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Research Article **Published Date:-2024-06-28 16:10:10**

3-D Current Density and Magnetic Field of 3-D MR Scanner Gradient Coil

The topic of this paper is to describe the 3-D current density in the windings of a 3-D coil, which fills the volume between two coaxial cylinders at a precisely defined distance from each other, and which serves to generate a magnetic field gradient in the center of the cylinder axis. The 3-D current density is considered an unknown input quantity, which is calculated from the known gradient magnetic field output. It is an inverse problem in mathematics, where the direct problems are the calculation of unknown output quantities based on known input quantities. Fourier series expansion methods in the context of cylindrical coordinates were used to describe the 3-D current density. In that case, Bessel functions are used as development components. The current densities, at each point in space, were lined up to represent current lines. Each power line is associated with a coil winding through which a current of a certain strength flows. After that, the principle of discretization of coil windings was applied. Each winding is divided into a large number of elementary segments that were considered as current elements, which create, based on Bio-Savar's law, an elementary magnetic field. In this way, the total, continuous magnetic field is broken into many elementary components, which come from different current elements. An important result of this process is that each current element can be controlled independently by a current source. This means that the output magnetic field of the gradient can be controlled by current sources, which are the input sizes, and this is what is at the core of the topic of this paper.

Research Article **Published Date:-2024-06-26 11:12:28**

Estimating the Minimum Possible Deceleration of Cosmic Expansion Post-inflation

The inflationary epoch, occurring shortly after the Big Bang, initiated an extraordinarily rapid exponential expansion of the universe. Following this period, the rate of cosmic expansion decelerated for approximately 9.8 billion years, until observations indicated a transition to an accelerated expansion of space-time. This paper aims to estimate the minimum possible deceleration of cosmic expansion during the post-inflationary epoch, addressing an unresolved aspect of cosmological studies. The observable universe is modeled as a spherical region defined by the particle horizon in the FLRW metric. The model operates on the principle that the speed of light cannot exceed the speed of space-time expansion, given that photons are bound by space-time constraints. This paper hypothesizes that at the end of the 9.8 billion years of deceleration, the expansion speed was at its lowest, nearly equating to the speed of light. Subsequently, this speed has increased, correlating with the current accelerated expansion. Through a graphical representation assuming a uniform rate of change in expansion speed (for minimum possible values), we apply concepts of onedimensional motion to derive our estimates. This novel approach provides a foundational calculation of the minimum deceleration, significantly contributing to the understanding of the dynamics of cosmic expansion and offering a basis for future research and observational refinement.

Research Article **Published Date:-2024-06-18 11:51:04**

A Study on Nuclear Physics Fission using the Relativistic Time-dependent Density Functional Theory Approach

A thorough knowledge of the stationary characteristics of the nuclei of atoms, their stimulation wavelengths, how they react to outside factors, and how they disintegrate is the aim of nuclear structural science. Although achieving these objectives within just one structure is difficult and prevents the existence of a nuclear "standard model," it is evident that radioactive Density Functional Theory (DFT) offers perhaps the broadest variety of applications to date. We attempt to place DFT in a larger perspective in this study by making frequent allusions to electrical DFT. We also provide a brief overview of the numerous uses and an explanation of the connections between beginning techniques and Useful Field Concepts (EFTs) in particular. The article tries to promote collaborations with different scientific fields while being published from a subjective and perhaps biased point of view.

Research Article **Published Date:-2024-06-10 09:39:36**

Deriving the Average Change in Kinetic Energy of a Galaxy in Non-Relativistic Motion

This study presents a novel approach to calculating the average change in kinetic energy of galaxies exhibiting non-relativistic motion. The methodology integrates the dynamics of total observed motion, which encompasses both peculiar and recessive motion, with the gravitational influence of neighboring galaxies. The peculiar motion is quantified through peculiar redshift, while recessive motion is described by Hubble's Law. The total observed velocity is the sum of these two components. The research derives an expression for the average acceleration of a galaxy based on the change in its total observed redshift wavelength over time. Utilizing Newton's Second Law of Motion, the average observed force and subsequent work done by this force is calculated. The work done by conservative forces, primarily gravitational forces exerted by neighboring galaxies, is also considered to determine the total work done on the galaxy. Results indicate that the average total observed force causing the motion of a galaxy is a non-conservative force, resulting from the combined effects of non-conservative forces responsible for peculiar and recessive motion. The change in potential energy due to gravitational interactions with neighboring galaxies is accounted for, leading to the formulation of the average change in kinetic energy. The conclusion of the paper provides a comprehensive expression for the average change in kinetic energy of a galaxy, factoring in the mass of the galaxy, the speed of light, the total observed redshift, the change in distance with respect to Earth, and the gravitational constant. This expression is significant for understanding the dynamics of galactic motion and the forces at play in a non-relativistic context.

