Soviet and Japanese Aerospace Literature

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Soviet Aerospace Literature
This month: *Theoretical Cosmology*

A90-42970 The model and evolutionary status of the close binary system V 367 Cygni (O modeli i evoliutsionnom statuse tesnoi dvoinoi sistemy V 367 Lebedia). E. V. MENCHENKOVA, *Astronomicheskii Zhurnal* (ISSN 0004-6299), Vol. 67, May–June 1990, pp. 653–656. 13 Refs.

Observed parameters of the stellar components of V 367 Cygni have been compared with the theoretical ones for main sequence stars of the same mass, and considerable excesses in radii and luminosities of both components of the system were found. The whole set of observed characteristics of the bright, less massive component is well described by the existing theory of the evolution of close binary system of medium mass. It is also shown that the luminosity abundances of the secondary component cannot be explained within the framework of the disk accretion model.

A90-34983 Equilibrium flavor dynamics during the cosmic confinement transition. B. KAEMPFER, *Astronomische Nachrichten* (ISSN 0004-6337), Vol. 310, No. 3, 1989, pp. 203–212. 22 Refs.

The dynamics of the flavor composition of strongly interacting matter during the cosmic confinement transition is followed in a simplified thermodynamical model. Relying on thermal, mechanical, and chemical equilibrium, the strangeness fraction of strongly interacting matter is analyzed. Due to equilibrium with respect to Delta-S = 0 and Delta-S = 1 weak interactions, the relations between different flavors depend strongly on the poorly known lepton excess. In a universe where the lepton (antilepton) excess is in the same order of magnitude as the baryon excess, the strange quark abundances are suppressed (enhanced). In the hadron phase, the strange baryons carry up to a half of the baryon excess.

A90-22786 Behavior of volatiles in the evolution of the solar nebula (Povedenie letuchikh v protsesse evoliutsii doplanetnogo oblaka). I. L. KHODAKOVSKII, V. A. DOROFEEVA, and A. B. MAKALKIN, Space chemistry and comparative planetology; International Geological Congress, Session, 28th, Washington, DC, July 9-19, 1989, Reports (A90-22785 08-91). Moscow, Izdatel'stvo Nauka, 1989, pp. 5–15. 28 Refs.

The equilibrium composition of condensates of gas of solar composition is calculated using the model of P-T conditions in the solar nebula during the phase of its postaccretion evolution and dissipation. Results indicate that condensates produced in the formation zone of the terrestrial planets could not be responsible for the existing abundances of volatiles in them. It is suggested that the bulk of volatiles on Venus, earth, and Mars could have been supplied by planetisimals (r = 100 m to 10 km), transported due to diffusion from R = 5 AU to R = 15 AU, and captured by the growing planets during the final stage of their accumulation.

A90-44054 The wave function of the De Sitter universe (Volnovaia funktsiia vselennoi De Sittera). A. I. ZHUK, *Ukrainskii Fizicheskii Zhurnal* (ISSN 0503-1265), Vol. 35, Jan. 1990, pp. 7–11. 9 Refs.

The quantum cosmological De Sitter model is examined. The Hartle-Hawking expression for the wave function of the universe makes it possible to select a particular solution of the Wheeler-de Witt equation in the space of the imaginary values of the conformal factor a. An analytic expression for this solution is obtained, and its analytic continuation to the space of real values of a is effected.

A90-33200 Concealed parameters of dark matter and galaxy formation. V. N. LUKASH, Morphological cosmology; Proceedings of the Eleventh Krakow Cosmological School, Krakow, Poland, Aug. 22-31, 1988 (A90-33176 13-90). Berlin and New York, SpringerVerlag, 1989, pp. 331–339. 14 Refs.

The major dark-matter parameters responsible for the appearance of large-scale structure in the multicomponent universe are analyzed. Special consideration is given to some matter components, which are now elusive both dynamically and experimentally, that played a very important role in the early universe. Among these are dark baryons, which are considered to be highly perturbed or light weakly interacting particles which were relativistic near the equality epoch. They thus affected the cosmological perturbation spectum and left prints in the observable large structures, such as scales of cosmic voids and superclusters, microwave background parameters, and peculiar velocities. The need to take into account some concealed parameters of dark matter when modeling the large-scale structure of the universe is stressed. The paper discusses a new cosmological test of the fundamental world constant, the total amount of light particles in the universe relating to one relic photon.

A90-33736 The thermal regime of Venus. V. S. SOLOMATOV and V. N. ZHARKOV, *Icarus* (ISSN 0019-1035), Vol. 84, April 1990, p. 280-295. 50 Refs.

