AD NUMBER
AD333426
CLASSIFICATION CHANGES
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FROM: **confidential**
LIMITATION CHANGES
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CIA ltr, 7 Sep 2004; CIA ltr, 7 Sep 2004

CONFIDENTIAL

SCIENTIFIC INFORMATION REPORT

Physics and Mathematics

(23)

Summary No.4090

6 December 1962

Prepared by

Foreign Documents Division
CENTRAL INTELLIGENCE AGENCY
2430 E St., N. W., Washington 25, D. C.

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SCIENTIFIC INFORMATION REPORT

Physics and Mathematics (23)

This is a serialized report consisting of unevaluated information prepared as abstracts, summaries, and translations from recent publications of the Sino-Soviet Bloc countries. It is issued in six series. Of these, four, Biology and Medicine, Electronics and Engineering, Chemistry and Metallurgy, and Physics and Mathematics, are issued monthly. The fifth series, Chinese Science, is issued twice monthly, and the sixth series, Organization and Administration of Soviet Science, is issued every 6 weeks. Individual items are unclassified unless Individual items are unclassified unless otherwise indicated.

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Atomic and Nuclear Physics

1. Radial Topography of Magnetic Fields in Cyclic Accelerators

"Correction of Radial Topography of Magnetic Field in Cyclic Accelerators," by Yu. K. Petrov, A. V. Peshkov, and V. N. Kuz'min, Scientific-Research Institute of the Tomsk Polytechnic Institute imeni S. M. Kirov; Tomsk Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, No 4, 1962, pp 21-27

The methodology is described for correcting the field by means of turns with the current located concentrically on the surfaces of the steel laminated poles of the magnetic circuit, with variable radial spaces between the turns. Along with experimental data, information is given for the calculation and manufacture of pole windings.

2. Observation of Complex Emission Spectrum of Particle in Motion

"On the Possibility of Observing the Complex Spectral Composition of the Radiation of a Moving Source in a Medium With Negative Absolute Temperature," by G. L. Suchkin, Scientific-Research Radiophysics Institute, Gor'kiy University; Gor'kiy, Izvestiya VUZ, Radiofizika, Vol 5, No 4, 1962, pp 815-816

This note summarizes briefly a work suggested by I. M. Frank and done with the consultative assistance of B. M. Bolotovskiy, a fellow-participant in V. L. Ginzburg's seminar at the Physics Institute of the Academy of Sciences USSR. Frank (Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, 1959, p 823) noticed that the complex Vavilov-Cherenkov effect escaped observation because of the strong absorption in the Cherenkov frequency region, which the author attributes to the fact that observation was attempted only in absorbing media with positive absolute temperature ($T > 0$). The work described here indicates the possibility of observing the complex composition of the emission spectrum of a moving source in a medium with negative absolute temperature, where absorption is absent; at the same time, the $T < 0$ condition coincides with that range of physical phenomena in which the complex emission spectrum of a moving particle is substantial, which is of considerable importance in the study of lasers, molecular amplifiers, and the like.

3. Neutron Absorption by Cadmium and Indium Plates

"Absorption of Neutrons From a Fast Neutron Source by Cadium and Indium Plates in Aqueous Medium," by V. A. El'tekov and Yu. S. Ryabukhin; Moscow, Atomnaya Energiya, Vol 13, No 3, Sep 62, pp 266-269

An approximate estimate of the magnitude of the activation of an indium-gallium alloy in an activation generator, induced in a water reflector close to one of the boundaries of the reactor, was made by A. Kh. Breger and others (Report No 80 on the International Conference on Powerful Sources of Radiation, Warsaw, 1959) during the development of an indium-gallium radiation loop for the IRT reactor. For a more accurate solution of this problem, the following auxiliary problem, which may be of independent value, is solved.

A infinite plane isotropic source of fast neutrons of unit density exists in an infinite homogeneous medium in the plane x = 0. A plane which is "black" for slow neutrons but transparent for fast neutrons exists parallel to the source at distance ξ from the source. It is required to find the probability of absorption by the plate of the neutrons emitted from the source.

4. Measurements of Fission Neutron Moderation Length

"Measurement of Fission Neutron Moderation Length in Sintered BeO at Energies to 1.44 and 0.3 Ev," by I. F. Zhezherun et al.; Moscow, Atomnaya Energiya, Vol 13, No 3, Sep 62, pp 258-264

The density distribution of neutron moderation at energies of 1.44 and 0.3 ev, for a point source of fission neutrons in beryllium oxide, is measured, and the squares of the moderation length L^2f 1.44 → 0.3 ev to energies of 1.44 and 0.3 ev were determined to be 92 ± 1.5 and 104.5 cm^2 (with beryllium oxide density of 2.79 g/cm^3).

