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Halmak Aliaksandr M., **Many-placed operations**
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In this report for every $k \geq 2$, $l \geq 2$, $m \geq 1$ and each permutation σ of the set $\{1, 2, \ldots, k\}$ l-ary operations $[\ ]_{l,k}$, $[\ ]_{l,\sigma,k}$ .and $[\ ]_{l,\sigma,m,mk}$ are defined and studied.

Atanasiu Gheorghe and Neagu Mircea, **On Cartan Spaces with the m-th Root Metric**
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The aim of this paper is to expose some geometrical properties of the locally Minkowski-Cartan space with the Berwald-Moór metric of momenta $L(p)=\sqrt[n]{p_{1}p_{2}...p_{n}}$. This space is regarded as a particular case of the m-th root Cartan space. Thus, Section 2 studies the $v-$ covariant derivation components of the m-th root Cartan space. Section 3 computes the $v-$curvature d-tensor S^{hijk} of the m-th root Cartan space and studies conditions for $S3-$likeness. Section 4 computes the $T-$tensor T^{hijk} of the m-th root Cartan space. Section 5 particularizes the preceding geometrical results for the Berwald-Moór metric of momenta.

Vargashkin Vladimir Ya., **Results of search of the allocated direction and the non-homogeneity of the universe on the basis of statistics of distribution of quasars on celestial sphere**
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The database of quasars and active kernels of the French observatory Saint-Michel containing results of supervision more than 108.000 objects is analyzed. The catalogue does not contain data on own movement of quasars.
It is possible to assume that quasars have own movement which forms a visible stream of quasars on celestial sphere and which orientation reflects global anisotropy of the Universe. During realization of this stream quasars form areas visible divergences and convergences. However direct search of these zones as plots with it is abnormal high or it is abnormal in low density of distribution of quasars on heavenly sphere, now it is impossible. The matter is that zones of detailed supervision of quasars, and also a limit of depth of search of quasars on red shift z have appeared distributed on heavenly sphere very non-homogeneity.
Therefore distribution of angular coefficient of an inclination of a straight line of regress of functional dependence of relative density p of distribution of quasars on z from red shift z within statistical windows on celestial sphere has been subjected the analysis. Thus windows with the angular factor increased on absolute significance are interpreted as divergence areas, and with lowered – as convergence areas.
Distributions of angular coefficient on the celestial sphere, received at various ways of elimination of influence of tails of distribution p on z, have been spread out abreast on spherical functions. By results of decomposition the dipole moment is allocated. These angular spherical coordinates estimated from 95 % by the probability at various ways of preparation of experimental data, make: direct ascension α=6 *h* 1,36'…6 *h* 1,44'; declination: β =–20 …–23 º. The relation of the module of the dipole moment to a monopole component has appeared lying within 2,30 … 2,35 that testifies to the statistical importance of

the found out allocated direction. About same weak dependence of the received results on a way of preparation of sample of experimental data testifies.
Besides, during the distribution analysis on celestial sphere in a range of scales of distances about tens gigaparsec areas, under the characteristics reminding large-scale structure of the Universe as sets «sheets» and «voids» which are known in scales of distances about tens and hundreds megaparsec are revealed.

Peter Rowlands. **Fermion and vacuum, local and nonlocal**
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The nilpotent formulation of relativistic quantum mechanics leads to the simultaneous creation of the fermion and its own vacuum state, or 'rest of the universe' as seen by the fermion. The mathematical structure which makes this possible also leads to universal conditions for locality and nonlocality, which must apply simultaneously.

Alizada Tahir Ali. **Generalization of complex quantities for mathematical modeling of a multidimensional process**
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A concept of multicomplex quantities is introduced which are extensions of complex numbers. In contradistinction to hypercomplex numbers the multicomplex quantities retain all characters of complex numbers including commutativity of multiplication. Multicomplex variables can be used for the description of multidimensional objects, processes and mathematical models.