In the present numerical modeling study of the thermal evolution of Venus, the mantle is taken to be composed of independently convecting upper and lower mantles. A novel parameterization is used which takes into account recent numerical investigations in media with complex rheology. The parameters of the convecting planet in the asymptotic regime do not depend on initial conditions, and are ascertained analytically. Convection in the lower part of the crust is demonstrated to be involved in regions having specific crustal composition; heat transfer to the surface is primarily via advection by magmas that are produced by melting of the lower layers of the crust.

A90-33204   **Primordial black holes and their cosmological conse-quences.** A. G. POLNAREV, Morphological cosmology; Proceedings of the Eleventh Krakow Cosmological School, Krakow, Poland, Aug. 22-31, 1988 (A90-33176 13-90). Berlin and New York, SpringerVerlag,1989, pp. 369–376; Discussion, pp. 376. 25 Refs.

This paper shows that observational upper limits on the abundance of primordial black holes (PBHs) can be used as a method for obtaining nontrivial upper limits on the spectrum of initial metric perturbations and physical conditions in the very early universe. This method provides restrictions on cosmological models which predict the stages with soft equations of state, as well as on models which predict comparatively large metric perturbations at very small scales.

A90-29087   **Vacuum-dominated conformal cosmology (Vakuumno-dominirovannaia konformnaia kosmologiia).** V. M. PYZH, *Problemy ladernoi Fiziki i Kosmicheskikh Luchei* (ISSN 0131-3142), No. 29, 1988, pp. 44–57. 21 Refs.

The problem of the stability ofmaterial perturbations above cosmologi-cal vacuum is investigated in the framework of a conformally symmetric model with two scalar fields. It is shown that, in the conformally invariant generalization of general relativity, there exists a stable vacuum cosmolog-ical solution; the existence of this solution is substantially conditioned by the vacuum quantum properties (the Casimir effect). An investigation of the material perturbations above the vacuum indicates that the universe can evolve in an oscillating multiperiodic regime, without reaching a singular state anywhere.

A90-29039   **Duplicity of hot helium subdwarfs (Dvoistvennost' goriachikh gelievykh subkarlikov).** A. V. TUTUKOV and L. R. IUN-GEL'SON, *Astronomicheskii Zhurnal* (ISSN 0004-6299), Vol. 67, Jan.–Feb. 1990, pp. 109–114. 16 Refs.

In the framework of the standard scenario for the evolution of medium-mass close binary systems, the initial masses, mass ratios, and orbits of the major axes are found for evolution leading to the formation of helium subdwarfs. The total birthrate of binary systems with subdwarfs in the Galaxy is about 0.0067/yr. The majority of single blue helium subdwarfs are produced by merging degenerate helium dwarfs. The birthrate of these subdwarfs is 0.029/yr. The theoretically estimated duplicity fraction of subdwarfs is about 0.2, a value that does not contradict the preliminary results from the observations of Saffer and Liebert (1988).

A90-29033   **Nonlinear thermal instability in a nonstationary medium—The evolution of density fluctuations (Nelineinaia teplovaia neustoichivost' v nestatsionarnoi srede—Evoliutsiia vozmushchenii plotnosti).** A. G. KRITSUK, *Astronomicheskii Zhurnal* (ISSN 0004-6299), Vol. 67, Jan.–Feb. 1990, pp. 40–53. 24 Refs.

Condensational instability of radiating hot intergalactic gas is consid-ered. This instability is the possible cause of formation of the inhomoge-neous structure in the intracluster medium. The modal content of diverse initial disturbances and the evolution of density fluctuations are investi-gated. The influence of initial fluctuations spectrum and of the initial gas temperature on the properties of inhomogeneities formed when gaseous clumps cool to about 10,000 K is analyzed by means of one-dimensional nonlinear gas-dynamic modeling. The effects of thermal conductivity are simulated with the introduction of threshold wavelength in the initial spectrum. It is found that gas cooling from 10 million K results in the formation of compact gas clumps containing less than 30 percent of the total mass.

A90-27033   **Radial mixing of material in the asteroidal zone.** T. V. RUZMAIKINA, V. S. SAFRONOV, and S. J. WEIDENSCHILLING, As-teroids II; Proceedings of the Conference, Tucson, AZ, Mar. 8-11, 1988 (A90-27001 10-91). Tucson, AZ, University of Arizona Press, 1989, pp. 681–700. 62 Refs. (NASW-3516; NASW-4294).

