations [4] and Large-scale structure [5] provide indirect evidence for the late time accelerated expansion of the universe. The accelerating expansion of the universe is driven by a mysterious component with high negative pressure known as dark energy (DE). In spite of all these attempts, DE is still the open question to the theoretical physicists because its nature is unknown. According to the astronomical observations, the DE currently accounts for about 73% of the total mass/energy of the universe and only 27% of a combination of dark matter and baryonic matter [6]. The DE universe may have very interesting implications for the future [7,8]. A different way of accounting for the DE without any extra components is the modification of gravity [9,10].

The idea that instead of originating from a Big Bang singularity, the universe has emerged from a cosmological bounce has a long history [11]. Novello et al. [12,13] realized that a bouncing cosmology with a matter-dominated phase of contraction during which scales which are probed today, a cosmological observations exit a Hubble radius can provide an alternative to the current inflationary universe paradigm of cosmological structure formation. According to Cai et al. [10], the solution of the singularity problem of the standard Big Bang cosmology is known as bouncing universe. A bouncing universe with an initial contraction to a non-vanishing minimal radius and then subsequent an expanding phase provides a possible solution to the singularity problem of the standard Big Bang cosmology. Moreover, for the universe entering into the hot Big Bang era after the bouncing, the equation of state (EoS) of the matter content ω in the universe must transit from $\omega<-1$ to $\omega>-1$. In the contracting phase, the scale factor $R(t)$ is decreasing, this means $\dot{R}(t)<0$ and in the expanding universe, scale factor $\dot{R}(t)>0$. Finally at the bouncing point, $\dot{R}(t)=0$ and near this point $\ddot{R}(t)>0$, for a period of time. It is also discussed with other view that in the bouncing cosmology, the Hubble parameter H passes across zero $(H=0)$ from $H<0$ to $H>0$. Cai et al. have investigated bouncing universe with quintom matter. He showed that a bouncing universe has an initial narrow state by a minimal radius and then develops to an expanding phase. This means for the universe arriving to the Big-Bang era after the bouncing, the EoS parameter should crossing from $\omega<-1$ to $\omega>-1$. Sadatian [14] have studied rip singularity scenario and bouncing universe in a Chaplygin gas dark energy model. Recently, Bamba et al. [15] have investigated bounce cosmology from $f(R)$ gravity and $f(R)$ bi-gravity. Astashenok [16] has studied effective energy models and dark energy models with bounce in frames of $f(T)$ gravity. Solomans et al. [17] have investigated bounce behavior in Kantowski-Sach and Bianchi cosmology. Silva et al. [18] have studied bouncing solutions in Rastall's theory with a barotropic fluid. Brevik and Timoshkin [19] have obtained inhomogeneous dark fluid matter leading to a bounce cosmology. Singh et al. [20] have studied k-essence cosmologies in Kantowski-Sach cosmological Sachs and Bianchi space-times.

In this paper, Bouncing behavior of Kantowski-Sachs cosmological model has been obtained in the general theory of relativity. This work is organized as follows: In section 2, the metric and field equations have presented. The field equations have solved in section 3 by using the physical condition that the expansion scalar θ is proportional to shear scalar σ and the special form of average scale factor $R(t)=\left[(t-t_0)^2+\frac{t_0}{1-\beta}\right]^{\frac{1}{1-\beta}}$ proposed by Cai *et al.* [10]. The physical and geometrical behavior of the model have been discussed

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in section 4. In the last section 5, concluding remarks have been expressed.

II. Metric and Field Equations

Kantowski-Sachs metric is considered in the form

$$ds^2 = dt^2 - a^2 dr^2 - b^2\left(d\theta^2 + \sin^2\theta d\psi^{2)}\right), \quad (1)$$

where $A(t)$ and $B(t)$ are functions of cosmic time t.

The energy-momentum tensor when the source for energy is assumed a perfect fluid given by

$$T_i^j = (\rho + p)u_i u^j - pg_i^j, \quad (2)$$

where u^i is the flow of vector satisfying $g_{ij}u^i u^j = 1$. Here ρ is the total energy density of perfect fluid and p is the corresponding pressure. For the perfect fluid, p and ρ are related by and equation of state

$$p = \omega\rho, \ 0 \le \omega \le 1. \quad (3)$$

In co-moving system of co-ordinates, using equation (2), one can find

$$T_0^0 = \rho \text{ and } T_1^1 = T_2^2 = T_3^3 = -p. \quad (4)$$

The Einstein's field equations are given by

$$R_i^j - \frac{1}{2}g_i^j R = -T_i^j, \quad (5)$$

where R_i^j is a Ricci tensor, R is the Ricci scalar.

Using equation (2), for the metric (1), the field equations are given by

$$2\frac{\dot{a}\dot{b}}{ab} + \frac{\dot{b}^2}{b^2} + \frac{1}{b^2} = \rho \quad (6)$$

$$2\frac{\ddot{b}}{b} + \frac{\dot{b}^2}{b^2} + \frac{1}{b^2} = -\omega\rho \quad (7)$$

$$\frac{\ddot{a}}{a} + \frac{\ddot{b}}{b} + \frac{\dot{a}\dot{b}}{ab} = -\omega\rho, \quad (8)$$

where an overhead dot $\left(\dot{}\right)$ denotes differentiation with respect to t.

The average scale factor R and volume scalar V are given by

$$R^3 = V = ab^2. \quad (9)$$

The generalized mean Hubble's parameter H is defined by

$$H = \frac{\dot{R}}{R} = \frac{1}{3}\left(H_r + H_\theta + H_\psi\right), \quad (10)$$

where the directional Hubble parameters H_r, H_θ and H_ψ are given by

$$H_r = \frac{\dot{a}}{a}, \ H_\psi = H_\theta = \frac{\dot{b}}{b}, \quad (11)$$

The expansion scalar θ and shear scalar σ are given by

$$\theta = 3H = \left(\frac{\dot{a}}{a} + 2\frac{\dot{b}}{b}\right), \quad (12)$$

$$\sigma^2 = \frac{1}{2}\left[\sum_{i=1}^{n} H_i^2 - 3H^2\right]. \quad (13)$$

The deceleration parameter (DP) q is defined by

$$q = -1 + \frac{d}{dt}\left(\frac{1}{H}\right).$$

III. The Solution of Field Equations

The field equations (6) to (8) are a system of three highly non-linear differential equations in four unknowns A, B, ρ and ω. The system is thus initially undetermined. We need one extra physical condition to solve the field equations completely.

We assume that the expansion scalar (θ) is proportional to the shear scalar (σ). This condition leads to

$$\frac{1}{\sqrt{3}}\left(\frac{\dot{a}}{a} + \frac{\dot{b}}{b}\right) = \alpha_0\left(\frac{\dot{a}}{a} + 2\frac{\dot{b}}{b}\right).$$

which yields

$$\frac{\dot{a}}{a} = m\frac{\dot{b}}{b}$$

where α_0 and m are constants.

Above equation, on integration, reduces to

$$a = \eta(\mathrm{b})^m,$$

where η is an integration constant.

Here, for simplicity and without loss of generality, we assume that $\eta = 1$.

Hence, we have

$$a = (\mathrm{b})^m, \ (m \neq 1). \quad (15)$$

Collins et al. [21] have pointed out that for spatially homogeneous metric, the normal congruence

to the homogeneous expansion satisfies that the condition $\frac{\sigma}{\theta}$ is constant.

In cosmology, the constant deceleration parameter is commonly used by several researchers [22-26], as it duly gives a power law for metric function or corresponding quantity.

The motivation to choose time-dependent deceleration parameter (DP) is behind the fact that the expansion of the universe was decelerating in the past and accelerating at present as observed by recent observations of Type Ia Supernova [1,2, 27-29] and CMB anisotropies [3,31]. Also, the transition redshift from deceleration expansion to accelerated expansion is about 0.5. Now for a Universe which was decelerating in past and accelerating at the present time, the DP must show signature flipping [31-33]. So, in general, the DP is not a constant but time variable. The motivation to choose the following scale factor is that it provides a time-dependent DP.

Under above motivations, we use a special form of deceleration parameter as

$$q = -\frac{R\ddot{R}}{R^2} = -1 + \frac{d}{dt}\left(\frac{1}{H}\right) = -1 + \frac{1}{2}\left[(1-\beta) - \frac{t_0}{(t-t_0)^2}\right], \beta < 1 \quad (16)$$

where R is average scale factor of the universe.

This form is proposed by Cai *et al.* [10] and then modified by Sadatian [11].

After integration of (16), we obtain the Hubble parameter as

$$H = \frac{\dot{R}}{R} = \frac{2(t-t_0)}{(1-\beta)(t-t_0)^2 + t_0}.$$

Again integrating, the average scale factor which is time dependent given by

$$R(t) = \left[(t-t_0)^2 + \frac{t_0}{1-\beta}\right]^{\frac{1}{1-\beta}}, \quad (17)$$

where t_0 is initial time and $\beta < 1$ is constant.

Solving the equations $a = b^m$ and $R(t) = (ab^2)^{\frac{1}{3}}$ and using (17), we get

$$a = \left[(t-t_0)^2 + \frac{t_0}{1-\beta}\right]^{\frac{3m}{(1-\beta)(m+2)}} \quad (18)$$

With the help of equation (17), equation (15) takes the form

$$b = \left[(t-t_0)^2 + \frac{t_0}{1-\beta}\right]^{\frac{3}{(1-\beta)(m+2)}}. \quad (19)$$

Using above two equations (18) and (19), the metric (1) takes the form

$$ds^2 = dt^2 - \left[(t-t_0)^2 + \frac{t_0}{1-\beta}\right]^{\frac{6m}{(1-\beta)(m+2)}} dr^2 - \left[(t-t_0)^2 + \frac{t_0}{1-\beta}\right]^{\frac{6}{(1-\beta)(m+2)}} \left(d\theta^2 + \sin^2\theta d\psi^2\right). \quad (20)$$

Equation (20) represents Kantowski-Sachs cosmological model with time-dependent scale factor.

IV. Physical Properties of the Model

The physical quantities such as special volume V, Hubble parameter H, expansion scalar θ, mean anisotropy A_m, shear scalar σ^2, energy density ρ, equation of state parameter ω are obtained as follows :
The average scale factor is

$$R(t) = \left[(t-t_0)^2 + \frac{t_0}{1-\beta}\right]^{\frac{1}{1-\beta}}.$$

From fig. 4.1 (a), in the earlier stage, the scale factor is strictly decreasing $(\dot{R}(t) < 0)$ and in the expanding phase the scale factor increases rapidly $(\dot{R}(t) > 0)$. Hence our model is bouncing at $t = t_0$ $(\dot{R}(t) = 0)$.