Research Article **Published Date:-2024-06-05 11:00:08**

Structural Morphology of Organic Waste-derived Fiber in X–band Frequency

Sawdust is a by-product or waste product of woodworking such as cutting, sanding, machining, planning, and routing. Saw dust consists of small woodcutting intending to study the structural morphology of organic waste fiber derived in an X-band frequency and synthesis of the rice dust and sawdust. The solid-state method was employed to mix the husk, to obtain the fine power, and the Fourier-transform infrared spectroscope was used to determine the sample absorption rate. The FTIR results show that the best samples are 6.5 g and 6.5 g rice bark and sawdust, with an absorbance rate of 86% and 14% transmission, which will be used for the manufacture of electronic and communication devices.

Research Article **Published Date:-2024-05-21 16:24:49**

The Use of Computed Tomography to Quantify Renal Calculi Strain to Estimate Potential Symptomatic Incidents

This study investigates into the historical evolution and contemporary applications of Computed Tomography (CT) in renal stone estimation, with a focus on the innovative use of CT to quantify renallcalculiistrain for estimating potentiallsymptomatic incidents.
Historically, CT has played a pivotal role in diagnosing renal calculi, offering unparalleled sensitivity and specificity in detecting stones of varying composition and size. However, the clinical significance of renal calculi extends beyond mere detection, prompting researchers to explore novel approaches to predict symptomatic events associated with stone disease. This research aimed to determine the right way to classify asymptomatic radiographic calculi strain on computed tomography (CT) scans in Al-Hussein Teaching Hospital, Al-Muthanna, Iraq. A survey was made available to calculi formers who had a CT scan during asymptomatic after a calculi clinical assessment. A survey and a study of medical records revealed symptomatic calculi route incidents after a CT scan. The amount of calculus, the biggest calculi thickness, electronic total calculi size (TSV), and two-pronged calculus were measured radiographically and linked as predictors of calculi events. There were 55 calculi formers in the study, and 61% had a calculi event one year after the CT scan. The calculus number was (0–1, 2–3, 4–6, 7), the highest calculi diameter was (0–2, 3–4, 5–7, 8 mm), and 48% had bilateral calculus. The number of calculus per quartile had a danger ratio of 1.30 (p = 0.001), the largest calculi diameter had a hazard ratio of 1.26 (p 0.001), TSV had a hazard ratio of 1.38 (p = 0.001), and bilateral calculus had a hazard ratio of 1.80 (p = 0.001). Only TSV wass an unbiased measure offsymptomaticceventssin multivariable regression (HR = 1.35 per quartile,
p = 0.01). TSV-related incidents were also unaffected by demographics, urinary chemistry, or calculi composition. A drastic rise in TSV between CT scans (> 31 mm3/year) expected additional eventssin the 49 patients with interim events (HR = 2.8, p = 0.05). For calculating calculi pressure on CT scan, automated TSV is more accurate for asymptomatic events than physical approaches.

Research Article **Published Date:-2024-05-09 10:36:52**

Quantum System Dynamics: Harnessing Constructive Resonance for Technological Advancements, Universal Matter Creation and Exploring the Paradigm of Resonance-induced Gravity

The complex dynamics of constructive resonance are the main topic of this quantum physics study, along with its implications for matter generation, the unification of quantum and classical knowledge, and important technological developments. Space-time is conceptualized in terms of an interwoven fabric in which both linear and non-linear patterns are recorded in an information field. According to this paradigm, basic particle interactions that result in the development of the material universe are referred to as "Constructive Resonance Waves." A five-dimensional cosmos is shaped by the introduction of Cosmic Information (CI), which is essential since it is a basic base vector related to the dimensions of space and time. The Resonance-Induced Information Force Field (RIIFF) and Constructive Resonance are two new theoretical concepts that are introduced in this paper.