The asteroid belt shows radial zoning of compositional structure. The most abundant types are successively S, C, and P types from the inner to the outer parts of the main belt, and D type in the Trojan clouds. This paper examines processes for producing this structure before, during, and after the accretion of asteroids. The initial structure is established by tempera-ture and composition gradients in the turbulent solar nebula during the collapse of the presolar cloud. The radial scale of the zoning, comparable to the disk thickness, favors disk models with relatively low turbulent viscosity. Radial decay of solid bodies due to gas drag during settling to the central plane and planetesimal formation probably causes only a small degree of mixing, due to the systematic nature of drag-induced motions. The formation of Jupiter causes scattering of massive planetesimals from that planet's zone through the asteroid zone. The present random velocities of asteroids resulting from that stirring process are consistent with the radial scale of transitions between compositional types.

A89-51413   **The model of baryonic islands of large structures.** I. D. NOVIKOV, *Large scale structure and motions in the universe; Proceedings of the International Meeting,* Trieste, Italy, Apr. 6-9, 1988 (A89-51401 22-90). Dordrecht, Kluwer Academic Publishers, 1989, pp. 159–167; Discussion, p. 168. 12 Refs.

The possibility of baryonic islands existing in the universe is discussed. The dynamical evolution of matter inside and outside such an island is analyzed, and expressions for the characteristics of the island border are obtained. Observational tests for such island borders are described whose results do not contradict existing observational data.

A90-22789   **The thermal regime of Venus (O teplovom rezhime Venery).** V. S. SOLOMATOV and V. N. ZHARKOV, Space chemistry and comparative planetology; International Geological Congress, Session, 28th, Washington, DC, July 9-19, 1989, Reports (A90-22785 08-91). Moscow, Izdatel'stvo Nauka, 1989, pp. 33–45. 15 Refs.

Models of the thermal evolution of Venus andthe thermal regime of the Venusian crust are considered. A two-layer crust model is proposed, with an upper elastic layer (15-20 km) and a lower layer (50-100 km) in the state of subsolidus convection. Convection in the crust is assumed to be the dominant mechanism of heat transfer from the mantle to the surface of the planet. It is shown that the depth of the convective crust may be determined by the basalt-eclogite transition.

A90-21863   **The relativistic kinetic equation for gravitating particles in the Friedmann universe (Reliativistskoe kineticheskoe uravnenie dlia gravitiruiushchikh chastits v mire Fridmana).** A. V. ZAKHAROV, *Astronomicheskii Zhurnal* (ISSN 0004-6299), Vol. 66, Nov.–Dec. 1989, pp. 1208–1226. 10 Refs.

A chain of interlocking kinetic equations for one-particle, many-parti-cle, etc. distribution functions for relativistic gravitating particles is constructed. The gravitational interaction is described in the framework of general relativity. It is shown that, for constructing the kinetic equation for the one-particle distribution function in the Friedmann universe with a second-order accuracy in the interaction constant, it is sufficient to use linearized Einstein equations and to disregard threeparticle correlations. The resulting kinetic equation in the nonrelativistic limit reduces to the equation obtained by Bisnovatyi-Kogan and Shukhman for an expanding universe in the framework of the Newtonian gravitational theory.

A90-21756   **Theoretical color-magnitude diagrams of open clusters (Teoreticheskie diagrammy tsvet-svetimost' rasseiannykh zvezdnykh skoplenii).** M. POPOVA and Z. KRAICHEVA, *Astrofizicheskie Issledovaniia (Sofia)* (ISSN 0324-1459), Vol. 5, 1989, pp. 43–50. 20 Refs.

Theoretical isochrones were constructed for clusters with ages between 10 to the 7th and 10 to the 9th yrs. The isochrones are transformed to M(v)-(B-V) coordinates. The ages of 40 open clusters are obtained on the basis of these isochrones.

A90-15608   **Star evolution in the upper part of the Hertzsprung-Rus-sell diagram (Evoliutsiia zvezd v verkhnei chasti diagrammy Gertssh-prunga-Ressela).** E. I. STARITSIN, *Astronomicheskii Zhurnal* (ISSN 0004-6299), Vol. 66, Sept.–Oct. 1989, pp. 975–982. 19 Refs.

The observed star distribution in the upper part of the Hertzsprung-Russell diagram can be explained if the evolution of stars of about 64 solar masses is accompanied by mixing of matter in the semiconvective zone and loss of mass at observed rates, and stars of about 128 solar masses have a stage in which matter is lost at the rate of about 0.01 solar mass per year. The theoretical estimate of the fraction of stars of WR type agrees with observation if the mass loss rate comes to equal the rate typical of WR stars when the hydrogen content in the stellar envelope is decreased to about 40 percent by mass.