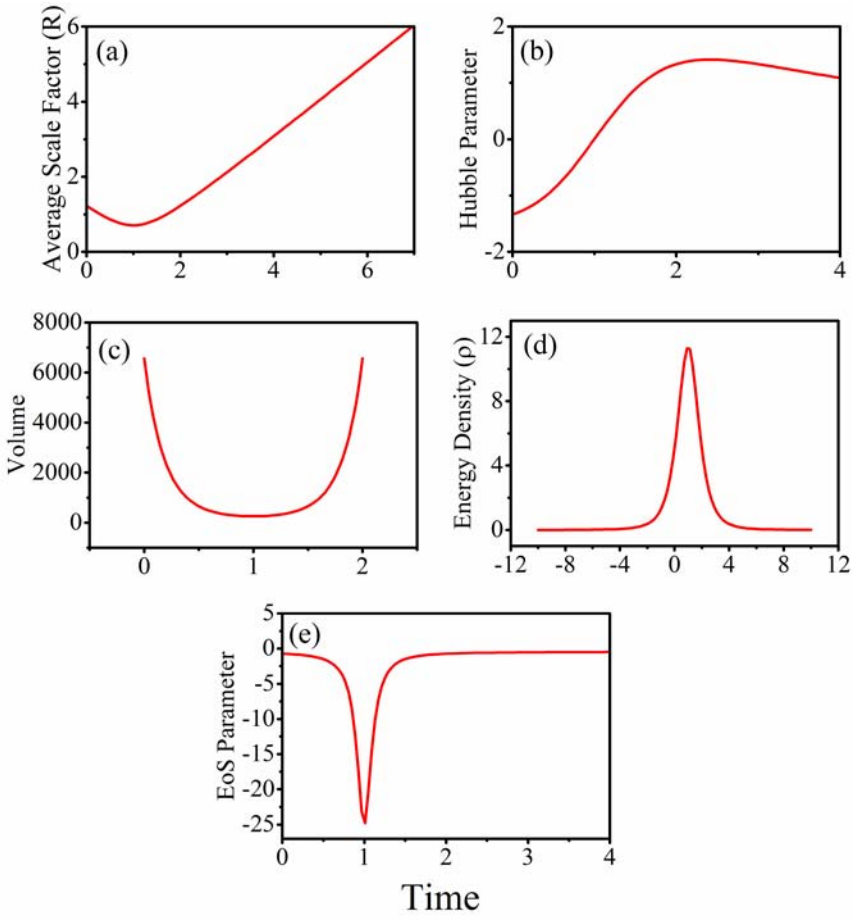

Fig. 4.1: Plots of time versus (a) Average scale factor (b) Hubble parameter (c) Spatial Volume (d) Energy density (e) EoS parameter for the values $\beta = 0.5$, $t_0 = 1$

The spatial volume is in the form

$$V = R^3 = \left[(t-t_0)^2 + \frac{t_0}{1-\beta}\right]^{\frac{3}{1-\beta}}. \qquad (21)$$

The spatial volume is finite at time $t = 0$ and increases with increasing value of time hence the model starts expanding with finite volume.

The Hubble parameter is given by

$$H = \frac{2(t-t_0)}{(1-\beta)}\left[(t-t_0)^2 + \frac{t_0}{(1-\beta)}\right]^{-1}. \qquad (22)$$

From fig. 4.1 (b) the Hubble parameter $H < 0$ for $t < 1$ and $H > 0$ for $t > 1$ indicating that H passes across zero $(H = 0)$ at $t = 1$, which represents that the universe is bouncing at $t = 1$.

The expansion scalar is

$$\theta = 3H = \frac{32(t-t_0)}{(1-\beta)(t-t_0)^2 + \frac{t_0}{1-\beta}}. \qquad (23)$$

The mean anisotropy parameter is

$$Am = 2\frac{(m-1)^2}{(m+2)^2} = cons\tan t(\neq 0, form \neq 1). \qquad (24)$$

The shear scalar is

$$\sigma^2 = 12\frac{(m-1)^2(t-t_0)^2}{(m+2)^2(1-\beta)^2}\left[(t-t_0)^2 + \frac{t_0}{(1-\beta)}\right]^{-2}. \qquad (25)$$

We observe that

$$\lim_{t\to\infty}\frac{\sigma^2}{\theta^2} = \frac{(m-1)^2}{3(m+2)^2} \ (\neq 0 \text{ , for } m \neq 1). \qquad (26)$$

The mean anisotropy parameter A_m is constant and $\lim_{t\to\infty}\frac{\sigma^2}{\theta^2} \neq 0$ is also constant. Hence the model is anisotropic throughout the evolution of the universe except at $m = 1$ i.e the model does not approach isotropy.

The matter energy density is given by

$$\rho = \frac{36(2m+1)(t-t_0)^2}{(1-\beta)^2(m+2)^2}\left[(t-t_0)^2+\frac{t_0}{1-\beta}\right]^{-2}+\left[(t-t_0)^2+\frac{t_0}{1-\beta}\right]^{\frac{-6}{(1-\beta)(m+2)}} \tag{27}$$

From fig. 4.1(d), the energy density decreases at the early stage of evolution when $t<1$ and goes into the hot Big Bang era. The model bounces at $t=1$ and after bouncing the energy density rapidly increases for $t>1$.

The equation of state (EoS) parameter ω is given by

$$\omega = -\left\{\begin{array}{l}\frac{108(t-t_0)^2}{(1-\beta)(m+2)^2}\left[(t-t_0)^2+\frac{t_0}{1-\beta}\right]^{-2}-\frac{24(t-t_0)^2}{(1-\beta)(m+2)}\left[(t-t_0)^2+\frac{t_0}{1-\beta}\right]^{-2}\\ +\frac{12}{(1-\beta)(m+2)}\left[(t-t_0)^2+\frac{t_0}{1-\beta}\right]^{-1}+\left[(t-t_0)^2+\frac{t_0}{1-\beta}\right]^{\frac{-6}{(1-\beta)(m+2)}}\\ \hline \frac{36(2m+1)(t-t_0)^2}{(1-\beta)^2(m+2)^2}\left[(t-t_0)^2+\frac{t_0}{1-\beta}\right]^{-2}+\left[(t-t_0)^2+\frac{t_0}{1-\beta}\right]^{\frac{-6}{(1-\beta)(m+2)}}\end{array}\right. \tag{28}$$

A bouncing universe model has an initial narrow state by a non-zero minimal radius and then develops to an expanding phase. For the universe going into the hot Big Bang era after the bouncing, the equation of state parameter of the universe crosses from $\omega<-1$ to $\omega>-1$, From fig. 4.1 (e), before bouncing point at $t=1$, we see that the EoS parameter $\omega<-1$ and after the bounce, the universe enter into the hot Big Bang ear and occurs the Big rip singularity. Further the EoS parameter $\omega>-1$ for $t>1$. Hence our model is bouncing at $t=1$.

V. Conclusion

Kantowski-Sachs cosmological model has been investigated in the general theory of relativity. The source for energy-momentum tensor is a perfect fluid. The field equations have been solved by using time-dependent deceleration parameter. The mean anisotropy parameter A_m is constant and $\lim_{t\to\infty}\frac{\sigma^2}{\theta^2}(\neq 0)$ is also constant, hence the model is anisotropic throughout the evolution of the universe except at $m=1$ *i.e.* the model does not approach isotropy. It is interesting to note that the behavior of the model is bouncing as the Hubble parameter H passes across zero $(H=0)$ from $H<0$ to $H>0$, for some finite time $t=t_0$. Also the energy density decreases at the early stage of evolution and rapidly increases showing big bounce at $t=t_0$. The Hubble parameter $H<0$, for $t<t_0$ and $H>0$, for $t>t_0$ indicating that H passes across zero $(H=0)$ at $t=t_0$. $(t\neq t_0)$ which represents the model is bouncing at $t=t_0$. The skew-ness parameter $\omega<-1$ before the bounce at $t=t_0$ and $\omega>-1$ after the bounce.

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Strict Proof of the *Perfection* of the First 98 Masks (Solution to the "X-Problem of the Number 3")

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Abstract- The proof of the *Perfection* for the first 91 normal Masks in one dimension and for the seven normal Masks in two dimensions is completed (all the centrally symmetric masks are not differentiated and are counted as one). A method is indicated for proving the *Perfection* of (presumably) any appropriate Mask (which is *Perfect*).

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Strict Proof of the *Perfection* of the First 98 Masks (Solution to the "X-Problem of the Number 3")

A. Kornyushkin

Abstract- The proof of the *Perfection* for the first 91 normal Masks in one dimension and for the seven normal Masks in two dimensions is completed (all the centrally symmetric masks are not differentiated and are counted as one). A method is indicated for proving the *Perfection* of (presumably) any appropriate Mask (which is *Perfect).*

I. Introduction

This study is a continuation of the studies [1] - [3] and includes the complete proof of the *Perfection* of Masks (Neighborhoods) shown in Fig. 1. Let us briefly discuss the proof.