Research Article **Published Date:-2024-04-24 11:52:25**

Electronic and Thermo-Dynamical Properties of Rare Earth RE2X3 (X=O, S) Compounds: A Chemical Bond Theory

The electrical, mechanical, and thermodynamic properties of cubic structured rare earth sesqui-chalcogenides RE2X3 (RE = La-Lu, X = O, S) are examined in this work using the chemical bond theory of solids. For these materials, the values of the homopolar gaps (Eh), ionic gaps (Ec), and average energy gaps (Ep) have been assessed. It has been discovered that the calculated values of the homopolar gap (Eh) and average energy gap (Ep) are in great agreement with the values derived from the Penn and Phillips models. The electrical, mechanical, and thermodynamic properties of these materials (RE2O3), such as their bulk modulus and heat of formation, have been estimated using the bond ionicity values. The computed values accord very well with the theoretical results that have been published thus far.
PACS No.: 71.20.Eh, 71.15.Mb, 61.50.Ks, 71.15.Mb

Research Article **Published Date:-2024-04-05 15:48:15**

Statistical Mathematical Analysis of COVID-19 at World Level

Worldwide, statistical data of people infected by COVID-19 has been taken until March 29, 2023, which, when correlated, showed a predictive logistic model. The purpose was to determine the predictive model, which was acceptable, in such a way that the proportionality constant and the correlation and determination coefficients are of great importance to estimating epidemiological and pandemic data; coinciding with what was reported by other authors. Bearing in mind that a mathematical model is a mathematical description through a function or equation of a phenomenon in the real world; whose purpose is to understand infections and make predictions for the future. The stages were: to model the number of people infected as a function of time, formulate, and choose the logistic model, determine the model and obtain mathematical conclusions, and make predictions (estimates) about the number of people infected by COVID-19 worldwide. The logistic model was derived to predict the speed of people infected by COVID-19 and the critical time (tc = 733 days) for which the speed was maximum (1694,7209 infected/day). The Pearson correlation coefficient for the time elapsed (t) and the number of people infected (N) worldwide, based on 32 cases, was r = -0.88; the relationship between time and those infected is real, there is a “very strong correlation” between the time elapsed (t) and the number of people infected (N) and 77.03% of the variance in N is explained by t.

Research Article **Published Date:-2024-04-05 15:43:58**

Time Electron Theory

What is time? Is it a physical quantity, illusion, or dimension? Defining time is challenging and fascinating. We often consider time as a dimension to help us understand the concept of space-time. Time undeniably exists, but we can only sense its presence through its effects. For instance, if we take two apples, one bought months ago and the other just a day ago, we can tell that one apple was bought a long time ago because it had rotted. We express time as the effect caused by it. If there were no effects of time on this universe, then the concept of time would not exist [1,2].

Mini Review **Published Date:-2024-03-19 17:45:03**

Approximation of Kantorovich-type Generalization of (p,q) - Bernstein type Rational Functions Via Statistical Convergence

In this paper, we use the modulus of continuity to study the rate of A-statistical convergence of the Kantorovich-type (p,q) - analogue of the Balázs–Szabados operators by using the statistical notion of convergence.
Mathematics subject classification: Primary 4H6D1; Secondary 4H6R1; 4H6R5.

Mini Review **Published Date:-2024-02-20 15:40:52**

Thermoelectric Materials Based on Lead Telluride and Prospects for their Practical Application

Lead telluride (PbTe) is considered one of the most promising materials in thermoelectrics due to its unique thermoelectric properties. This semiconductor exhibits a high thermoelectric figure of merit (ZT) in certain temperature ranges, making it highly effective for converting heat energy into electricity. Additionally, PbTe is characterized by stability and low thermal conductivity, which further enhances the efficiency of thermoelectric devices. Another advantage of using PbTe is its relative affordability and high availability of raw materials. This makes it attractive for manufacturing mass thermoelectric devices such as thermoelectric modules for automobiles, industrial thermoelectric generators, heat recirculation, and others. The paper provides a review of works and an analysis of general approaches to semiconductor thermoelectric materials, including lead telluride.