A89-52855   **Dimensional reduction of the Kaluza-Klein universe due to the production of scalar particles (Razmernaia reduktsiia vselennoi Kalutsy-Kleina, obuslovlennaia rozhdeniem skaliarnykh chastits).** G. M. VERESHKOV and V. M. DRAGILEV, *Astronomicheskii Zhurnal* (ISSN 0004-6299), Vol. 66, July–Aug. 1989, pp. 673–679. 20 Refs.

The semiclassical self-consistent model of a minimally coupled massless scalar field in a five-dimensional homogeneous universe is examined in order to study a possible cosmological mechanism of compactification in the Kaluza-Klein approach. The energy-momentum tensor of real particles is calculated under the assumption that the temperature is much less than the inverse of the diameter of the internal space. It is shown that there exists a family of solutions with the internal-space diameter approaching a constant and the Friedmann expansion law for the observable dimensions at late times. All of these solutions are characterized by zero initial temperatures. The initial values of the internalspace diameter, the curvature scalar, and the scale factors are free parameters.

A89-53538   **On the quantum state of relic gravitons.** L. P. GR-ISHCHUK and IU. V. SIDOROV, *Classical and Quantum Gravity* (ISSN 0264-9381), Vol. 6, Sept. 1989, pp. L161–L165. 16 Refs.

It is shown that relic gravitons created from zeropoint quantum fluctuations in the course of cosmological expansion should now exist in the squeezed quantum state. The parameters of the squeezed state generated in a simple cosmological model which includes a stage of inflationary expansion are determined. It is pointed out that, in principle, these parameters can be measured experimentally.

A89-40704   **Possible explosion mechanism in the total cosmologi-cal model (Vozmozhnyi mekhanizm vzryva v polnoi kosmologicheskoi modeli).** B. V. CHIRIKOV, *Pis'ma v Zhurnal Eksperimental'noi i Teoretich-eskoi Fiziki* (ISSN 0370-274X), Vol. 49, March 10, 1989, pp. 261, 262. 8 Refs.

The paper examines the hypothesis of the very rapid expansion ('explosion') of the finite universe immediately after its quantum birth. The expansion coefficient, depending exponentially on the total number of fields in nature, is estimated. The results are of interest in connection with the inflationary hypothesis.

A90-10973   Cosmological solutions in relativistic gravitation theory (K kosmologicheskim resheniiam v reliativistskoi teorii gravitatsii). A. A. VLASOV, *Moskovskii Universitet, Vestnik, Seriia 3—Fizika, Astronomiia* (ISSN 0579-9392), Vol. 30, May–June 1989, pp. 88–90.

New solutions are obtained for equation of relativistic gravitation theory. The solutions describe a homogeneous and isotropic universe in the effective curved space. In Minkowski space, however, the universe is no longer uniform or isotropic.

A89-54433   Power-law inflation with continuous phase transition (in early universe). B. KAEMPFER, *Astrophysics and Space Science* (ISSN 0004-640X), Vol. 158, No. 1, Aug. 1989, pp. 35–42. 18 Refs.

The phenomenology of a cosmic-phase transition on the GUT energy scale is considered. Relying on numerical studies of the nucleation theory within a restricted range of parameters, an approximate power-law expansion is found, accompanied by a large increase of both the scale factor and the comoving entropy. The distinct feature of this particular idea is the fact that inflation and phase conversion of the GUT continuum proceed simultaneously. The generic features of such an idea are explored.

A89-52363   White holes in extended manifolds—The problem of existence. A. P. TROFIMENKO and V. S. GURIN, *Astrophysics and Space Science* (ISSN 0004-640X), Vol. 152, No. 1, Feb. 1989, pp. 105–117. 62 Refs.

The global structure of the Kerr-Newman space-time manifold is considered. It consists of different regions, subluminal and superluminal, which are separated by pseudosingular surfaces. Collapsing, anticollapsing, and oscillating motions are analyzed in such manifold, which correspond to black holes, white holes, and grey holes, respectively. The possibility of inner stability of the structure of space-time manifolds is shown, as well as the removal of some difficulties of the white hole theory. Anticollapsars are divided into four types, depending on the radius of maximal expansion.