It is established that the expermentally obtained value L^2f (12.5 ± 2.5 cm^2) considerably exceeds the value calculated in the moderation hypothesis for free atoms of beryllium and oxygen. Synthetic functions of the effect are chosen for the moderation of the form

$$P(r_1E_r)=K_n,\ 2n \sum_{i=1}^{3} \frac{Pi}{(4\pi\tau_i)^{3/2}} e^{-r^2/4\tau_i},$$

which agree satisfactorily with experimental data.

5. Diffraction of Slow Electrons

"Experimental Methods in the Study of Diffraction of Slow Electrons," by A. A. Babad-Zakhryapin, N. S. Gorbunov, and V. I. Izvekov; Moscow, Uspekhi Fizicheskikh Nauk, Vol 77, No 4, Aug 62, pp 727-748

The process of diffracting slow electrons is studied. Various experimental methods in the observation of the diffraction process are discussed: diffraction chambers, systems in which gasses are admitted, vacuum systems, methods of recording diffraction patterns, and diffraction chambers with photographic recording of the diffraction patterns.

A number of features of methods of diffracting slow electrons are discussed, among these being features of diffraction effects, cleaning of the surfaces studied, structure of residual gas layers on metallic surfaces, and dependence of the form of the diffraction pattern on the condition and geometry of the film.

The authors conclude that up till now the two most important applications of the method of diffraction of slow electrons have been (1) the study of the adsorption of gasses and (2) the determination of the internal potential of crystal lattices; but with these new methods, it is now possible to study such things as the order of the structure of monomolecular gas layers, photoeffects, and electron emission.

6. Thermal Equilibrium of a Neutral Gas and Electrons

"Establishing Thermal Equilibrium Between a Neutral Gas and Electrons," by Ya. P. Kotov and G. Ya. Umarov, Physicotechnical Institute, Academy of Sciences Uzbek SSR; Tashkent, Izvestiya Akademii Nauk UzSSR, Seriya Fiziko- Matematicheskikh Nauk, No 4, 1962, pp 52-56

A two-component system consisting of atoms (molecules) and electrons -- for example, a beam of electrons is injected into a neutral gas -- is examined. It is possible to assume that each of these components has a Maxwellian distribution at various temperatures. It is shown how rapidly the system enters into a state of equilibrium; in other words, the rate of temperature equalizing between electron and neutral gases is found.

7. Calculation of Fast Proton Interaction With Heavy Nuclei

"Calculation of Fast Proton Interaction With Heavy Nuclei With Allowance for the Fission Process," by B. N. Belyayev and A. N. Murin; Moscow, Atomnaya Energiya, Vol 13, No 4, Oct 62, pp 317-321

The reaction of the interaction of a 135 Mev bombarding proton with the Bi^{209} nucleus was calculated by the method of random trials. As a result of the calculation, the information concerning the effect of the evaporative processes on the distribution and on the magnitude of the pulses of the recoil nuclei has been corrected. By using the hypothesis of I. Dostrovsky et al. (Report No 1615, presented by Israel at the Second Conference), the corresponding average pulses and the average energy of excitation were determined and the fission cross section was calculated. There was satisfactory agreement of the data calculated with experimental data.

8. 30 Mev Linear Electron Accelerator fro Neutron Spectroscopy

"A 30-Mev Linear Electron Accelerator for Neutron Spectroscopy," by R. M. Voronkov et al.; Moscow, Atomnaya Energiya, Vol 13, No 4, Oct 62, pp 327-336

A linear electron accelerator which is intended for neutron spectroscopy is described. With electrons accelerated to 25-32 Mev and a pulse duration of 0.6, 0.2, and 0.05 microsecond, the current in the pulse rises to 160-500 milliampere. The pulse repetition goes up to 100 cps. The neutrons are generated in a U^{238} target located inside a water moderator. The results of the measurements of neutron spectra from the accelerator which were obtained at an emission distance of 109 m in the energy range of from 4 ev to 30 Kev are given.

9. Loop Model of the Tbilisi IRT-2000 Reactor

"Model of the Indium-Gallium Radiation Loop of the Tbilisi IRT-2000 Reactor," by E. L. Andronikashvili; Moscow, Atomnaya Energiya, Vol 13, No 4, Oct 62, pp 342-349

A description of the indium-gallium loop of the IRT-2000 reactor which is intended for obtaining a gamma field with a high dosage rate is given. The loop was made for the IRT-2000 research reactor in Tbilisi. The presence of the loop extends considerably the experimental possibilities of the reactor. The first data on the technology in exploiting the loop and the formulas to calculate the gamma radiation intensity are given.