Melnikov V.N. **Multidimensional Generalizations of GR and problems of Cosmology**
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Problems of gravitation as the fundamental interaction are analyzed.
Some properties of integrable multidimensional cosmological models with different matter sources are described, present acceleration, nonsingular models and variations of effective G in these models in particular.
Basics of gravitational-relativistic metrology related to precise space-time measurements are also presented. Possible future transition to new definitions of SI units in 2011, based on fundamental physical constants are discussed.
Fundamental physical constants choice, classification, number, precision of measurement and connection to fundamental physical theories are analyzed
Special attention is paid to the problems of Newton's gravitational constant G: its absolute value measurements and possible time and range variations.
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R. Ibadov[1], B. Kleihaus[2], J. Kunz[2]. **About Gravitating dyons, dyonic monopole-antimonopole systems and black holes**

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We consider various aspects gravitating dyons, dyonic monopole-antimonopole systems and black holes. Particularly, non-Abelian dyons in Einstein-Yang-Mills-Higgs theory. The dyons are spherically symmetric with unit magnetic charge. For large values of the electric charge the dyons approach limiting solutions, related to the Penney solutions of Einstein-Maxwell-scalar theory.

Kokarev Sergey, Pavlov Dmitry, **Additive polyangles in H_3**
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The problem of conformal-invariant additive polyangles (biangles and triangles) construction is considered within H_3 hypercomplex polynumbers. Additivity condition is reduced to some functional equation on space of conformal-invariant variables, which can be solved in some special cases. We investigate the problem of additive polyangles both from the viewpoint of generalized geometry (Berwald-Moor geometry) and generalized "complanarity condition", which vectors (polynumbers) in additivity condition obeys to. Some concrete examples of additive polyangles are performed.

Fil'chenkov M., Laptev Yu., **Anisotropic Cosmological Models Revisited**
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Anisotropic cosmological models are considered in the framework of both General Relativity and quantum cosmology. Classical models are described in terms of Raychaudhuri's equation. The Hamiltonian formalism is used to obtain Wheeler-DeWitt's equation in quantum cosmology. The observational cosmology data are interpreted on the basis of theoretical results. Some Finslerian generalizations are discussed.

Bolokhov Sergei V., **On the description of elementary particles in Finslerian spaces**
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The description of elementary particles in terms of spinors associated with Finslerian spaces is considered. The non-quadratic invariant forms naturally arise when describing the states of particles in momentum space which is assumed to be a primary concept in many physical models of interaction such as well-known S-matrix theory, as well as the relational scheme of interactions proposed by Yu.S.Vladimirov. The spinor representation of Lorentz group induces the natural correspondence between momentum spaces of various dimensions and special type of vector spaces equipped with invariant metric forms of higher order. Different classes of these Finslerian invariant forms are shown to be connected with internal states of particles.

Morozov Andrey, **Influence of spatial anisotropy of the Universe on fluctuations of ion mobility**
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Measurements in small volumes of electrolyte with the thickness of 6 μkm contained in thin canals with the diameter of 0.2...0.4 μkm have been carried out. Results of experimental data averaged for the period of 1436 minutes are presented and the dependence of ion mobility fluctuations on the orientation of the experimental setup is shown. A conclusion has been made about single-axis space anisotropy in the direction close to the direction of the center of the Galaxy. The obtained magnitude of relative anisotropy is equal to 10^{-5} relative units, which exceeds the expected value connected with space deformation by gravitational field of the Galaxy by an order of magnitude.

Gladyshev V.O., Gladysheva T.M., Sharandin Ye.A., Tiunov P., Leontiev A.,
3-Dimentional interferometric optical experiments for observing anisotropy of space
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Results of interferometric experiment for observating space anisotropy are presented in the work. In experiments a disc optical interferometer was used, the interferometer was continuously rotated in horizontal plane during a day and a night. In the interferometer light from a He-Ne laser propagated in opposite directions in an optical disc rotating with frequency 250Hz.
The obtained results of measurement of interference pattern shift have a view of dipole anisotropy, and direction of a dipole coincides with the direction of dipole anisotropy of the relict radiation. In the report the signal spectrum and noise sources are discussed.