A89-51635   Large-scale structure of the universe in unstable dark matter models. A. G. DOROSHKEVICH, M. IU. KHLOPOV, and A. A. KLYPIN, *Royal Astronomical Society, Monthly Notices* (ISSN 0035-8711), Vol. 239, Aug. 15, 1989, pp. 923–938. 37 Refs.

The formation and evolution of the large-scale structure in unstable dark matter (UDM) models. The main feature of the models is that galaxy formation stars after decays are discussed. Reasonable agreement was found with the observed picture for models with mass of decaying particles 60-90 eV and decay time $(0.3-1.5) \times 10$ to the 9th yr. Galaxy formation in UDM models starts at $z = 3$ if products of decays are relativistic at present or at least at $z = 6-7$ if the products are nonrelativistic.

A89-49229   A comparison of standard cosmological models with observations (Sravnenie modelei standartnoi kosmologii s nabliudeniiami). V. S. TROITSKII and I. V. GORBACHEVA, *Astronomicheskii Zhurnal* (ISSN 0004-6299), Vol. 66, May–June 1989, pp. 470–479. 14 Refs.

The $m(z)$ and $\theta(z)$ tests are used to study the determination of the curvature of the space-time and evolutionary characteristics of galaxies and quasars. Data on the luminosity of 169 galaxies and 3683 quasars were obtained in the redshift interval of 0.05-3.8. Data on the angular dimensions of 215 radio galaxies and 296 quasars were obtained in the redshift interval of 0.01-2. It is found that galaxies and quasars form a continuous smooth $m(z)$ curve which strongly deviates from the 5 lg z straight line at z greater than 1.

A89-35539   The hydrodynamic study of supernova 1987A in the Large Magellanic Cloud—The cooling wave stage (Gidrodinamicheskoe issledovanie sverkhnovoi 1987A v Bol'shom Magellanovom Oblake—Stadia volny okhlazhdeniia). V. P. UTROBIN, *Pis'ma v Astronomicheskii Zhurnal* (ISSN 0320-0108), Vol. 15, Feb. 1989, pp. 99–108. 16 Refs.

The dependence of the bolometric light curve and of the effective temperature on the density distribution in a progenitor, its chemical composition, mass, radius, and explosion energy is studied. It is shown that, just before the supernova 1987 A outburst, the outside layers of the blue supergiant SK-69.202 deg had a density distribution similar to that of the polytropic model with an index of $n = 3$, a chemical composition with a mass fraction of hydrogen of the order of 0.1 and a relative helium abundance of about 0.9.

A88-29843   Study of structural and dynamical characteristics of open clusters (OCl). II—The effects of nonstationarity (Izuchenie strukturnykh i dinamicheskikh kharakteristik rasseiannykh zvezdnykh skoplenii /RZS/. II—Proiavlenie nestatsionarnosti). V. M. DANILOV and A. F. SELEZNEV, *Kinematika i Fizika Nebesnykh Tel* (ISSN 0233-7665), Vol. 4, Jan.–Feb. 1988, pp. 51–58. 45 Refs.

OCl characteristics obtained by star counts are analyzed. Dynamical parameters of observed clusters are compared with the results of numerical experiments on modeling of nonstationary, nonisolated OCl. Possible causes and character of evolution for star clusters are considered. The external gravitational field of the Galaxy or effects of small age of the clusters may cause visible nonstationarity in the regular field for 27-31 percent of the observed clusters. The presence of massive clouds of dust and gas in the clusters' neighborhood increases this fraction to 90-100 percent.

A89-49227   Statistical estimates of the parameters of the theory of the formation of the structure of the universe (Statisticheskie otsenki parametrov teorii obrazovaniia struktury vselennoi). A. G. DOROSHKEVICH, *Astronomicheskii Zhurnal* (ISSN 0004-6299), Vol. 66, May–June 1989, pp. 449–461. 20 Refs.

Estimates of the mean distance between superclusters are obtained from an analysis of deep surveys of the distribution of galaxies. The mean distance between pancakes and the mean density of the maxima of the smallest main deformation tensor are calculated. A comparison is made between the observations and calculations within the framework of the unstable hidden mass model. The rate of pancake birth is calculated using this model. It is shown that, in variants with nonrelativistic products of decay, pancake formation can take place at redshifts of 5 to 6.

A89-49195   One definition of time for the isotropic cosmological model (Ob odnom opredelenii vremeni dlia izotropnoi kosmologicheskoi modeli). N. N. GOROBEI and A. S. LUK'IANENKO, *Ukrainskii Fizicheskii Zhurnal* (ISSN 0503-1265), Vol. 34, June 1989, pp. 814–816. 6 Refs.