10. Calculation of Neutron Cross Section for U^{238}

"Calculation of Neutron Cross Section for U^{238} on the Basis of a Nuclear Optical Model," by V. Ye. Kolesov and V. S. Stavinskiy; Moscow, Atomnaya Energiya, Vol 13, No 4, Oct 62, pp 371-372

At present the optical model with the diffusion complex potential makes it possible to describe satisfactorily the total interaction of neutrons with atomic nuclei σ_t. This model is used also to calculate other cross sections, in particular the cross sections of inelastic scattering σ in and the cross sections of neutron radiative capture $\sigma_{n\gamma}$. It is interesting to investigate on the optical model the energy relation of various neutron cross sections from which the total cross section is made up for a given nucleus.

In this article, such investigations are made for U^{238}. Together with the total cross section and the cross section of formation for a composite nucleus σ_c which at high energies coincides with the cross sections of neutron inelastic interaction, the cross sections for neutron inelastic scattering and radiative capture are calculated, as well as the transport cross section, σ_{tr}.

11. Disintegration of Carbon and Oxygen Nuclei

"Investigation of Disintegration of Carbon and Oxygen Nuclei Induced by 15-29 Mev Protons," by S. S. Vasil'yev, V. V. Komarov, and A. M. Popova, Institute of Nuclear Physics, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 737-748

The disintegration of C^{12} and O^{16} nuclei into α particles induced by protons with energies of 15 to 29 Mev is investigated by the photoemulsion method. The energy distributions of the decay products produced in the reactions C^{12} (p, p' 3α) and O^{16} (p, p' 4 α) are obtained, as well as the excitation energies of the intermediate nuclei C^{12}, B^9, and Be^8 possibly produced in the C^{12} (p, p' 3 α) reactions. An analysis of the experimental data indicates that the main mechanism of the reactions investigated is the disintegration of the N^{13} system in the case of the C^{12} (p, p' 3α) reactions and of the F^{17} system in the case of the O^{16} (p, p' 4 α) reactions into particles and a proton with their paired resonance interaction in energy states of the Be^8 and Li^5 nuclei.

12. Elastic and Inelastic Scattering of Protons

"Elastic and Inelastic Scattering of Protons by Ne^{22} Nuclei," by P. V. Sorokin et al., Physicotechnical Institute, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 749-751

Information on the excitation levels of Na^{23} nucleus is obtained by studying the energy dependence of γ quanta yield and of the angular distribution of protons scattered in the reaction Ne^{22} (p, p γ).

13. Dissociation Cross Sections of D_3^+ Ions into D_2^+ and D^+ Ions

"Cross Sections for Dissociation of D_3^+ Ions Into D_2^+ and D^+ Ions in Collision With Deuterium Molecules," by S. Ye. Kupriyanov, A. A. Perov, and N. N. Tunitskiy; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 763-764

The cross sections for the production of D_2^+ and D^+ ions as a result of dissociation of D_3^+ ions due to single collisions with deuterium molecules are determined for D_3^+ energies between 30 to 100 Kev. The cross-section measurements were made on a double mass spectrometer. It is shown that with the growth of the D_3^+ ion energy the cross sections increase and are equal to 1.3×10^{-16} cm^2/atom at an energy of 100 Kev.

14. Angular Distribution of Decay Products of Λ-Hyperons

"Angular Distribution of Decay Products of Λ-Hyperons Produced by 2.8 Bev/sec π^- Mesons on Xenon Nuclei," by I. A. Ivanovskaya et al., Institute of Theoretical and Experimental Physics, Academy of Sciences USSR, Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 765-774

The asymmetry coefficients of the angular distribution of the decay products of Λ-hyperons produced by 2.8 Bev/sec π^- mesons on xenon nuclei are measured relative to the plane of production of the Λ-particles ("up-down" asymmetry) and to two planes, perpendicular to this plane: (a) a plane perpendicular to the direction of flight of the Λ-particle in the laboratory system ("forward-backward" asymmetry) and (b) a plane passing through the direction of the flight of the Λ particles ("right- left" asymmetry). Only decays of the $\Lambda \to \pi^- + p$ type were used in constructing the distributions.