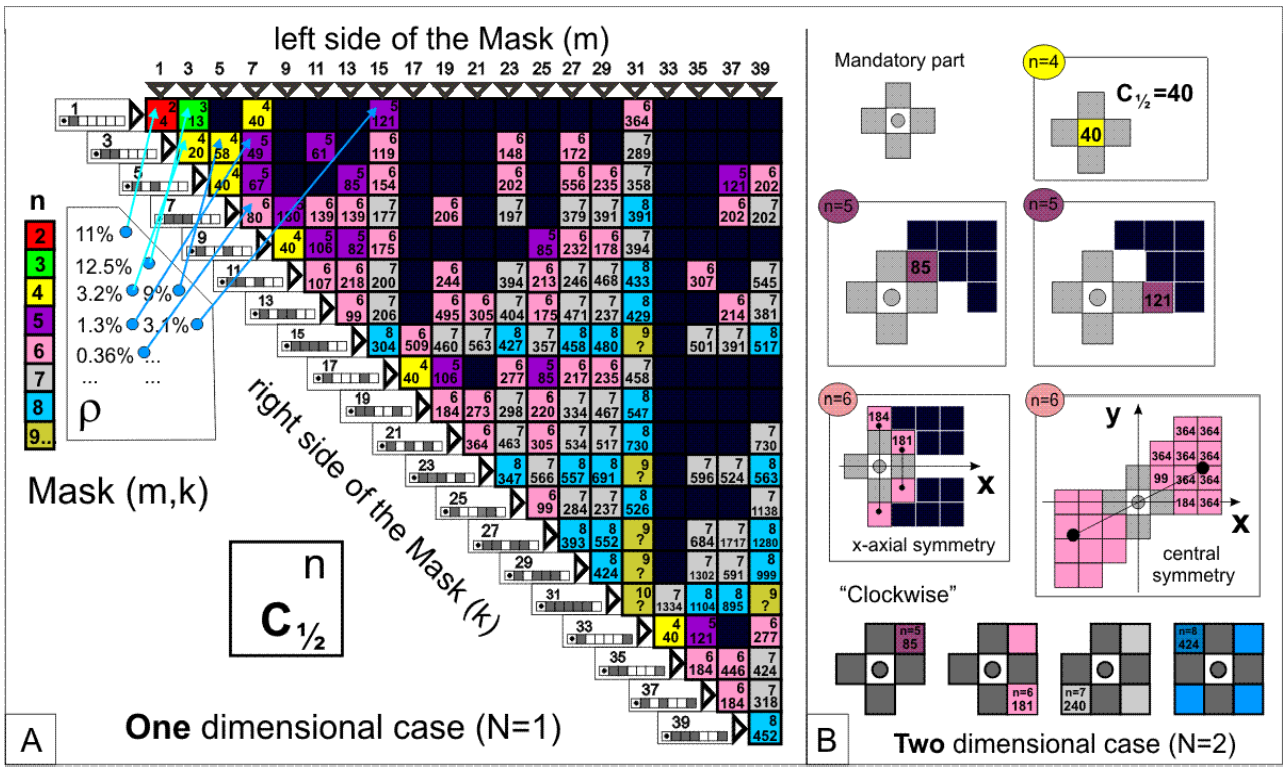

Fig. 1: The set of the first *Perfect* Masks in one (left panel) and two (right panel) dimensions (taken from [1]). On the top of the left panel, a few examples of 1D *Perfect* Masks are shown; on its bottom – the colored diagram indicating properties if the first 1D *Perfect* Masks (see explanations in [1]). Two numbers in the colored squares in the left panel stand for *n* (n is the number of cells in a particular Mask) and $c_{1/2} = (c-1)/2$ (*c* is the number of rows in a Transition Table build for that Mask)

First, one small but important Lemma will be proven: the Lemma for all *normal* Masks. Then the proof of *Perfection* will be carried out separately for each Mask. The *Perfection* proof will be aided by the computer and completed in three stages. The first two stages have been described in detail in [1]. We will briefly revise these stages and then talk about the "third" stage. Also, we will talk about the important "problem of the number 3".

II. Definition of an *Ordinary* Cellular Automaton (CA) and a Transition Table

We define an *ordinary* (*traditional*) CA as a *Cellular Automaton (CA)* which is single-plane in time. In

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general, it operates on the N-dimensional Lattice. The Lattice space can be closed (for instance, it can form a torus) or continue *ad infinitum.* The state of a cell in this Lattice at the time point *t+1* depends on states of the cells in its neighborhood at time point *t*. A majority of Cellular Automata are *ordinary*.

To operate *ordinary* Cellular Automaton, one needs to specify (define) five things (see Fig. 2).

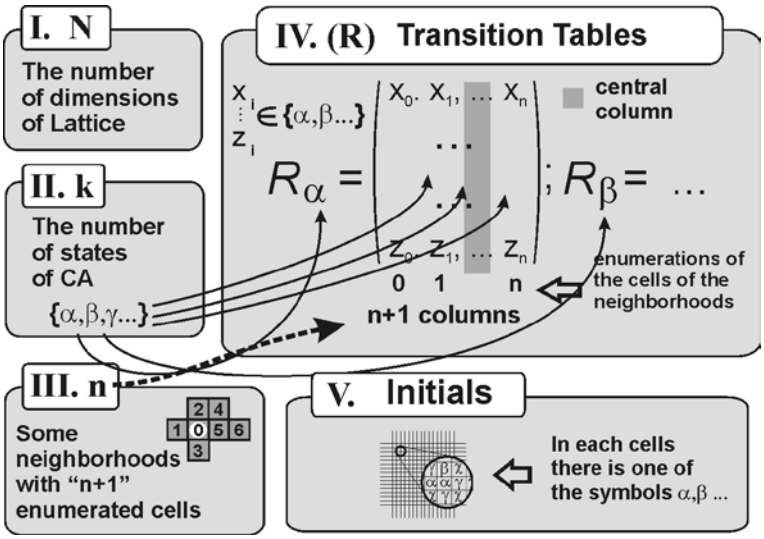

Fig. 2: Things to be defined for a correct operation of an *ordinary* cellular automaton

In this Figure, there 5 panels (I-V). Below we specify the content of each panel.

- N- dimensionality of the Lattice and the dimensions of the boundaries of Cellular Automaton.
- k- the number of possible cell states.
- n- the number of cells (cells are numbered from 0 to n) forming the Neighborhood including "central" cell. Example is shown of a particular cell numbering for some 2D Mask.
- The Transition Tables *R* with the corresponding index. The Transition Tables determine the state of CA at the next time point (t+1). Both the index of the Table and its content (elements) belong to the set from II. For each cell and at each time point, we write out (in accordance with the numbering III) a string and compare it to the content of the Transition Tables. When we find the matching row in TT we choose this row index as the next state of the Automaton.
- The Initial Conditions.

After establishing the above definitions, we can start the operation of our CA and monitor its changes.

Also it is important to mention properties of a Transition Table (TT) [1]:

1) The row position in TT does not matter.
2) The number of columns in TT is equal to *n+1*, where *n* is the number of points in the "numbered" neighborhood (see III).
3) Each TT has a "rightmost selected" column (which represents the central point). In the figures below, it is highlighted in grey.
4) All the rows, both in one TT and in the other ones, differ among themselves.
5) The maximum number of all rows of TTs must be less or equal to k^{n+1}. ($2^{2+1}=4+4$ is true for the Automaton called "Rule 30" (Fig. 3A); $2^{8+1}=372+140$ is true for the Automaton called "Life" (Fig. 3B)). If some row(s) is (are) missing, then one should explain why this row(s) cannot appear during the operation of the CA.

In Fig. 3 one can see some examples of *ordinary* CAs:

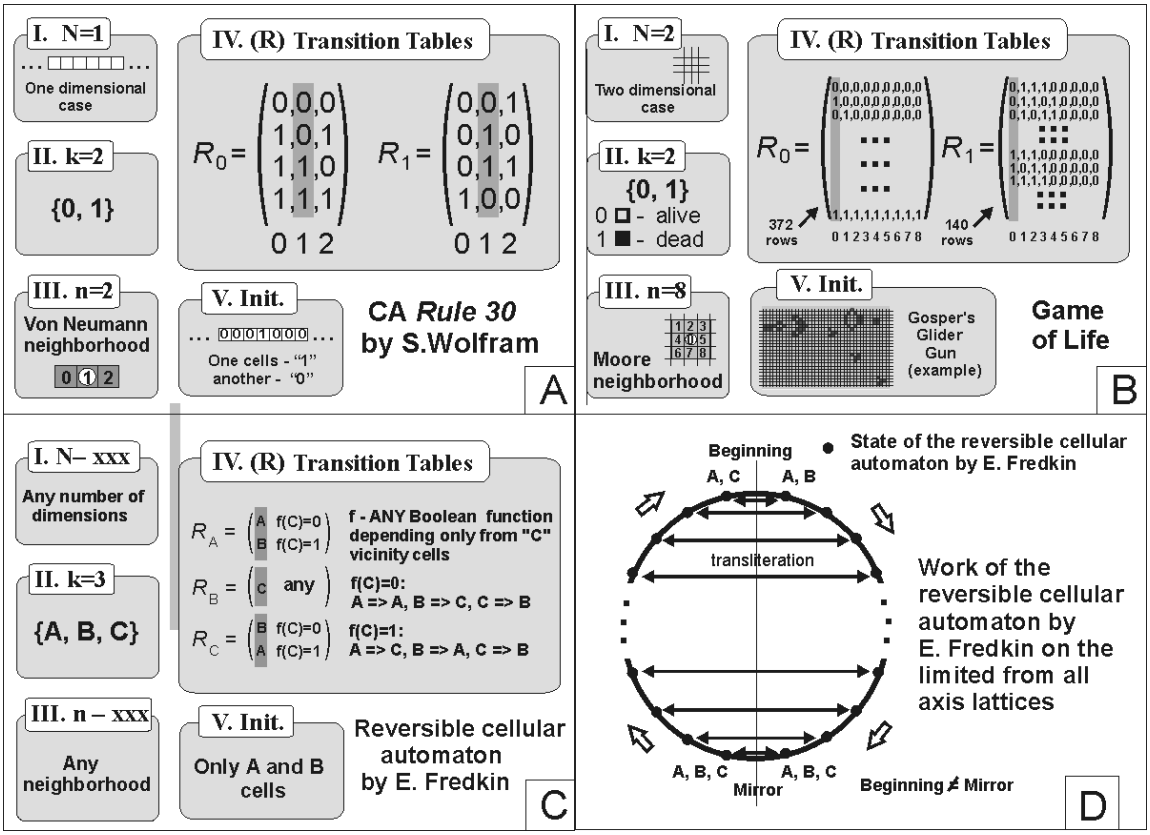

Fig. 3: Examples (with the Transition Tables) of *ordinary* CAs; Panel A is Wolfram's CA named "Rule 30"; Panel B is a Conway's CA: "Game of Life"; Panel C is a reversible Fredkin's CA with three states; Panel D explains how Fredkin's Automaton operates on a closed Lattice

Let us consider Fig. 3. Panel C describes Fredkin's Automaton (we call this type of Automaton by the name of its inventor it [4]). Fredkin's Automaton has THREE states: A, B, and *C*. In it, we calculate a certain Boolean function, that depends only on cells *C*, which fall into neighborhood "f(C)" and then we make the corresponding transformations depending on function f (see Fig. 3C).

Let us define transliteration as a replacement of all C's by B's and B's by C's. Then it is easy to prove the following statement: (i) we make a transliteration in the Fredkin's Automaton, then (ii) we make one time step forward and after that (iii) another transliteration, we will be in the previous state [5]. That means that this Automaton is reversible.

Let us consider the situation when the initial state of Fredkin's CA comprises cells A and/or B. That is, there are no C cells at all. (Let us assume that f(C) is equal to 0 in this case. This is another condition we impose on the Automaton). That is, the Automaton (with no C cells) will be transformed as follows: A=>A and B=>C, that is, to its transliteration. Then we should watch two movements synchronously: the first is directed forward in time, the second is directed backward. At each new step, the "forward and backward" states will be transliterations of each other. If the number of states is finite, there will necessarily be a moment when with the next move forward, we will get its transliteration, that is, the "backward" move. We can say that we have reached the Mirror Point, or the Half-Period Point (point of return). Then the motion is repeated. (Fig. 3D).