Vladimir Balan, **Spectral properties and applications of the numerical multilinear algebra of m-root structures**
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In the framework of supersymmetric tensors and multivariate homogeneous polynomials, the talk discusses the Berwald-Moor case. The eigenvalues and eigenvectors are determined; the recession and degeneracy vectors, characterization points, rank, asymptotic rays, base index, are studied. As well, the best rank-one approximation is derived, relations to the Berwald-Moor poly-angles are pointed out, and a brief outlook on real-world applications is provided.

Vladimir Balan, Ariana Pitea, Ileana-Rodica Nicola, **Mean curvature and KCC theory in Berwald-Moor pseudo-Finslerian framework; theoretical aspects and symbolic software developments**
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A short parallel is presented between the classical Finsler (with positive definite Finsler fundamental tensor) and the more recent pseudo-Finsler (the non-degenerate indefinite alternative) frameworks. Specializing to m-root metrics (to Berwald-Moor cases, in particular) are examined both the Y-mean curvature for hypersurfaces, and the KCC stability basic objects. The theory is compemented by a MAPLE-computer software package which builds in dimensions 3 and 4 the main geometric ingredients.

Olin E. A., **Minimal surfaces. which are isometry invariant in three-dimensional Finsler spaces with Randers metric**
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The theory of minimal surfaces in Riemannian spaces is well-developed, however minimal surfaces in Finsler spaces are not so well-studied. Wide class of Finsler spaces are Randers spaces. They occur in physical applications -Finsler metric of Randers spaces is the Lagrangian of relativistic electrons in electromagnetism [4]. Minimal surfaces have a long history of lying in the interface between physics and mathematics, because physics problems can be posed as extremal problems and because the mean curvature is the lowest-degree, rotationallyinvariant scalar, minimal surfaces arise as solutions. This is one of the reasons why it is interesting to understand the nature of minimal surfaces in Finsler geometry, in Randers spaces in particular. The fundamental result in this subject was given by Z. Shen [2], where he introduced the notion of mean curvature for immersions into Finsler spaces via variational methods. If this mean curvature is identically zero, then the immersion is said to be minimal and is a critical point of the volume functional. In general, Randers metric is a Finsler metric F (x, y)= ®(x, y)+ .(x, y), where ®(x, y) is a Riemannian metric, and .(x, y) – 1-form, whose norm in metric is less than 1. In [1,3] minimal surfaces in the spaces with Randers metric were considered. In [3] there was obtained the equation which describes minimal immersions in a at Randers space, and rotationally invariant minimal surfaces were studies in Randers spaces with special metric py21+ y22+ y23+by3, b< 1, and the rotation is about x3 axis.

We are study minimal ruled surfaces which are invariant under the one-parameter isometry group in three-dimensional Randers space with the special metric py21+ y22+ y23+ by3, b< 1. It is proved that all such a minimal surfaces are helixes (t cos µ, t sin µ, k. + a). Note that for immersion into Euclidean space this result is known.

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Vladimirov Yuri, **Finslerian Geometry and the Relational Approach in Physics.**
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The class of Finslerian geometries corresponding to the multipoint geometries very close to the Berwald-Moore geometry is considered. It is shown that in the relational approach in physics based on the action-at-a-distance idea and on the theory of systems of relations, the properties of multipoint geometry appear in a number of key statements of the theory. It holds true in case of relational formulation of classical physics as well as physics of microcosm.

Kauts V.L., **Dark Matter in the Solar System**
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There are several processes able to increase the density of dark matter in the Solar system:

1. gravitation-collisional capture
2. gravitational capture
3. particles focusing in the Solar system gravitational field
4. baryon compression

Some mechanisms of dark matter density enhancement in the Solar system are considered in detail in the talk. Also, the unexplained phenomena within Solar system (the Pioneer anomaly and the flyby anomaly) are discussed.