The "up-down" asymmetry for Λ particles with momenta in the laboratory system between 400 and 900 Mev/sec is characterized by the quantity $a\bar{P}_1 = +0.27 \pm 0.12$, in the right hand coordinate system; the "forward-backward" asymmetry is $a\bar{P}_2 = +0.27 \pm 0.13$ and for the "right-left" asymmetry $a\bar{P}_3 = +0.26 \pm 0.12$. All three coefficients have been determined from the angular distribution of π-meson decay in the rest system of the Λ hyperon. Possible systematic errors in determining the magnitude of $a\bar{P}_2$ are discussed.

15. Elastic Scattering of Protons by Magnesium Isotopes

"Elastic Scattering of 5.45 Mev Protons by Mg Isotopes" by A. P. Klyucharev and N. Ya. Rutkevich, Physicotechnical Institute, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 775-776

Elastic scattering of 5.45 Mev protons on Mg isotopes was studied. In contrast to heavier isotopes, an anomaly in the angular distribution is obtained for Mg^{24} nucleus.

16. Stripping Reactions on Nickel Isotopes

"Investigation of Stripping Reaction on Nickel Isotopes," by M. V. Pasechnik and P. G. Ivanitskiy, Institute of Physics, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 777-782

The angular distributions of protons from the (d,p) reactions on Ni^{58}, Ni^{60}, Ni^{62}, and Ni^{64} nickel isotopes for deuteron energies of 13.6 Mev are obtained. Values of l_n for the captured neutrons and also conclusions regarding the possible values of the spins and the parities of of the states investigated are obtained by comparing the experimental angular distributions with Butler's theory.

17. High Energy Nuclear Interaction of Secondary Particles

"Rare Case of High Energy Nuclear Interaction With Isotropic Angular Distribution of Secondary Particles," by K. I. Alekseyeva et al., Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 783-789

An interaction in a photoemulsion of the type 2+3+40p with an isotropic angular distribution of the particles in a certain coordinate system (with a Lorentz factor γ_c=65) is examined. The event is compared with others possessing close values of the numbers of secondary relativistic particles n_s and γ_c. Under the usual assumption regarding the mean value of the transverse momentum, the effective mass of the target is determined and found to be close to the π meson mass.

18. Investigation of a-Decay of Am^{241}

"Investigation of a-Decay of Am^{241}," by S. A. Baranov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 795-799

Alpha decay of Am^{241} is studied with a double focusing magnetic a-spectrograph. Analysis of the a-spectra made it possible to detect more than 18 fine structure a-radiation groups, most of which were observed for the first time. An energy level scheme for the Np^{237} nucleus is constructed on the basis of the experimental data. The existence of a new rotational band in the scheme indicated is established.

19. Rsonance Scattering of γ Quanta on Sn^{116} Nuclei

"Resonance Scattering of γ Quanta on Sn^{116} Nuclei," by D. K. Kaipov et al., Institute of Nuclear Physics, Academy of Sciences Kazakh SSR, Institute of Nuclear Physics, Academy of Sciences Uzbek SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 808-812

Resonance scattering of 1290 Kev γ quanta on Sn^{116} nuclei is investigated by using a gaseous source In^{116m} in $InCl_3$. The lifetime of the first excitation state determined by the self-absorption method is $\tau_\gamma = (6.4 \pm 2.7) \times 10^{-13}$ sec.

20. Low Energy Photodeuterons From Lithium

"Low Energy Photodeuterons From Lithium," by A. S. Beloysov, S. V. Rusakov, and Ye. I. Tamm, Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; Moscow; Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 813-814

The energy dependence of the relative yield of photodeuterons from lithium is examined for energies $E\gamma_{max}$ lying between 160 and 260 Mev.

21. ΛK^o and $K^o\bar{K}^o$ Pair Production in the Interaction Between π^- Mesons and Protons

"Study of ΛK^o and $K^o\bar{K}^o$ Pair Production in the Interaction Between 7-8 Bev/c π^- Mesons and Protons," by Wang Yung-ch'ang et al., Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 815-822

ΛK^o and $K^o\bar{K}^o$ pair production in π^- p-interactions is studied for π-meson momenta of 7-8 Bev/c. The angular and momentum characteristics of the Λ- and K^o-particles (in the π^-p center of mass system) from the ΛK^o and $K^o\bar{K}^o$ pairs and also the angular and momentum distributions of $\pi^\pm$mesons accompanying ΛK^o pair production are presented. Data on the magnitude of Q for the pairs investigate are also presented.