A canonical time parameter corresponding to a synchronous coordinate frame is found in an isotropic cosmological model with dust matter. The Hamiltonian related to this time parameter is obtained. Within the framework of a quantum version of the model, the world radius is a time-dependent operator commutating with the Hamiltonian. It is concluded that a cosmological singularity is unavoidable in the quantum theory.

A89-44504   The universe and the origin of life on the earth (origin of organics on clays). V. I. MARON and M. D. NUSSINOV, *Advances in Space Research* (ISSN 0273-1177), Vol. 9, No. 2, 1989, pp. 99–103. 28 Refs.

The transition from the chemical stage of matter evolution in the universe and the biological stage of matter evolution on earth is examined. A model of the noncelled phase of abiogenesis is developed, taking into account the characteristics of the intermediate transitional material as a base for the transition. The role of clayish materials in meteoroids as in situ formation catalysts of organic polymers is discussed. The conditions for the formation of primitive nucleoproteinaceous complexes, nucleic acids, and short peptides are considered.

A89-42450   Deuterium in the universe (Deiterii vo vselennoi). BORIS V. VAINER and IURII A. SHCHEKINOV, *Priroda* (ISSN 0032-874X), April 1989, pp. 25–33. 13 Refs.

The existing standard and nonstandard models of deuterium synthesis are examined with reference to the problem of the development of an adequate model of the origin of light elements. It is noted that none of the recently proposed nonstandard scenarios is capable of providing an unambiguous and noncontradictory explanation for the available observation data on light element abundances. Besides, none of the scenarios can compete with the standard model in simplicity of the initial assumptions. It is recommended that the standard model be used as the basis for the analysis of the origin of large scale structures and other problems asociated with the evolution of the universe.

A89-40729   Elliptical galaxies—Optical and X-ray properties and predictions of the hot model of galaxy formation (Ellipticheskie galaktiki—Opticheskie i rentgenovskie svoistva i predskazaniia goriachei modeli formirovaniia galaktik). A. A. SUCHKOV, *Pis'ma v Astronomicheskii Zhurnal* (ISSN 0320-0108), Vol. 15, March 1989, pp. 216–222. 11 Refs.

It is shown that the hot model can be used toexplain the dimensions of E galaxies. This model can also be used to predict the existence of a relationship between: (1) the temperature of X-ray coronae and surface brightness, and (2) the luminosity, the dispersion of stellar velocities, and surface brightness. The latter relation is consistent with the Faber-Jackson relation.

A89-37377   The evolution of self-gravitating clusters of gasdust nebulae participating in planetary body accumulation (Evoliutsiia samogravitiruiushchikh sgustkov gazopylevoi tumannosti, uchastvuiushchikh v akkumuliatsii planetnykh tel). V. P. MIASNIKOV and V. I. TITARENKO, *Astronomicheskii Vestnik* (ISSN 0320-930X), Vol. 23, Jan.–Mar. 1989, pp. 14–26. 10 Refs.

A mathematical model for the evolution of selfgravitating gas-dust clusters is presented. A method of two-scale expansion to a set of hydrodynamic and thermodynamic equations describing the behavior of the selfgravitating gas-dust clusters is used. The dependence of the pressure and temperature distribution functions on the mass and characteristic density values and the typical course of cluster evolution is analyzed.

A89-30052   Clusters of galaxies (Review) (Skopleniia galaktik /Obsor/). R. D. DAGKESAMANSKII and M. V. KONIUKOV, *A study of clusters of galaxies and extragalactic radio emission sources* (A89-30051 11-90). Moscow, Izdatel'stvo Nauka, 1988, pp. 5–42. 128 Refs.

The papers surveys observational data on galaxy clusters as well as models of the galactic, plasma, and relativistic components of this class of objects. Particular attention is given to the dynamical evolution of clusters, their radio emission, and the activity of cluster galaxies. The features of radio galaxies and quasars in clusters are examined.

A89-24401 **Perturbations and streaming motions on large scales (in universe).** A. G. DOROSHKEVICH and A. A. KLYPIN, *Royal Astronomical Society, Monthly Notices* (ISSN 0035-8711), Vol. 235, Dec. 15, 1988, pp. 865–874. 23 Refs.