III. A *Simplified* Fredkin's Automaton (SFA) and the "X-Problem of Number 3" in a Non-Formal Form

Let us "facilitate" the Fredkin's Automaton, that is, we will remove the word "any" from definition of the *f(C)* function and will consider *f(C)=0*, if there are NO *C* cells in the given neighborhood, and *f(C)=1*, if they ARE *C* cells in the given neighborhood.

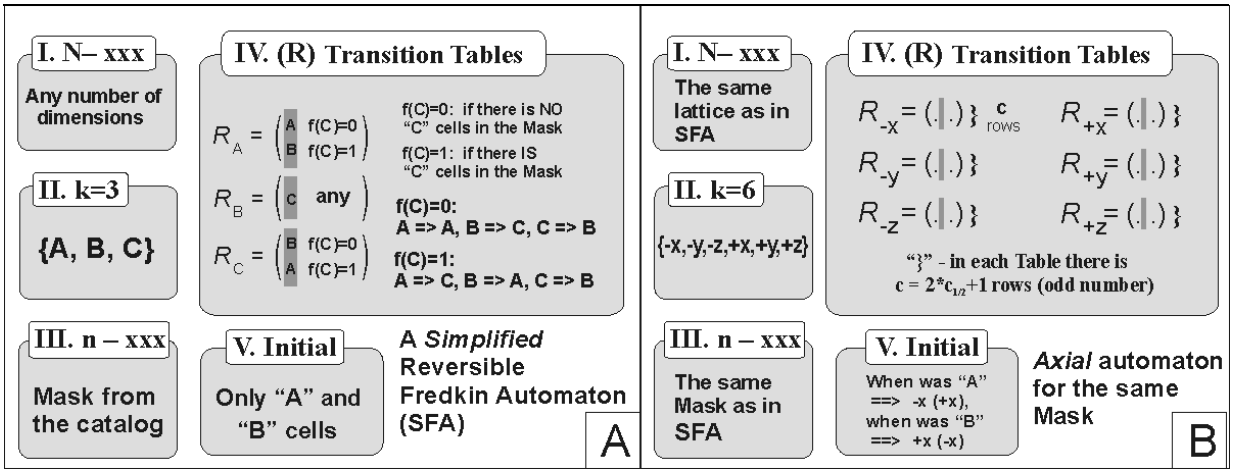

Fig. 4: Panel A is *Simplified* Fredkin's CA (SFA), Panel B is *Axial* Automaton for the same Mask

This kind of Fredkin's Automaton will be a subject of following discussions because *exactly this kind of Fredkin Automaton* demonstrates, rather than any other Fredkin's Automata, a completely surprising and paradoxical behavior. All other FA (and that can be shown) "deteriorate" over time. Most of the "random" FA are "broken" at the moment the FA are created, see for instance Supplementary reference [i].

Only SFA can, roughly speaking, run indefinitely. It does not "die in the Hypercycle" (the cycle where an ordinary FA goes on has an unimaginably large number of steps), but it appears again in the initial state (see Supplementary reference [ii]).

In an informal way, we will call this circumstance the "problem of the number 3". This problem is related to a profound strangeness of the behavior of large enough number of SFAs. We refer to number *three* because we choose only three states for CA. This number will appear more than once in our text. To explain a remarkable behavior of SFA (for example, it can produce puzzling objects resembling "rivers" flowing in two dimensions) is a separate task, we will not deal with it now. Yet, we will prove a very interesting theorem related to these SFAs.

IV. *Normal* Masks. Two-Dimensional Automaton Plot (2D-AP). The Main Lemma. A Strict Formulation of the "X-Problem of Number 3"

Let us give a mathematically strict definition of the "X-problem of number 3", but let us first talk about what kind of SFAs and their corresponding Masks (neighborhoods) we will consider.

Further on, we will consider only the Masks containing *the Neumann Mask* (see Supplementary reference [iii]) in N dimensions. Let us call these Masks *normal*.

At this point, we are going to limit our Automaton from all sides. Let us imagine a chess figure. This figure can (i) walk on the N-dimensional Lattice one step forward or backward along any of the axes (that is, just along the Neumann neighborhood) and (ii) step into positions (fields) where it has been before. It is obvious that such a figure can visit all the cells in any finite Lattice (Z^N) and, eventually, return to the starting point.

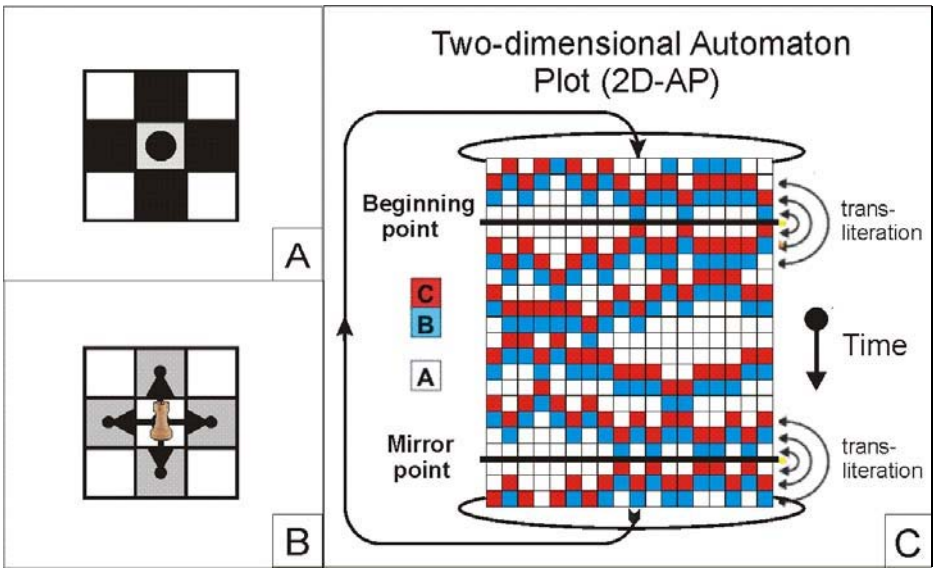

Fig. 5: Panel A presents the Neumann Mask (Neighborhood) for two dimensions (2D). Panel B presents the moves of a "chess figure" unfolding the 2D lattice into 1D "string". Panel C presents Two Dimensional Automaton Plot (or *Test Plot*) illustrating the effect of non-intersection of the CB bands. The picture refers to a one-dimensional Mask

Ignoring (or not permitting) any meaningless moves (e.g., forward and immediately backward) of this figure, we unfold (or transform) an N-dimensional bounded (e.g., closed as in torus) area into one dimension. After that, we place every next position of the CA under the previous one and by doing so we build in the end a so-called "Two-dimensional Automaton Plot" (2D-AP) using two variables. On the x-axis, the sweep of the CA into one dimension made with our chess figure. We name this sweep as *r*. In dimensions with large N, the Neighborhood itself will somehow spread itself along the x-axis, but it does not matter which manner it spreads. The y-axis in 2D-AP is directed downwards and shows the time evolution. Now, let us prove the *preliminary Lemma.*

The Lemma.

If SFA contains Neumann Mask, then the following is true:

1) The Mirror Point (for any non-trivial SFA with a return period > 2) is not equal to the Start Point.
2) Like the Start Point, the Mirror Point contains exclusively *A* and *B* cells.
3) Each *C* cell on the Test Plot (2D-AP) necessarily touches another *C* cell on each side and *only once*. That is, the *CB* rows run across the Test Plot as non-intersecting strips (Fig. 5C)

This not very complicated lemma has been proved in [2]. At this point, we will give a strict definition of the "X-problem of number 3".

We take *some Masks* (later on, we will call them *Perfect), any size of CA and any initial conditions.* Then we consider the following: (i) take any arbitrary initial conditions consisting only of A and B cells and remove all the B cells from it on the 2D-AP (it is very convenient to remove B cells (thus making cell space "vacant") layer by layer from top to bottom: "first", "second", "third", etc…), (ii) "lift" all the cells (they can be either A or C cells) from the lower layers up into the vacant spaces (the exact procedures and formulas are given in [1]).

By doing so, we will build a matrix (from the Start Point to the Mirror Point) having Θ rows along the y-axis and filled with cells A and C. Now, let us take an "additional" initial coloring. That is, we change all the A cells to *B* cells, and *B* cells to A cells. Now, we will do the same procedure. We will build a matrix having Θ^* rows along the y-axis also filled with cells A and C as well.

We need to prove the following statement: for any *Perfect* Mask (Fig. 1) Θ will always be equal to Θ^*, and the obtained matrices will coincide with each other when all the A cells are replaced by C cells and the C cells are replaced by A cells.

"X- problem of number 3" means exactly this statement.

V. The First Two Stages. Theorem 1 Proving that There Exist an *Axial* Automaton for Automaton with a *Perfect* Mask

First, let us note that in the previous study [1] this Axial Automaton has been called *Table.* We decided to change its name in order to emphasize its *central position* between "the Ordinary World" and "the Complementary (Parallel) World" and rename is as *Axial*. In the study [1] the following has been proven:

Theorem 1. (The *Correctness* Theorem).

This theorem states that for all the Masks in Fig. 1, which are not shaded in black color and for which $n < 9$, there is a *Axial* Automaton with k=6 (Fig. 4 panel B) and with corresponding Transition Tables (TTs) R_{-x}, R_{-y}, R_{-z}, R_{+x}, R_{+y}, R_{+z} which are obtained from R_{-x} by corresponding substitutions:

$$R_{-x}:e=\{-x,-y,-z,+x,+y,+z\};\quad R_{-y}:e_1=\{-z,-x,-y,+z,+x,+y\};\quad R_{-z}:e_2=\{-y,-z,-x,+y,+z,+x\};$$
$$R_{+x}:e_3=\{+x,+z,+y,-x,-z,-y\};\quad R_{+y}:e_4=\{+y,+x,+z,-y,-x,-z\};\quad R_{+z}:e_5=\{+z,+y,+x,-z,-y,-x\}. \quad (1)$$

Such Transition Tables have surprising properties.

First stage. TTs from the above are calculated under the *assumption* that the corresponding Mask is *Perfect* as follows. Tests are carried out with a random (finite) Lattice size and random initial conditions. After the Automaton reaches its Mirror Point (its Half-Period Point), a "selection" is carried out as described in Chapter 3 (see [1]), with the parameter *F* retained (F represents the number of the step at which the MP has been reached) and F has index A or C (i.e., F_A or F_C) depending on what was written on this "dice". After that, the following substitutions are made: F_A *(mod 3)=0* ⇔ *"-x"*, F_A *(mod 3)=1* ⇔ *"-y"*, F_A *(mod 3)=2* ⇔ *"-z"*, F_C *(mod 3)=0* ⇔ *"+x"*, F_C *(mod 3)=1* ⇔*"+y"*, F_C *(mod 3)=2* ⇔ *"+z"*.