22. Cascade a Particles From Carbon Nuclei Split by Protons

"Cascade a Particles From Carbon Nuclei Split by 660 Mev Protons," by A. P. Zhdanov and P. I. Fedotov, Radium Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 835-838

The experimental spectra of cascade γparticles from carbon nuclei disintegrated by 660 Mev protons are compared with the corresponding spectra computed for an intranuclear cascade in carbon. Collisions of cascade nucleons with substructures of the a-particles type are taken into account in the calculations. A comparison of thecalculated spectra with the experimental ones shows that about 70% of cascade a-particles of the experimental spectrum can be regarded as the result of direct interaction of cascade nucleons with intranuclear a-substructures.

23. Paramagnetic Resonance of Cr^{3+} Ion in Spinel

"Paramagnetic Resonance of the Cr^{3+} Ion in Spinel," by V. A. Atsarkin, Institute of Radioengineering and Electronics, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 32, No 3(9), Sep 62, pp 839-840

Results of investigation of paramagnetic resonance of the chromium ion in spinel are given. Spin Hamiltonian constants are found which sharply differ from those cited by Stahl-Brada and Low (Phys. Rev, Vol 116, 1959, p 561). From the dependence of the line width on orientation in a magnetic field, it is concluded that the magnesium and aluminum ion distribution in spinel is disordered.

24. Probability of U^{233} Nuclei Triple Fission

"Probability of Triple Fission of U^{233} Nuclei by Resonance Nuetrons," by A. A. Panov, Institue of Theoretical and Experiemtnal Physics, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 847-851

The relative cross section for triple fission of U^{233} nuclei is measured in the 1-10 ev neutron energy region by a time-of-flight method with a resolving time of 2 sec/m. The resonances observed have the same energy as the resonances in double U^{233}. Within the limits of statistical errors (<8%), the ratio of the two fission cross sections or the U^{233} triple fission probability are independent of the neutron energy.

25. Angular and Energy Distributions of Photoprotons

"Investigation of Angular and Energy Distributions of Photoprotons From Heavy Nuclei," by V. G. Shevchenko and B. A. Yur'yev, Institue of Nuclear Physics, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 860-864

The angular and energy distributions and the yields of photoprotons from W nuclei fro $E_{\gamma max}$ equal to 22.5 and 33.5 Mev and from Pt and Pb nuclei for $E_{\gamma max}$ equal to 22.5 and 33.5 Mev, respectively, are measured. the photoproton angular distributions are asymmetric with respect to 90°, the maximum being shifted toward small angles. The asymmetry increases with increase of the photoproton energy, as well as with increase of the maximum γ-radiation energy. The maximum of the cross sections for photoproton production lies above 22 Mev, and γ-radiation absorption in this region is chiefly of a quadrupole nature.

26. 2n and 3n Transfer Reactions

"Transfer Reaction of 2n and 3n by Bombardment of Al, Cu, and Ta With Ions of N^{15} and N^{14}," by V. V. Volkov et al., Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 864-872

The transfer reactions of two and three neutrons were studied by bombarding Al, Cu, and Ta with ions of N^{15} and N^{14}. Nucleus of N^{17} as detector particle was used. The thick targets yields and cross sections in the energy interval of the ions 50 to 140 Mev were obtained. Effective cross sections for the transfer reactions of one, two, and three neutrons are compared.

27. "Mesons Decay Anomalies in Paramagnetic Metals

"Search for Anomalies of μ⁻Mesons Decay in Paramagnetic Metals," by L. B. Yegorov et al., Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 873-876

The relative yields of electrons from μ⁻mesons decays in mesic atoms of the transition metals palladium and titanium, and their hydrides are measured with scintillation counters. The results of the measurements directly indicate the absence of the effects due to unpaired electrons responsible for the increase of μ⁻meson decay probability in mesic atoms of transition metals of the ion group and also for the shift of X-ray frequency emitted in the 2p-1s transitions.

28. Possible Charged Particle Acceleration by Electromagnetic Waves

"Possibility of Resonance Acceleration of Charged Particle by Electromagnetic Waves in a Constant Magnetic Field," by V. Ya. Davydovskiy, Novokuznetsk State Pedagogical Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 886-888

The integral of motion is examined for a charged particle in a constant magnetic field and a field of electromagnetic waves, from which it is deduced that the cyclotron resonance can be maintained a sufficiently long time so that the energy of the particles can increase considerably.

29. Inelastic Atomic Collisions

"Theory of Inelastic Atomic Collisons," by A. M. Dykhne and A. V. Chaplik, Institute of Radiophysics and Electronics, Siberian Department, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 889-892

The validity of the known Laudau-Zener theory in a broad interval of variation of the perturbation parameter Δ/ω and adiabatic parameter $1/\omega T$ is established. A formula for the transition probabilities is deduced which is valid throughout the whole range of variation of the parameter / .