The problem of the interpretation of large-scale streaming motions on the 50-100 Mpc scale is discussed. A method of conditional correlations is developed which makes it possible to find the mean value and dispersion of large-scale velocities for a fixed motion of an observer. The scale and the amplitude of possible perturbations are compared with constraints obtained by the Relict experiment. Perturbations (Delta rho)/(rho) of about 0.1-0.3 on the 50-100 Mpc scale seem to be needed to overcome the contradictions between modern cosmological models and huge bulk motion on large scales. The perturbations with the same amplitude but on the 200-300 Mpc scale are excluded by (Delta T)/(T) constraints.

A89-13278 **Isotopic cosmogony (Izotopnaia kosmogoniia).** LEVKONSTANTINOVICH LEVSKII, *Priroda* (ISSN 0032-874X), Aug. 1988, pp. 11–19. 8 Refs.

Several models for the origin of the solar system are reviewed, including the condensation model, the hypothesis concerning a neighboring supernova, and the model of colliding gas-dust clouds. An effort is made to give a consistent explanation of the available experimental data concerning the chemical and isotopic composition of planets, planetary satellites, and meteorites.

A88-39922 **Is the formation of the universe 'from nothing' possible? (Vozmozhno li obrazovanie vselennoi 'iz nichego'?).** IAKOV-BORISOVICH ZEL'DOVICH, *Priroda* (ISSN 0032-874X), April 1988, pp. 17–27. 21 Refs.

An effort is made to clarify whether the formation of the universe 'from nothing' contradicts the general laws of nature. It is suggested that the observed baryon asymmetry of the universe appears at an early stage of the universe expansion due to a difference in the properties of particles and antiparticles, and the absence in nature of a precise conservation law for the number of bayrons and leptons. Also considered are the hypothesis of the pulsating universe, the closed univsrse model, and the hypothesis of the quantum birth of the universe. A.D. Sakharov offers some comments on Zel'dovich's paper.

A88-38853 **Cosmological models with decaying neutrinos (Kosmologicheskie modeli s nestabil'nymi neitrino).** A. G. DOROSHKEVICH, A. A. KLYPIN, and M. IU. KHLOPOV, *Astronomicheskii Zhurnal* (ISSN 0004-6299), Vol. 65, Mar.–Apr. 1988, pp. 248–262. 50 Refs.

Cosmological models with decaying neutrinos are analyzed. Estimates of relic background radiation fluctuations, correlation function, galactic peculiar velocities and the masses and decay times of neutrinos are given. The set of observational data is properly explained by the models with a two-component neutrino of mass 60-70 eV or four-component neutrino of mass 30-35 eV. The age of the universe for these models is (10-11)x10 to the 9th yr and the neutrino decay time is 10 to the 9th yr. Models with a positive cosmological constant have essential difficulties with the explanation of the slope of the correlation function of galaxies.

A88-37551 **'Hot' model for the formation of galaxies—The sizes of galaxies and the origin of the stellar component ('Goriachaia' model' formirovaniia galaktik—Razmery galaktik i proiskhozhdenie zvezdnoi komponenty).** A. A. SUCHKOV, *Astronomicheskii Zhurnal* (ISSN 0004-6299), Vol. 65, Jan.–Feb. 1988, pp. 1–11. 35 Refs.

A mechanism by which a protogalaxytransforms into a stellar system is proposed in the framework of the hot model of galaxy formation. The mechanism gives a quantitative relation between the mass and size of the galaxy which agrees well with the observational relation; it also specifies two characteristic mass values which coincide with masses of stars and globular clusters. It is shown that a hot protogalaxy (T = 10 to the 7th K) contracting under the gravity of a massive dark halo attains a critical size and fragments into separate clouds via thermal instability.

A89-23729 **Coalescence of self-gravitating gaseous masses—A numerical model (Koalestsentsiia samogravitiruiushchikh gazovykh mass—Chislennaia model').** D. I. BARAUSOV, A. IU. USHAKOV, and A. D. CHERNIN, *Astronomicheskii Zhurnal* (ISSN 0004-6299), Vol. 65, Nov.–Dec. 1988, pp. 1155–1163. 15 Refs.

A numerical two-dimensional gas-dynamic model of a noncentral supersonic collision of self-gravitating gaseous masses with a primordial chemical composition is used to find coalescence criteria. Allowance is made for volume radiant cooling. The formation of a gaseous protogalaxy with a significant amount of angular momentum is possible during coalescence.

A89-13117 **Changes in the photometric and colorimetric characteristics of eruptive stars at the stage of circumstellar dust envelope formation—Pu Vul during the deep minimum of 1980 (Izmenenie fotometricheskikh i kolorimetricheskikh kharakteristik eruptivnykh zvezd na stadii formirovaniia okolozvezdnykh pylevykh obolochek. PU Vul vo vremia glubokogo minimuma 1980 goda).** IU. S. EFIMOV, *Astronomicheskii Zhurnal* (ISSN 0004-6299), Vol. 65, July–Aug. 1988, pp. 807–815. 10 Refs.