Turbin Anatoly F., Jdanova Yulia D., **Lost in multidimensional Euclidean paradise**
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One of enigmatic disagreement in multidimensional Euclidean geometry is the assertion that [1-5]:

1. in E^4 there exist *6 (and no more!)* types of regular polyhedrons;
2. in E^n, $n \geq 5$, there exist *3 (and no more!)* types of regular polyhedrons.

This assertion ascending to L.Shlefli (1850) has become a "geometrical dogma".

Our researches on classification of multidimensional algebras of hypercomplex numbers have lead us to discovering the "multidimensional Euclidean paradise": starting from dimension $n = 4$ the number of regular polyhedrons in multidimensional space E^n is infinite! "To wander and not to lose a way" in multidimensional space E^n, we leant upon the followings heuristic principles:

a) if in the space E^n there exist a great variety Π_n of regular polyhedrons then in the space E^{n+1} there exist regular polyhedrons, n-the measured verges of which are polyhedrons from Π_n;

b) the possibility (let even theoretical) of visualization of multidimensional regular polyhedrons (multidimensional vision);

c) active using of representations of finite sub-groups of group of orthogonal transforms $SO(n)$.

Thus since the number of regular polyhedrons is in space E^4 infinite (but not six, as accepted to consider), with growth of dimension the number of regular polyhedrons expands $\aleph_0$-exponentially. It results to the necessity of classification in the variety Π_n of regular polyhedrons in E^n.

Sherkova Tatiana A., **Egypt before pyramids**
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First settlers in the Nile Valley: archaeological survey. Creation of cultural space. Predynastic culture – the mother of civilization. Mythological images of the universe. Divine kingship. Funerary rites and architecture. From mastaba to pyramid. The excavations of the ancient Egyptian temple in the Nile Delta. Traditions and innovations.

Koivisto Tomi, **Anisotropy in Cosmology**
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According to the standard inflationary paradigm of cosmology, the structure in the universe originates from quantum fluctuations during an early period of inflation. In usual models the primordial spectrum of fluctuations is statistically isotropic and nearly Gaussian. The initial perturbations can be observed in the cosmic microwave background (CMB), and they form into galaxies and galaxy clusters as the universe evolves. Thus the assumption of (statistical) isotropy can be tested with high precision. Some anomalous features have been observed in the large scale structure and in the CMB, possibly indicating cosmological anisotropy of the order of few percents. Some existing models try to connect the anomalous observations with the late-time acceleration of the universe (anisotropic dark energy) or with the generation primordial fluctuations (anisotropic inflation).

Petoukhov S.V., **Anisotropy of biological spaces and a cyclicity of physiological processes from the viewpoint of Yin-Yang-algebras of the genetic code**
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The lecture is devoted to 8-dimensional algebras of the genetic code and to relevant 8-dimensional numeric systems, which were revealed at analysis of matrix presentations of genetic code structures.

These algebras are an adequate instrument of studying the genetic code. Analysis of these algebras and of their multi-dimensional geometries shows anisotropic character of relevant "genetic spaces". Mutual cyclic transformations among members of a great set of these genetic algebras at conditions of cyclic permutations of genetic elements in genetic matrices are demonstrated. These genetic algebras are used for modeling of phenomena of anisotropy and a cyclicity in living matter.

Zhotikov V.G. **Finsler geometry and Relativity principle**
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Connection between Finsler geometry and a principle of the least (extreme) action in physics is established. On this way we come to new, invariant-geometrical (without coordinate description) to the form of the equations relativistic dynamics [1] to which necessity of construction repeatedly paid attention PA.M. Dirac [2]. The given form of relativistic dynamics describes system of the evolutionary equations in corresponding phase space of every possible observers described from the point of view of ensemble (generally nongolonomical). The gauge transformations of Finsler metrics are considered and examined. This gives the basis to formulate new, more the general laws of preservation which are working in non-uniform space-time. The received results allow for us to formulate new, more common point of view on essence of the Principle of relativity (special and general) in physics.
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Taha Selim, **Spacetime as the bedrock of physics** (Poster)
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Every physical process takes place within spacetime setting. We study this process by spacetime geometry which depends on events and world lines of particles like Euclidean geometry which depends on points and curves. Spacetime setup by observer or reference frame and it can give us a global picture for the universe. If fundamental laws of physics are the same in all regions of the universe, we led to four – dimensional manifold, M, description of spacetime. In global picture the matter content in the universe determines energy – momentum tensor and this in turn determines the curvature of spacetime via famous Einstein's field equation.
Here we found that spacetime is the whole physics. We show and explain spacetime, and as the bedrock of physics by physical meaning, concepts and mathematical language from classical mechanics, special and general relativity to the world of super strings and parallel universes (multiverse). We show how spacetime develop our understanding to universe and we need more than four dimensions for space or not? Is geometry describing universe better that relativistic geometry or not? Finally, we show cosmology according to spacetime itself