The results serve to construct the corresponding Transition Tables: R_{-x}, R_{-y}, R_{-z}, R_{+x}, R_{+y}, R_{+z}. (Details and examples are given in [1]).

Second stage. Thus, a new CA is defined. It starts on the same Lattice as the SFA, but with the corresponding replacement of the initials A and B by "-x" and "+ x". This CA has a very small "density", the latter refers to the ratio of "the number of rows in all the matrices *R*" to "the maximum number of possible rows" (6^{n+1}). This ratio is rather small for most of *Perfect* Masks (Fig. 1) Yet, it is proven by the method of induction that no other rows can appear during the operation of the CA. (It is also proven by the induction that the *Axial* Automaton is reversible, and the matrices for the inverse R^{-1}_{-x}, R^{-1}_{-y} … transformation are also obtained from R_{-x} by the corresponding substitutions (see [1]). We call *Correct* a Masks for which there exists an *Axial Automaton*.

What is the only interesting point in this proof – it *always* comes to an end. There are no exceptional ideas in it. This is a traditional proof made by an "exhaustive search" and "by induction".

Axial Automata have their own value. These Automata manifest some new symmetries and there are, in fact, a lot of those symmetries.

In a spirit of study [3], let us take a certain neighborhood

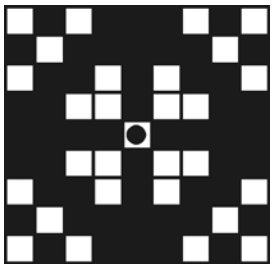

Fig. 6: A certain symmetrical Mask (Neighborhood) in two dimensions with n=52

Let us ask a mathematician what kind of symmetry it has? The answer will be – the symmetry of a square: symmetry along the axes "x" and "y" and along the diagonals. Yet, it turns out *not to be a complete* answer.

There exist also some other (!) symmetry. In fact, this new symmetry is represented by R_{-x} Transition Table which is very interesting by itself. We are 100% convinced that there is such a symmetry – the R_{-x} Table, an *Axial* Automaton – exists for a huge number of Masks that are not symmetric. It surely exists for all centrally-symmetric Masks (it is clear from indirect data), and of course the same is true for Masks that have the symmetry of a square. One needs just a *very* good computer to determine the R_{-x} Table. In order to prove the *Correctness* of this R_{-x} Table, by using a brute force search by exhaustion, one needs to exploit an extremely powerful computer (the author has a doubt that such a computer can be built, in principle). "A nested cycle of several thousand values with a depth equal to 53…" – it is indeed very challenging! Yet, when *n* is small enough (n<9), the personal computer copes without difficulty with all the three tasks: (i) finding the TT, (ii) finding the proof of the *Correctness*, (iii) and finding the proof of the *Perfection* (it will be shown in the next chapters).

Let us move on to the third stage: the proof of the *Perfection* from the *Correctness*.

VI. The *United* Two-Dimensional Automaton Plot (U2D-AP) and the *Axial* Automaton Plot (AAP). *Reduced Lines* of the U2D-AP (P_F, V_F) and of the AAP (P, V)

Note that we have replaced terminology in comparison with [1]. What we have called "half-strings" in [1], we now call "*Reduced Lines*".

We will call a *United* Two-dimensional Automaton Plot (U2D-AP) the combination of two passes on one Automaton Plot (2D-AP): the first pass with some initial conditions $(f_{ABC}(t, r))$ and the second one with condition $(f^*_{ABC}(t, r)))$ which are additional or complimentary to the $(f_{ABC}(t, r))$ conditions. In Figures 7 and 8, one can see examples of several U2D-APs. One can see U2D-APs in the form of an animation in Supplementary reference [iv].

Let us introduce the concept of a *Reduced Line with the index f*: (P_f, P_f*) and the *Value function* on the *Reduced Lines* (V_f, V_f*). Here, index *"f"* shows that the *Reduced Lines* will be determined from the U2D-AP. In principle, it can be introduced for any Fredkin's Automaton, but we will consider it only for SFAs with *normal Perfect or normal Imperfect* Masks.

Definition

Reduced Line $P_f(\tau, r, \text{"In."})$ is an integer function ($P_f \in Z$) from three variables τ, r ,*"In."*, where $\tau, r \in Z$ and "In." are some (any) initial conditions. The definition is given by the induction

$P_f(0, r, \text{"In."}) = 0$; with an induction step:

$$P_f(\tau+1, r, \text{"In."}) = \begin{cases} P_f(\tau, r, \text{"In."}) + 1 & \text{if } f_{ABC}(P_f(\tau, r, \text{"In."}) + 1, r) = \text{"A"} \vee \text{"C"} \\ P_f(\tau, r, \text{"In."}) + 2 & \text{if } f_{ABC}(P_f(\tau, r, \text{"In."}) + 1, r) = \text{"B"} \end{cases} \quad (2)$$

In fact, this is the "lift up" (see Chapter 3 and [1]) mentioned before. A similar definition is valid for function P_f* $(\tau, r, \text{"In.*"})$.

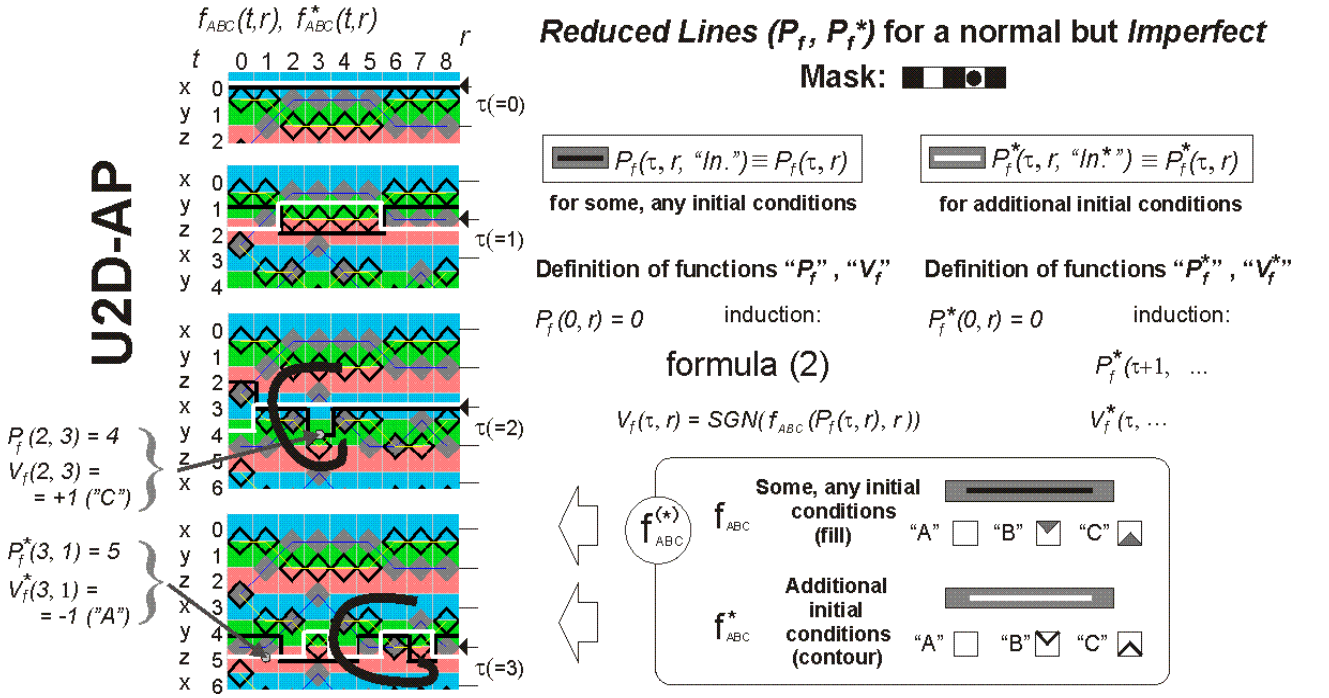

Fig. 7: On the left, there is U2D-AP for a *normal* but *Imperfect* Mask. Black and white lines show the *Reduced Lines* for the first few τ values. One can see that P_f and P_f* are not symmetrical with respect to the "centerline", which is an abscissa with the coordinate t = 3τ/2. The "errors" of the symmetry are shown with a thick line.

Let us introduce the *sgn* (sign) function for the quantities {-x, -y ...} (*sgn (-x)=-1*, *sgn (+ x)=1*, *sgn (-y)=-1…*) and the *SGN* function for cells A and C: *SGN(A)=- 1; SGN (C) = 1, (SGN (B)* - not determined). Let us use these indications to write the *Value function* on the *Reduced Line* for "arbitrary" initial conditions: $V_f(t, r, \text{"In."}) = SGN(f_{ABC}(P_f(t, r, \text{"In."}), r))$ and the analogous function $V_f^*(t, r, \text{"In."}) = SGN(f_{ABC}(P_f^*(t, r, \text{"In. *"}), r)))$ for the "additional" initials. These are the values that we would obtain from the "lifting up" procedure described in Chapter 3 of reference [1]. There is no connection found between values V_f and V_f* for *Imperfect* Masks (Fig. 7).