It is shown that the model of the circumstellar dust envelope with the size of particles changing in time explains several observed characteristics of the photometric and colorimetric behavior of PU Vul at the stage of circumstellar dust envelope formation. These characteristics include the time-dependent light minima in various spectral bands, the reddening of the star during the decline of light and the bluing in the area of minimal brightness, the rapid light and color variations at the light minimum, and certain characteristics of the color-magnitude diagram. From the comparison of the calculated curves and the observed data, it is concluded that the deep minimum of 1980 was caused by the formation, near the hot component of the system, of a circumstellar envelope of silicate particles, which grew from molecular size to the size of interstellar particles with a mean growth rate of 0.001 micron/day.

A88-43803 **Cosmological redshift in the stationary Seeliger-Einstein universe (Kosmologicheskoe krasnoe smeshchenie v statsionarnoi vselennoi Zeeligera-Einshteina).** P. N. KROPOTKIN, *Akademiia Nauk SSSR, Doklady* (ISSN 0002-3264), Vol. 298, No. 4, 1988, pp. 827–829. 15 Refs.

It is argued that the Seeliger-Einstein stationary cosmological model should not yet be ruled out. The need for a more complete investigation and comparsion of mechanisms proposed for the explanation of photon aging is emphasized.

A88-41077 **The cosmology of the super-early universe and the 'fundamental length' (O kosmologii sverkhrannei vselennoi i 'fundamental'noi dline').** V. L. GINZBURG, V. F. MUKHANOV, and V. P. FROLOV, *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (ISSN 0044-4510), Vol. 94, April 1988, pp. 1–5. 13 Refs.

The cosmology of the super-early universe and its consequences are based on a far-reaching assumption pertaining to the validity of the theory down to Planckian scales, and in particular, to a length of 10 to the −33 cm. It is maintained that the existence of a 'fundamental length' which is greater than this Planckian length can radically change the situation. The study is pertinent to the inflationary hypothesis.

A88-26019 **How the universe exploded (Kak vzorvalas' vselennaia).** IGOR' DMITRIEVICH NOVIKOV, *Priroda* (ISSN 0032-874X), Jan. 1988, pp. 82–91.

Current problems in cosmology are discussed, and it is suggested that the inflation of the universe is the key that may solve the riddle concerning the fundamental properties of the universe. Particular emphasis is placed on Linde's (1986) theory, according to which quantum fluctuations existing at very large densities (close to the Planck density of 10 to the 94th g/cu cm) play the dominant role. In Linde's conception, the universe has neither beginning nor end.

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This month: *Theoretical Cosmology*

A90-40093 **Soft inflation (in cosmology).** ANDREW L. BERKIN, KEI-ICHI MAEDA, and JUN'ICHI YOKOYAMA, *Physical Review Letters* (ISSN 0031-9007), Vol. 65, July 9, 1990, pp. 141-144. Previously announced in STAR as N90-22506. 21 Refs. (NAGW-1340).

The cosmology resulting from two coupled scalar fields was studied, one which is either a new inflation or chaotic type inflation, and the other which has an exponentially decaying potential. Such a potential may appear in the conformally transformed frame of generalized Einstein theories like the Jordan-Brans-Dicke theory. The constraints necessary for successful inflation are examined. Conventional GUT models such as SU(5) were found to be compatible with new inflation, while restrictions on the self-coupling constant are significantly loosened for chaotic inflation.

A89-28905 **Detectability of early thermal radiation from a neutron star in SN 1987A.** KEN'ICHI NOMOTO, SACHIKO TSURUTA, Supernova 1987A in the Large Magellanic Cloud; Proceedings of the Fourth George Mason Astrophysics Workshop, Fairfax, VA, Oct. 12-14, 1987 (A89-28851 11-90). Cambridge and New York, Cambridge University Press, 1988, pp. 421-423. 15 Refs. (MOESC-16404216; NSF AST-86-02087).

Cooling of a young neutron star right after its birth is examined. Theoretical calculations show that within less than a month after the explosion, the surface temperature falls significantly below the detection limit of Ginga due to the plasmon neutrino emission near the surface. However, it will remain high enough to be detected easily by Rosat, AXAF, and other future X-ray satellites within the next 100 years.