Zakharov Valeri, **Physics and generalized spaces**
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Generalized geometrical spaces underlie the modern physics. The special case of them are the Finsleroid – Finsler fibre spaces, which allow to construct a Univers model taking into account the anisotropy factor. Whence does this "inconceivable effectiveness of mathematics in the physics" occurs? A Einstein named

it a wonder, and this wonder means the existence of the modern theoretical physics, which has for object the abstract (metaphysical) geometrical forms. Meanwhile there exists no logical ground of the metaphysics, because there exists no logical definition of distinction between the sensual perceptions and the pure ideas. So it is possible to say: an inconceivable effectiveness of mathematics is that mystery, which makes the modern physics like a magic.

Silagadze Zurab, **Special relativity and geometry**
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Special relativity is no longer a new revolutionary theory but a firmly established cornerstone of modern physics. The teaching of special relativity, however, still follows its presentation as it unfolded historically, trying to convince the audience of this teaching that Newtonian physics is natural but incorrect and special relativity is its paradoxical but correct amendment. We argue in favor of logical instead of historical trend in teaching of relativity. In fact the inspection of the geometrical foundations of special relativity shows that special relativity is neither paradoxical nor correct (in the absolute sense of the nineteenth century) but the most natural and expected description of the real space-time around us valid for all practical purposes. This last circumstance constitutes a profound mystery of modern physics better known as the cosmological constant problem.

Siparov Sergey, **Introduction to the problem of the anisotropic geometrodynamics**
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The equation of the generalized geodesics obtained for the anisotropic space makes it possible to produce the equation for the gravity force that contains not only the Newtonian term but also the terms proportional to the velocity of a particle and to a proper motion of the gravity source. This approach preserves all the results of classical geometrodynamics and provides the missing explanation for such observed phenomena as rotation curves of the spiral galaxies and Pioneer effect.

Klimes Ludek, **Hamiltonian formulation of Finsler geometry**
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We would like to demonstrate that the Hamiltonian formulation simplifies the equations of the Riemann geometry, and makes the Finsler geometry no more difficult than the Riemann geometry (Klimes, 2005).
The basics of the Finsler geometry were formulated by Hamilton (1937), including the figuratrix (surface of normal slowness), indicatrix (Fresnel wave surface), equations of geodesics (general equations of rays, now called Hamilton equations), distance between points (characteristic function), equations for the distance (now called Hamilton-Jacobi equations), etc. Solution of the equations of geodesics also yields the first-order partial derivatives of the distance with respect to spatial coordinates.
The Hamiltonian equations of geodesic deviation in the Finsler geometry have been derived by Cerveny (1972). Solution of these linear ordinary differential equations along geodesics also yields the second-orderpartial derivatives of the distance with respect to spatial coordinates.
The third-order and higher-order partial derivatives of the distance with respect to spatial coordinates can be calculated by simple numerical quadratures along geodesics (Klimes, 2002). The first-order and higher-order perturbation derivatives (derivatives with respect to arbitrary perturbation parameters) of the distance or of its spatial derivatives can also be calculated by simple numerical quadratures along geodesics (Klimes, 2002).

In the Hamiltonian formulation, it is also simple to calculate the amplitude of waves which propagation is described by the Finsler geometry (Cerveny, 1972), along with the spatial and perturbation derivatives of the amplitude (Klimes, 2006).