Theorem 1 (see [1]) says that for those Masks for which there exists an *Axial* Automaton (that is, for *Correct* Masks), we can determine what we now call the *Axial* Automaton Plot (AAP). It is obtained by entering the result of the *Axial* Automaton operation each time into a new row with the number τ. The *Reduced Lines* on the *Test Plot* (U2D-AP) with their values *(P, P*, V, V*)* without index "f" are obtained from the known formulas (see [1], Fig.8D)

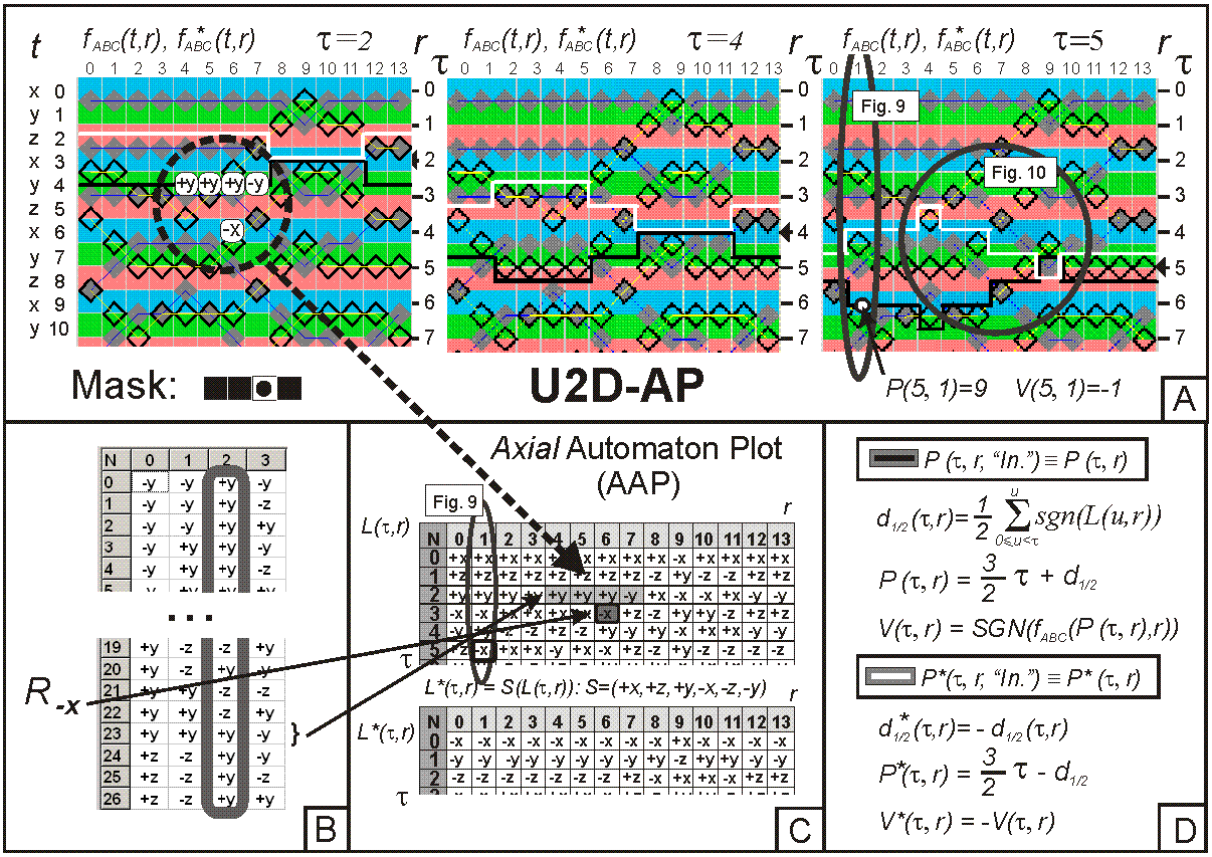

Fig. 8: Panel A – *United* Two-dimensional Automaton Plot (U2D-AP) for the *Correct* Mask (3,1) with three examples of the *Reduced Lines* (*P* and *V*, without "f") constructed according to the formulas from Panel D of the same figure for $\tau = 2$, $\tau = 4$ and $\tau = 5$. One can see that they are symmetrical with respect to the straight line ($t = 3\tau/2$) and coincide with P_f and V_f. Panel B – table R_{-x} for the Mask (3,1). Panel C is a result of *Axial* Automaton operation (AAP as well). Panel D shows formulas from [1] describing the operation of *Axial Automaton* (we will illustrate the formulas and operation by using a concrete example, for $\tau = 5$ and $r = 1$ in Fig.9)

The arrows show the relationship between Panels A, B, and C by the example of one point ($t = 6$, $\tau = 2$, $r = 1$; initial conditions are "arbitrary"). The ovals show those areas that are taken out into the other figures.

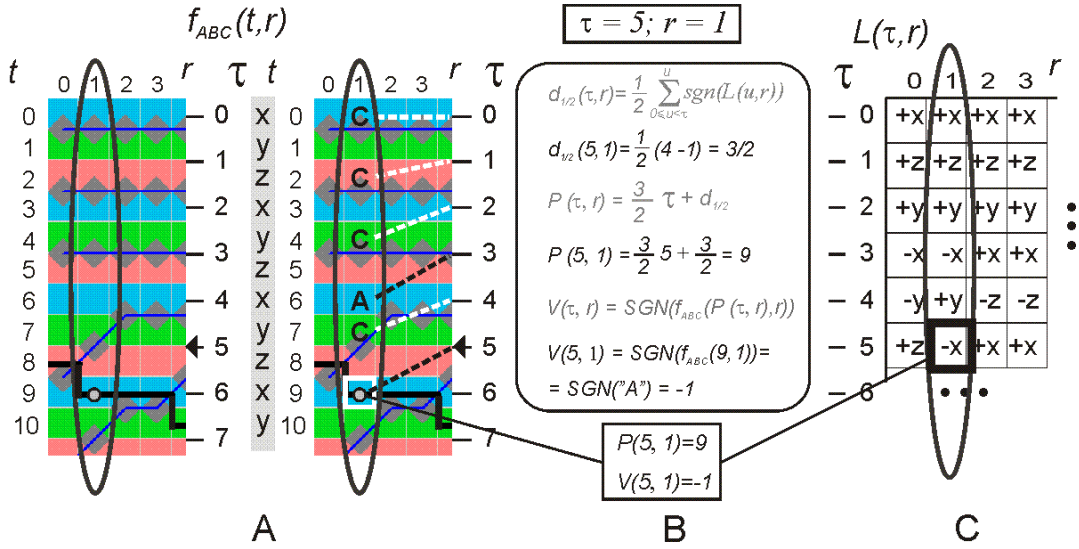

Fig. 9: A detailed calculation of the quantities *P (5.1) and V (5.1) f*rom Fig. 8. Panel A of two colored images shows 2D-AP (Test Plot) for "arbitrary" initial conditions and for the *Reduced Line* with $\tau = 5$. Panel B shows the formulas and performed calculations. Panel C shows AAP of the *Axial* Automaton in our case.

VII. Completion of the Proof of the *Perfection* of the First *Normal Correct* Masks. The Proof of the Identity of the Reduced Lines (P_F, V_F) and (P, V)

We want to prove that for any Correct Mask $P_f(\tau, r) = P(\tau, r)$ and $V_f(\tau, r) = V(\tau, r)$. Let us see what *other tests* for the Transition Tables need to be done in order to assert the above equalities.

Theorem 2. (The *Perfection* Theorem).

Let us prove using the method of induction that for any *Correct* Mask from Fig.1 with $n<9$ and for any τ, the *Reduced Lines* with index *"f"* (P_f, V_f, P_f^*, V_f^*; i.e., the *Reduced Lines* of U2D-AP) will coincide with the *Reduced Lines* without index *"f"* (P, V, P^*, V^*; the *Reduced Lines* of AAP). (We talk only about the *Reduced Lines* P_f, V_f, P, V; because the theorem can be proven similarly for the *Reduced Lines* P_f^*, V_f^*, P^*, V^*).

Test 1.

We will call those pairs of cells (columns) of TT which have no pairs (-x, y), (+x, - z), (-y, +z) as *Good*, and we will construct not directed Graph on all the cells of the Mask using these pairs. If one can pass using the edges of the Graph from the central cell to all other cells of the Mask, then Test 1 for the Mask is declared valid. All Correct Masks, with n<9, from the Figure 1 will pass this test. In all one-dimensional Masks with "natural" numbering of cells (that is the one made in a row) there are two simple passages from the central cells to the left and to the right.

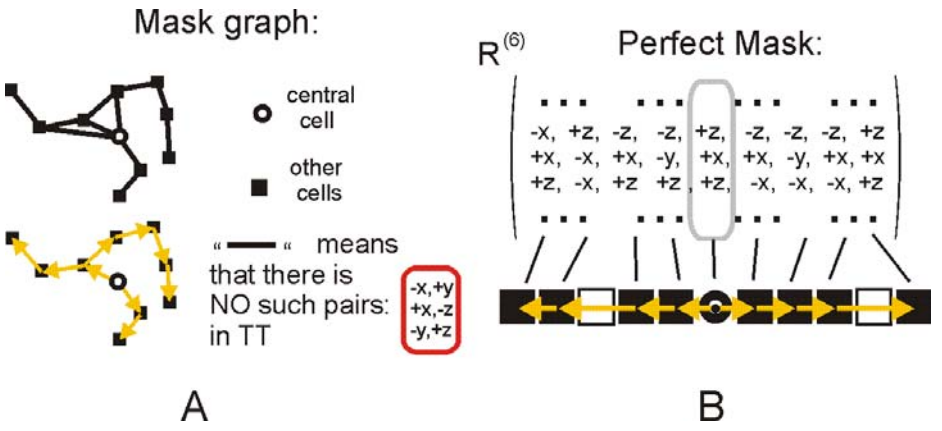

Fig. 10: Panel A – an example of the Graph for a hypothetical Mask with n = 9. Panel B shows a passage through the cells of the Perfect Mask (25, 23). The vectors of the passage are drawn by yellow on both panels (and also in other Figures)

The induction is related to τ; it will be proven simultaneously that condition 3 continues to be valid. The condition is as follows: for all vectors and for all the passages where r_a is vector's origin and r_b is vector's end the following comes true:

$$\delta_{ab} = \left| P_f(\tau, r_a) - P_f(\tau, r_b) \right| < 2 \qquad (2)$$

See Fig. 11:

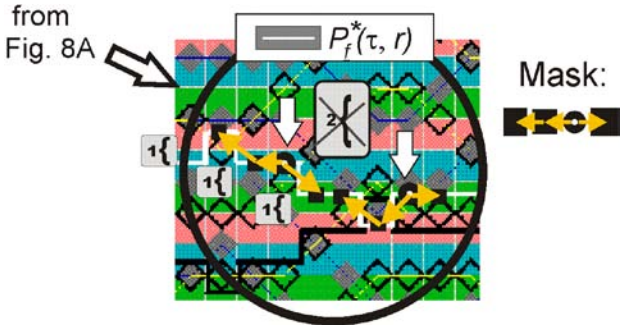

Fig. 11: Illustration of Formula 3 for real *Reduced Line* $P^*(\tau, r)$ from Fig. 8A

Formula 3 bears two functions for our proof.