30. Universal Weak Interaction Model

"Model of Universal Weak Interaction," by E. M. Lipmanov, Volgograd Pedagogical Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 893-899

On the basis of a number of initial assumptions, a model of weak interaction is constructed in which particles not involved in strong interactions (intermediate bosons and leptons) possess "schizon" properties in the Lee and Yang sense of the word. The possiblity of an experimental detection of new heavy charged leptons predicted by the model is discussed.

31. Use of Hartree Fock Type Equations in Collision Theory

"Single Electron Approximation in Collision Theory," by B. A. Veklenko and I. V. Novobrantsev, Moscow Power Engineering Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 919-926

The collision of a slow electron with an atom is examined within the framework of the single electron approximation. Exchange and polarization phenomena are taken into account. Equations of the Hartree-Fock type are derived. Some concrete calculations are carried out on scattering of zero energy electrons on hydrogen atoms.

32. Transverse Polarization of Cosmic Ray μ-Mesons

"Transverse Polarization of Cosmic Ray μ -Mesons," by V. S. Berezinskiy, Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3 (9), Sep 62, pp 927-931

It is shown that cosmic ray μ- mesons possess transverse polarization. The μ-meson transverse polarization at the instant of production is calculated for various angles and energies. The transverse polization of μ -mesons with a kinetic energy of 44 Mev at heights exceeding 3,000 m above sea level is determined.

33. Optical Potential of Heavy Nuclei

"Optical Potential of Heavy Nuclei," by M. Ya. Amus'ya, Physicotechnical Institute imeni A. F. Ioffe, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 41, No 3 (9), Sep 62, pp 942-952

An expression for the imaginary part of the optical potential W of heavy atomic nuclei is obtained for different energies of the incident particle ($E > 0$) on the basis of a two-parameter model of nuclear matter, considered by M Ya. Amus'ya (ZhETF., Vol 41, 1962, p 429; Vol 43, 1962, p 287). It is shown that at intermediate energies ($E \approx 5$ to 10 Mev), W is large on the surface of the nucleus, and at very high energies ($E > 100$ Mev) it is simply proportional to the density of the system. For quasi single particle and hole excitations ($E < 0$), damping occurs on the surface of the system. The formulas obtained are applicable to other systems besides the proton-neutron system (nuclear matter).

34. Energy Loss of a Charged Particle

"Energy Loss of a Charged Particle Moving in a Medium of the Emission of Longitudinal Waves," by L. S. Naryshkina, Moscow Engineering Physics Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3 (9), Sep 62, pp 553-957

The energy loss of a charged particle due to the emission of longitude waves in a medium is examined. It is shown that if the charged particle possesses proper vibration it may be amplified by the interaction of the charge with the medium.

35. μ^+ Molecules

" μ^+ Molecules," by A. A. Ansel'm and V. M. Shekhter, Physicotechnical Institute imeni A. F. Ioffe, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3 (9), Sep 62, pp 958-962

Molecules or ions consisting of ordinary atoms and mounium or a μ^+ meson are investigated. Such μ^+ molecules can be produced when μ^+ mesons are slowed down in matter, and in many respects they resemble molecules in which a hydrogen atom is located in the corresponding site. The vibrational and rotational spectra of these molecules differ from those of ordinary molecules. The probability of a system consisting of muonium and a hydrogen atom being formed upon the slowing down of μ^+ mesons in hydrogen gas is calculated. It strongly depends on the gas temperature; up to 800°K practically no molecules are produced, whereas above this temperature almost all μ^+ mesons yield molecules. Some other reactions are discussed, as well as the possibility of experimental investigation of μ^+ molecules.

36. Neutrino and Antineutrino Elastic Scattering onElectrons

"Elastic Scattering of Neutrino and Antineutrino on Electrons by Taking Into Account Higher Approximations," by Nguyen Van Hieu, Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3 (9), Sep 62, pp 984-990

With the help of the dispersion relations, the elastic scattering of neutrino and antineutrino on an electron is examined by taking into account only the $(1 + \gamma_5)$ invariant interaction of the (ve)(ev) type. The Low integral equation whose solution depends on two constants is derived in the two particle approximation from the dispersion relations and the unitary condition. One of the constants is defined by the universal weak interaction constant. The result obtained shows that in the approximation under consideration, a resonance exists whose position and half width depend on an unknown constant. When the energy tends to infinity, the cross section for the processes under consideration approaches zero.