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Bogoslovsky G.Yu., **Finslerian general relativity based on the group DISIMb(2)**
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Within the framework of Finslerian general relativity based on the group DISIMb(2) we explain the fact that the velocity of a particle in a circular orbit around a finite spiral galaxy becomes independent of the radiusof the orbit at large radii.

Hamza Rawash, **Experimental and observable results**
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The paper gives us experimental and observable results of existence of anisotropy in different worlds of our Universe, control of free pyramid (to scale) motion by Pulsed laser beam or magnetic field or electric field in specific direction. Also AGN radiation in polar direction, haw do Finsler geometry with Berwald - Moor metric explains pioneer anomaly and Fly by anomaly also rotation of planets by MAGDA.

Laemmerzahl Claus, **Confronting Finsler space–time with experiment**
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Within all approaches to quantum gravity small violations of the Einstein Equivalence Principle are expected. This includes violations of Lorentz invariance. While usually violations of Lorentz invariance are introduced through the coupling to additional tensor fields, here a Finslerian approach is employed where violations of Lorentz invariance are incorporated as an integral part of the space–time metrics. Within such a Finslerian framework a modified dispersion relation is derived which is confronted with current high precision experiments. As a result, Finsler type deviations from the Minkowskian metric are excluded with an accuracy of 10^{−16}. -- In addition to the photon sector we work our corresponding consequences for a Finslerian extension in the matter sector. Such an extension in the quantum equation for a scalar particle can be explored using atomic interferometry where the photon recoil which can be measured very precisely depends on the full Hamiltonian of the atomic wave. Such terms are also accessuble through Hughes-Drever type experiments which have the potential to rule out such anisotropies at the level of 10^{-30}.

Kagramanova Valeria, **Static higher dimensional space--times with integrable equations of motion**
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The complete analytical solutions of the geodesic equations of massive test particles in higher dimensional Schwarzschild, Schwarzschild—de Sitter, Reissner-Nordtr\"om and Reissner--Nordstr\"om--de Sitter space--times are presented. Using the Jacobi inversion problem restricted to the theta divisor the explicit solution is given in terms of Kleinian sigma functions. Types of derived orbits depend on the structure of roots of characteristic polynomials being a function of particle's energy and angular momentum, of the charge of the gravitational source and the cosmological constant. We show that bound orbits exist only in Schwarzschild--anti-de Sitter space-times and in higher dimensional Reissner--Nordstr\"om--(de Sitter) space--times where a particle is prevented from falling into the singularity by a potential barrier.

Noureddine Mebarki, **Induced Inhomogeneities, Modified gravity, dark matter and energy and matter antimatter asymmetry from noncommutative geometry**
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Using noncommutative deformed canonical commutation relations, a model of gravitation is constructed and a schwarchild like static solutions are obtained. As a consequence, the Newtonian potential is modified and the expression of the gravitational acceleration proposed in the modified Newtonian dynamics theories (MOND) is obtained explicitly without any ad hoc asymptions. Moreover, the noncommutative Friedman like non static solutions are also obtained and discussed. It turns out that the noncommutativity of the geometry plays an important role in explaining the origin and evolution of our universe,dark matter and energy as well as the matter and antimatter asymmetry. Similar to the Turok model,our universe starts with a big crunch followed by a Big Bang in a cyclic infinite sequences.

Mueller Hartmut, **Scaling as a fundamental property of natural oscillations of matter and the fractal structure of space-time**
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A mathematical model of natural (resonant) oscillations of a chain system of protons will be presented.
The distribution of radioactivity fluctuations in the proton resonance spectrum will be discussed.
The character of the interaction of electromagnetic radiation with matter depends on the distribution of the electromagnetic wave lengths in the proton resonance spectrum.
A classification of the celestial bodies of the Solar system in dependence on the distribution of the celestial bodies physical properties will be discussed.
The fractal structure of matter of all scales can be understood as a consequence of resonant oscillation processes.
Scaling of resonant oscillation processes determines the space-time scales of the universe.