On one hand, fulfillment of a Formula 3 will allow us to place correctly initial letters of *A* and *C* for an induction step; see Fig. 12:

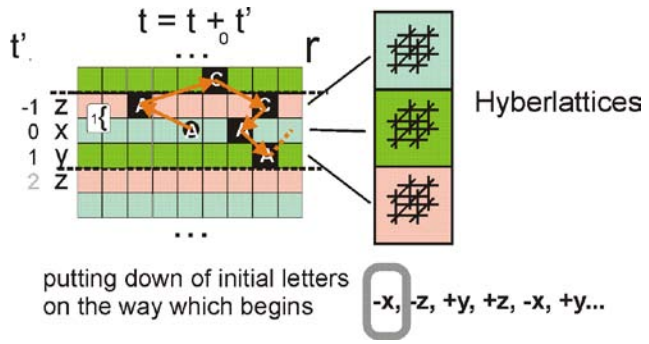

Fig. 12: Placement of letters in the rows of TT along one of the passages of a hypothetical Mask

On the other hand, if we prove that for all rows of TT, the letter lying under the central cell is correctly restored only from the content of the row under consideration, then this will prove the entire Theorem

and, further on, validity of formula 3! We will explain it in more detail below.

Let us assume that Test 1 and Test 2 (the restoration of the subsequent letter from our row; see further on) are passed. Then let us assume that the formula 3 ceased to be met. We will take the first step of τ on which δ_{ab} is equal to two. Let us look at Fig. 13 …

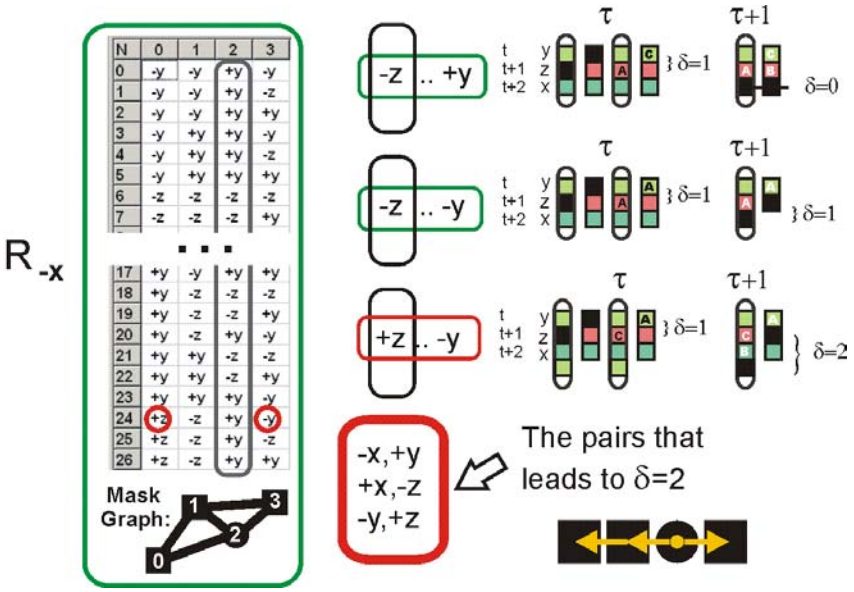

Fig. 13: Explains that δ can never be equal to 2 (or greater number) using the example of Transition Table R_{-x} for the Mask (3.1)

In one move (i.e., when τ increases by 1), if the letter has a "+" sign, then the *Reduced* Automaton *Line* is shifted down by two cells (on a 2D-AP), and if the letter's sign is "-", then it is shifted down by one cell. Therefore, it is clear that δ cannot immediately become equal to, say, three. It must necessarily pass through δ=2.

It turns out that δ can become equal to 2 only for a few pairs. These are pairs: (-x, + y), (+ x, -z), (-y, + z) where one of the values is the beginning of a vector of the bypass passage, and the second is its end. Yet, these pairs do not appear in our TT in a process of the bypass passage. It turns out that they cannot appear there in principle (see Theorem 1). So we have encountered a contradiction. Therefore, the absolute value of δ is and will remain less than two.
It was necessary to make the last decisive check.

Test 2.

Let us perform the test for generally complex Mask in N dimensions. Let us consider the way it is carried out? In this test, the rows from TT are taken one by one (note that the test is carried out for *all the rows* of the TT). First, we build four empty N-dimensional Lattices (we choose four as a start point; and if it turns out that four is not enough, we will add one more Lattice, and will start checking from the beginning), which in all directions are several-fold larger than the Mask under consideration (to start with, say, 3-fold larger Lattices; if it happens that we go beyond the limits, we can increase the Lattice size and repeat the test again from the beginning). Let us number these four Lattices according to time t': … t' = - 2, t' = - 1, t' = 0, t' = 1, t' = 2 … . Then, we begin to "restore" our truncated "Automaton Plot" from what we have at the moment.

The letters A or C are placed into the center of Lattice 0 (t' = 0) dependently on a sign of the state (x, y, or z) existing in the central (zero) point of the row of the Transition Table under the test (Fig. 12A): if *sign = -1*, then we fill the center of Lattice 0 with letter A, and if *sgn =+1*, we fill the center of Lattice 0 with letter C.

The corresponding letters for Hypercubes with numbers … -2,-1, +1, +2 … are written in the manner shown in Fig 11. All letters (see Fig. 12) of our rows proceeding from the shifts are brought to the cells of the Hypercube, as we perform the bypass passage. In all other cells of Hypercube are filled with "-1". It represents the fact that the value is not known yet (see Fig. 14).

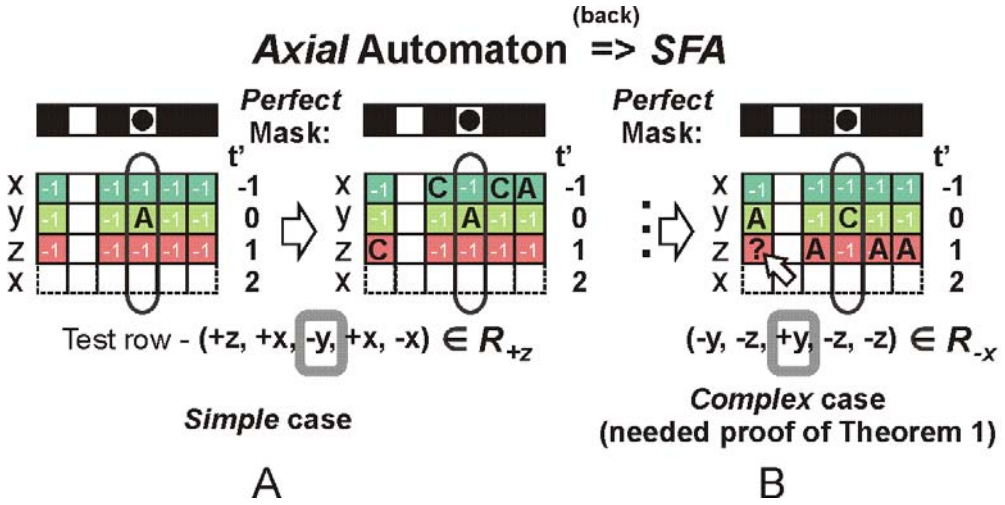

Fig. 14: The beginning of testing of two rows from TT R_{+z} and R_{-x} for the Mask (5,3). Rows can happen to be either *simple* or *difficult* for the analysis. The majority of rows in any TT (678 of 702 for a mask (5,3)) are simple. This means that the value we expect to obtain is calculated directly from the row. But there are also a few *difficult* cases (24 of 702 for a mask (5,3)). Then it is necessary to address to the proof of Theorem 1 and study how could such a row appear, in general.

Now let us begin the restoration of the "truncated" Test Plot under conditions of lack of information. First, we look through all the cells in all the Lattices that are filled with "-1" and for which we can determine value f(C) and, correspondingly, which of letters A, B or C are placed in the given cell of the Lattice(s). The ultimate goal is to fill the Lattices with letters (we need to find whether letter A or C goes into Lattice 1 or 2) and what is the letter immediately below the zero point of Lattice 0.

If we cannot determine which of letters A or C lie under the zero point of Lattice 0 (we still have "-1" there) or (another plausible scenario) the letter (A or C) with corresponding "+" or "-"signs does not match the index of the Transition Table from which we took the row under the test, then Test 1 (*for the entire Mask!*) is considered as failed!

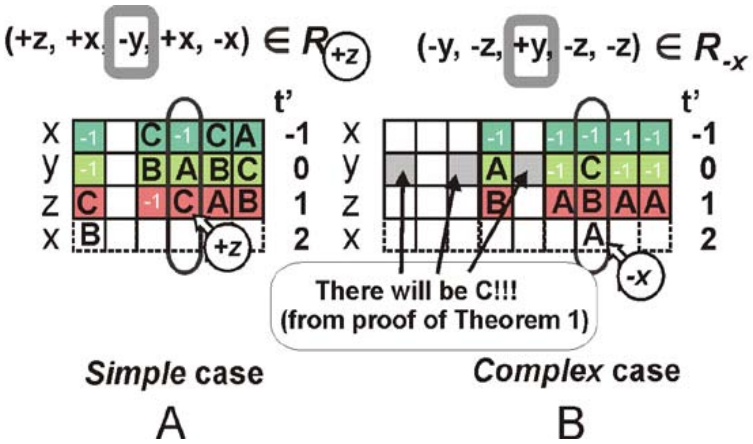

Fig. 15: The final stage of the test from Fig. 12 for two rows from Fig. 14. Test 2 have passed for this rows

So, one by one we check all the 6C rows and, eventually, we find that all the *Correct* Masks from Fig. 1 *have passed* the test! Fig. 16 shows the checking of TT R_{-x} of our "favorite Mask (3,1).