37. Photoelectrons Angular Distribution From K-Shells

"Angular Distribution of Photoelectrons From K-Shells," by V. G. Gorshkov and A. I. Mikhaylov, Physcotechnical Institute imeni A. F. Ioffe, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 991-1004

The angular distribution of photoelectrons from K-shells is obtained for γ quanta energies above 0.5 Mev. The relative accuracy of the calculations is of the order of $(aZ)^2$. The effect of screening is taken into account. The cross section for photoelectrons emitted in the direction of the incident photons can be represented in an analytic form with a relative accuracy of the order of aZ. The results of the numerical calculations agrees with experiments within the errors of the measurements.

38. Two Types of Nuclear Fission

"Two Types of Nuclear Fission," by Yu. A. Selitskiy and V. P. Eysmont; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 1005-1008

Data on fragment kinetic energies are examined from the viewpoint of the hypothesis of the existence of two independent types of fission -- symmetric and asymmetric. Such an examination makes it possible to explain many experimental facts and to establish the properties of the fission types mentioned.

39. μ-Meson Energy of Cosmic Rays

"Energy of μ-Mesons in Cosmic Ray μ-Meson Beams," by Yu. N. Vavilov, Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 1009-1011

On the basis of experimental data on the intensity of μ-meson beams at different depths underground, it is shown that the minimum value of the mean energy entering into the μ-meson beams at sea level should be $\gtrsim 10^{12}$ Ev.

40. Infrared Asymptotics of Green's Function

"Infrared Asymptotics of Green Functions in Some Quantum Field Theory Models," by G. A. Milekhin, Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 1012-1020

The infrared asymptotics of single particle Green's functions are investigated for certain types of interactions by the continual integration method. It is shown that under some conditions the first term of the asymtotic expansion is determined only by low energy virtual processes, whereas the subsequent terms significantly depend on high energy virtual processes. It is shown also that the pseudoscalar interaction of mesons with nucleons is weak in the infrared region.

41. Calculation of Parameters of Experimental γ -Quantum Resonance Absorption Spectrum

"Calculation of Parameters of Experimental γ -Quantum Resonance Absorption Spectrum in Crystals," by G. A. Bykov and Pham Duy Hien, Institute of Nuclear Physics, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 909-918

The parameters of the γ-quantum resonance absorption spectrum observed in crystals are calculated for single and split lines by taking into account self-absorption in the source.

Electricity

42. Spectral Coefficients for the Image and Sensitivity of Silicon Photoelements

"Investigation of Spectral Coefficients for the Image and the Sensitivity of Silicon Photoelements," by M. A. Kropotkin and B. P. Kozyrev, Leningrad Electrical Engineering Institute imeni V. I. Ul'yanov; Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, No 4, 1962, pp 118-122

The spectral coefficients for reflection of p-type silicon and p-type silicon undergoing p-n transition were measured in the 0.5-1.2 micron range. The effect of the light gathering film on the reflection of p-type silicon with a p-n transition is explained. The coefficients of the diffuse reflection and the spectral sensitivity of some types of silicon photoelements with and without a light gathering film are measured.

Silicon photoelements have already attained an efficiency of 13%, and further increase has wide practical significance.

Some increase in the efficiency of the photoelement can be obtained by applying on its surface a light-gathering film of a fixed composition and thickness of decrease the loss due to the reflection of the incident radiation. In this connection, it is evident that the addition of such a film will increase the integral sensitivity of the photoelement. In fact, silicon photoelements with such a film have a integral sensitivity somewhat higher than those without the film. However, the light gathering film decreases the reflection only in a comparatively narrow spectral range, depending on the thickness of the film, and, therefore, its application on the surface of the photoelement may produce a change in its spectral characteristics.

This work is an experimental study of the spectral coefficients of reflection of the working surfaces of silicon photoelements and their spectral sensitivity, as well as an investigation of the extent of the effect on the characteristics of these photoelements of adding a light-gathering film to their surface.

43. Optimum Working Modes for Silicon Photoelements

"Investigation of Optimum Working Modes for Silicon Photo-elements With High Light Flux," by L. A. Dubrovskiy and P. I. Knigin, Physicotechnical Institute, Academy of Sciences Uzbek SSR; Tashkent, Izvestiya Akademii Nauk UzSSR, Seriya Fiziko-Matematicheskikh Nauk, No 4, 1962, pp 57-61

In connection with the utilization of photoelectrical converters for power purposes, a thorough investigation of the optimum working modes of the photoelements is necessary. To make powerful equipment, the study of the behavior of silicon photoelements is the most interesting and important in the case of large illumination intensities. However, as far as is know, this question has not been sufficiently examined.

In this article, data obtained from an analysis of the volt-ampere characteristic of the silicon photoelements during illumination of up to 100 times solar intensity are given, and the proof of the dependence of the optimum power P_{opt} on the light flux Φ is given.