Research Article **Published Date:-2024-02-09 11:38:08**

Optimizing Milk Safety: Applying Nuclear Techniques in X-ray Fluorescence Spectroscopy for Heavy Metal Quantification in Powdered Milk Consumed in Senegal

This study conducted an elemental analysis and assessed heavy metal concentrations in five powdered milk samples (V1, L1, H1, G1, and D1) from Senegal, utilizing X-ray Fluorescence (XRF). The analysis focused on aluminum (Al), calcium (Ca), potassium (K), phosphorus (P), and chlorine (Cl). Aluminum was either undetected or found at negligible levels in all samples. Calcium levels consistently surpassed the Acceptable Maximum Level (AML) in all samples, with H1 exceeding the AML by approximately 11.1 times (27,745.06 ± 310.16 ppm). Potassium concentrations varied, with G1 exhibiting the highest levels, significantly exceeding the AML (51,058.15 ± 456.13 ppm), while V1 remained within acceptable limits. Chlorine concentrations generally complied with the AML, except for G1, which slightly exceeded the limit (3631.04 ± 31.23 ppm). Phosphorus concentrations in H1 were notably higher than the AML (13,750.94 ± 275.35 ppm). The non-uniformity in heavy metal concentrations among samples emphasizes the need for ongoing research and regulatory scrutiny to address potential risks and ensure the safety of powdered milk.

Mini Review **Published Date:-2024-01-19 09:46:09**

Generation of Curved Spacetime in Quantum Field

To reach such a consistent theory which contains the quantum field theory of particle physics and Einstein's theory of gravitation as limiting cases, one may proceed in the following way: Standard quantum field theory just ignores the effects of gravity. This is justified in many cases due to the weakness of gravitational interactions at the presently accessible scales. In a first step beyond this approximation, one may consider an external gravitational field that is not influenced by the quantum fields. Here one may think of sources of gravitational fields that are not influenced by the quantum fields under consideration, as high-energy experiments in the gravitational field of the earth or quantum fields in the gravitational field of dark matter and dark energy. This approach amounts to the treatment of quantum field theory on curved spacetimes. The problem of quantization in curved spacetimes is now clearly visible. In Minkowski spacetime, there is a large group of symmetries that enforces a particular choice of vacuum by demanding the vacuum to be invariant. Such a criterion is absent for a general spacetime (M,g). We therefore do not know which state to choose as the vacuum. One might hope that the different prescriptions might be unitarily equivalent such that it doesn't matter which state one takes to define the theory. Sadly this is not the case: The Stone-Von Neumann theorem is no longer valid for systems with an infinite amount of degrees of freedom. This means that unitarily inequivalent representations of the canonical commutation relations will arise, and it is not clear which equivalence concept representation is the physical one. In the second section of this chapter, we review the notions of Cauchy surfaces and global hyperbolicity.

Research Article **Published Date:-2024-01-18 12:16:50**

Markov Chains of Molecular Processes of Biochemical Materials

Biochemical systems are analytically investigated after encoding the properties of the dynamics, which rule the time evolution of the transition properties, using some Markov models, such as the Hierarchical Markov-State Models. The present paper is aimed at analytically writing the (finite) Markov chain originating from the considered Markov models. Within this framework, the interaction with the environment is considered, and the ergodicity of the systems obtained from numerical simulation is controlled and compared with the qualities of the Markov chain. The (von Neumann) conditions to be imposed on the Bloch equations for the biomaterial structures to be described analytically in a consistent way are governed. The formalisms of the 'heat bath' and that of the control of the numerical errors ensure the good measure-theoretical framework and the ergodicity of the finite chain, respectively. The finite Markov chains are investigated and the analytical expressions are presented, after which the Hierarchical Markov-State-Model provides the time evolution of the transition probabilities in biochemical systems.

The notion of heat bath is used to describe the interactions of the biomaterial with the environment and thus to control the uses of the projection operators in the Markovian processes where the appropriate measure is defined; the stochastic equations allow one to obtain the wanted measure from the probability spaces.

The cases in which a violation of the Markov property of the process occurs, i.e. in open systems, or dissipative processes are also considered. Furthermore, in complex molecules in biological systems, these features are investigated to be possibly even more dramatic. As far as molecular processes are concerned, this occurrence is associated with the appearance of chaotic effects with certain characteristics of potential surfaces: rather than the technique of isocommittors, the method of projectors in measure spaces is used for the Nakajima-Zwanzig paradigm for the density operator; this latter method complementary compares the time-convolution-less technique.

The finite Markov chains are finally proven to be ergodic after the control of the numerical errors which provide the Sinai-Markov partitions to be applied for the analysis of the measure space of the Markov chain, that is, one endowed with a Hilbert measure. The von Neumann conditions are therefore newly demonstrated to be apt to be applied to the Bloch equations for biomaterial structures after the use of the notion of heat bath, from which the measure space arises.

The qualities of the Hierarchical Markov-Sate Models which bring the analytical expression of the time evolution of probabilities of biomaterials are therefore newly analytically studied.