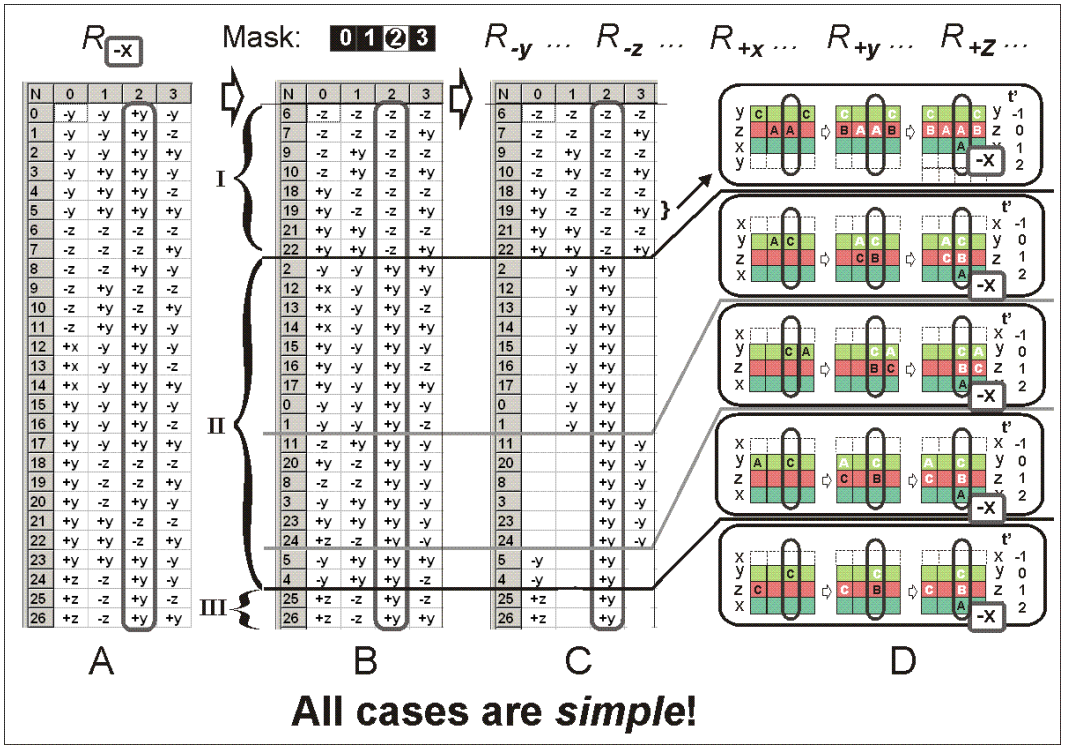

Fig. 16: Panel A shows Transition Table R_{-x} for the Mask (3,1). Panel B shows how this Table is sorted (just for clarity) and collected into clusters of the same type. Panel C shows that the parts of the rows that do not participate in the restoration are closed with white "curtains". Panel D shows the restoration of the letter according to procedures described in the above text. Actions are performed from left to right. After performing the next action, the letters are shown "white"; the newly appeared ones are shown in "black". It can be seen that in all the cases, the letter "-x" is restored correctly

This, taking into account earlier considerations, proves the Theorem! In more details, for all τ and r the following is valid:

$$\left.\begin{aligned} P_f(\tau,r) &= P(\tau,r) \\ V_f(\tau,r) &= V(\tau,r) \end{aligned}\right\} \Rightarrow \left.\begin{aligned} P_f(\tau+1,r) &= P(\tau+1,r) \\ V_f(\tau+1,r) &= V(\tau+1,r) \end{aligned}\right\} \quad (4)$$

Corollary.

All the *Correct* Masks with $n<9$ from Fig.1 are *Perfect*.

In accordance to the formulas presented in Fig. *9D* (see [1]) for the *Axial* Automaton, the content of rows (and their arrangement) in the "lifted up matrices" for the SFAs will repeat that for matrixes *L* and *L** where all the "negative" letters are replaced by A and all the "positive" letters, by C. On the other hand, we know that *L* and *L** are connected by relation *L = S (L*),* where *S* is a substitution (+x, +z, +y, -x, -y, -z). That is, the pluses change to minuses and *vice versa*. Consequently, all the considered Masks in Fig. 1 are *Perfect*.

VIII. One More (Additional) Property of the Transition Tables

For any correct filling of our Perfect Mask with Masks from TT there are two particular rows:

1) A row which turns out as a result;
2) A row which lies in the central point.

We will construct – at the proof of the Theorem 1 – the histogram by the number of use of the given line i in the first case (N_i^r) and in second (N_i^c). There is an interesting fact! For any i and for all Perfect Mask from Fig. 1 it is fairly:

$$N_i^c = N_i^r$$

The reference to the interactive program *key_5M3* about a private research of the proof of the Mask (5,3) is given in *Annex 2*. In the Fig.17 it is presented the part of a screenshot of the program illustrating a formula (5).

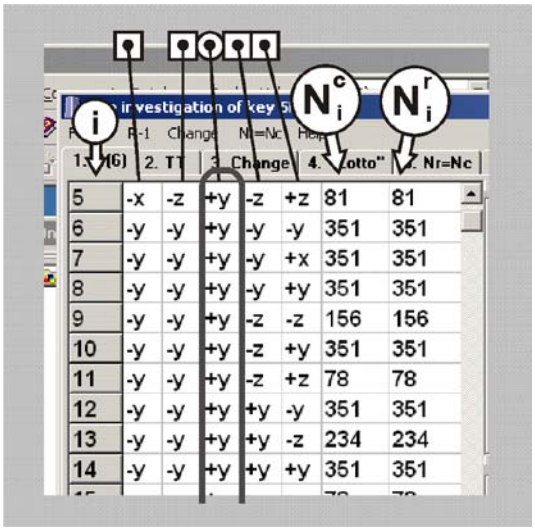

Иллюстрация программой key_5M3 формулы (5)

Fig. 17: Illustration of the program key_5M3 of the formula (5)

We will present one more part of a screenshot (Fig. 18) of the filling connected with a concrete isolated case from the proof of the Theorem 1.

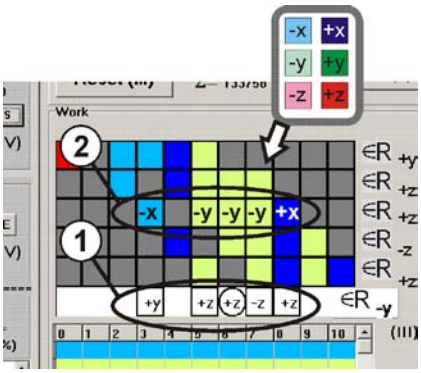

Fig. 18

It is visible that for this case of filling of the Mask (number is equal 100000 of 133758) the rows belongs to the first case (1) *(-x, - y, - y, - y, +x)*; the rows belongs to the second (2) – a row *(+y, +z, +z, - z, +z)*. It is clear, that these lines can't turn out from another by any substitution.

IX. What Problems Still Remain?

The concept of "*normality*" is a bit excessive, so let us introduce the concept of "*Generalized Normality*".

Definition.

A Mask of *Generalized Normality* is such a Mask in N-dimensions that has one of the corresponding elements in the direction of each of the axes: either element 1, see its depiction in Fig. 14 (it is the same as in *normal Mask)* or element 2 (symmetrically placed "dominos", in the direction of the corresponding axis, see Fig 19). It is obvious that this is enough for the *preliminary Lemma* to work.

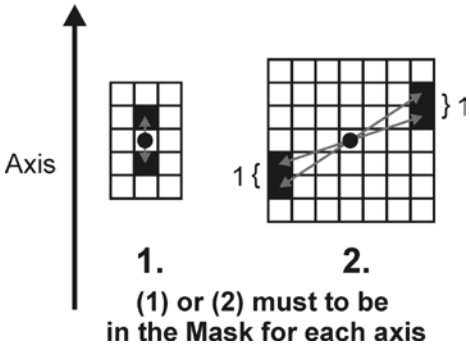

Fig. 19

There are two obvious problems arising.

Problem 1. Is it possible to prove (or disprove) that any *Generalized Centrally-Symmetric Normal* Mask is *Perfect*?

Problem 2. Is it possible to determine the *Perfection* of the Mask directly from the type of the Mask?

We propose to name the new mathematical discipline which we are developing the *discrete* N-dimensional *Geometry*. We believe that it can be an appropriate term.

X. Conclusion

In mathematics, there are finite simple groups. As the mathematical textbooks say that all this is about the rotation of several polyhedra in the N-dimensional space.

We acted differently: we penetrated *into* one cell of an N-dimensional lattice and looked at things "from there". After that, we have suddenly discovered a multitude of most unexpected and surprising symmetries. Using the computer, we learned about some properties of those symmetries, yet the inner essence of those symmetries remains unclear.

Acknowledgments

The author is grateful to Drs. V. Belyaev and E. Moskovets for reading this article and for their assistance.

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Annex 1.

Change of terminology in comparison with [1].

What it was called in [1]	What it is called now
Simple Automaton	*Simplified* Fredkin's Automaton (SFA)
Table Automaton	*Axial* Automaton
Strings: First half Second half	String (remain the same) The *Reduced Lines* of the SFA with "arbitrary" initial conditions. The *Reduced Lines* of the SFA with "additional" initial conditions.

Annex 2.

The reference to the program *key_5M3* for interactive studying of the proof of the Perfection of the Mask (5,3) is presented in (v). (We have counted six properties of the Transition Tables, and the last 4 of which are very paradoxical). Start the program and follow the description.

Supplementary references:

i. https://www.youtube.com/edit?o=U&video_id=wFfWCMyvi7k
ii. https://www.youtube.com/watch?v=Y38RNvRHUCc
iii. https://en.wikipedia.org/wiki/Von_Neumann_neighborhood
iv. https://youtu.be/08bxuG7lm0A
v. https://yadi.sk/d/0scIbLG83NRUNF

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4. Manuscript's Category,

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16. Use proper verb tense: Use proper verb tenses in your paper. Use past tense, to present those events that happened. Use present tense to indicate events that are going on. Use future tense to indicate future happening events. Use of improper and wrong tenses will confuse the evaluator. Avoid the sentences that are incomplete.

17. Never use online paper: If you are getting any paper on Internet, then never use it as your research paper because it might be possible that evaluator has already seen it or maybe it is outdated version.

18. Pick a good study spot: To do your research studies always try to pick a spot, which is quiet. Every spot is not for studies. Spot that suits you choose it and proceed further.

19. Know what you know: Always try to know, what you know by making objectives. Else, you will be confused and cannot achieve your target.

20. Use good quality grammar: Always use a good quality grammar and use words that will throw positive impact on evaluator. Use of good quality grammar does not mean to use tough words, that for each word the evaluator has to go through dictionary. Do not start sentence with a conjunction. Do not fragment sentences. Eliminate one-word sentences. Ignore passive voice. Do not ever use a big word when a diminutive one would suffice. Verbs have to be in agreement with their subjects. Prepositions are not expressions to finish sentences with. It is incorrect to ever divide an infinitive. Avoid clichés like the disease. Also, always shun irritating alliteration. Use language that is simple and straight forward. put together a neat summary.

21. Arrangement of information: Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. Think technically: Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

Please carefully note down following rules and regulation before submitting your Research Paper to Global Journals Inc. (US):

Segment Draft and Final Research Paper: You have to strictly follow the template of research paper. If it is not done your paper may get rejected.

- The **major constraint** is that you must independently make all content, tables, graphs, and facts that are offered in the paper. You must write each part of the paper wholly on your own. The Peer-reviewers need to identify your own perceptive of the concepts in your own terms. NEVER extract straight from any foundation, and never rephrase someone else's analysis.

- Do not give permission to anyone else to "PROOFREAD" your manuscript.

- Methods to avoid Plagiarism is applied by us on every paper, if found guilty, you will be blacklisted by all of our collaborated research groups, your institution will be informed for this and strict legal actions will be taken immediately.)
- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.

Criterion for Grading a Research Paper (Compilation) by Global Journals Inc. (US)

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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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