Mechanics

44. Semispaces Having Moduli of Elasticity Which Are Power Function of Their Depths

"The Basic Integral Equation of a Contact Problem in the Theory of Elasticity for a Semispace Whose Modulus of Elasticity Is a Power Function of the Depth" (presented by Academician G. N. Savin, Academy of Sciences, Ukrainian SSR), by G. I. Belik and V. L. Rvachev, Berdyansk State Pedagogical Institute; Kiev, Doklady Akademii Nauk Ukrainskoy SSR, No 8, 1962, pp 1041-1043

The solution to the problem of a concentrated force applied to the boundary of an elastic semispace whose modulus of elasticity is a power function of the depth is reduced to finding the nonzero solution of a system of ordinary differential equations satisfying certain boundary conditions. In this way, the exact coefficient in the basic integral equation of the contact problem can be found.

45. Invariant-Group Solutions of Equations of a Charged Particle Beam

"Invariant-Group Solutions of Equations of a Plane Stationary Beam of Charged Particles," by V. A. Syrovoy; Moscow, Zhurnal Prikladnoy Mekhaniki i Tekhnicheskoy Fiziki, No 4, Jul/Aug 62, pp 10-20

The concept of auto-model solution is used in various areas of physics. The wide class of auto-model solutions has been analyzed with the aid of measure theory by L. I. Sedov. In the works (DAN SSSR, Vol, 118, No 3, 1958, and DAN SSSR, Vol 125, No 3, 1959), the concept of invariant-group solution (which includes the ordinary concept of auto-model solution) was introduced, and the general method for obtaining them was developed. In the work (DAN SSSR, Vol 125, No 3, 1959), this method was used for the analysis of the nonlinear equation of heat conductivity. After this, the invariant-group equation solutions of motion of viscous incompressible liquid (PMTF, No 1, 1960) and incompressilbe boundary layer (ZhVMMF, Vol 1, No 2, 1961) for the plane case were analyzed. Investigated in this work are properties of beam equations in the absence of an external magnetic field and in a given external magnetic field.

46. Effect of Magnetic Field on Shock-Wave Propagation

"Influence of Magnetic Field on Propagation of Plane and Cylindrical Shock Waves," by V. P. Korobeynikob and E. V. Ryazanov; Moscow, Zhurnal Prikladnoy Mekhaniki i Tekhnicheskoy Fiziki, No 4 Jul/Aug 62, pp 47-51

Plane and cylindrical shock waves are formed in experiments with T-shaped and H-shaped shcok tubes (The Physical Review, Vol 107, No 2, 1957, pp 345-350, et al.) and in experiments with fast electric discharges along straight conductors (see, for example, ZhETF, Vol 32, Issue 2, 1957, pp 199-207). Propagation laws of these shock waves are similar to the propagation laws of strong plane or cylindrical blast waves produced by point explosions (DAN SSSR, Vol 52, No 1, 1946, pp 17-20; and Techeniya Gaza s Bol'shoy Sverkhzvukovoy Skorost'yu /Gas Flow at High Supersonic Velocity/, by L. I. Sedov; Moscow, Gostekhizdat, 1957). For a theoretical description of similar experiments with an initially applied magnetic field and for experiments on interaction of blast waves from plane and cylindrical charges of ordinary explosives, analysis of the problem of strong plane or cylindrical point explosion in a gas, taking into account the influence of applied magnetic fields, may prove to be useful. The problem of cylindrical and plane explosions may be used also in the study of problems of hypersonic gas flow around thin, blunt bodies in the presence of a magnetic field.

47. Creation of Tractive Force in Continuous Medium

"On One of the Principles of Creation of Tractive Force for Motion," by M. A. Lavrent'yev and M. M. Lavrent'yev; Moscow, Zhurnal Prikladnoy Mekhaniki i Tekhnicheskoy Fiziki, No 4 Jul/Aug 62, pp3-9

Examined in this artdle is one possible principle of creation of tractive force for motion of bodies in a continous medium. This principle makes it possible to explain the motion of certain types of living organisms on land and water.

48. Shock-Wave Compression of Quartz

"Shovk-Wave Compression of Quartz," by G. A. Adadurov et al.; Moscow, Zhurnal Prikladnoy Mekhaniki i Teknicheskoy Fiziki, No 4, Jul/Aug 62, pp 81-89

This work studies quartz compressibility under a strong shock wave and determines the possibility of formation of solid form silica during momentary shock compression of quartz. For this, it was necessary to measure the shock adiabatic curve of the quartz and find the volume change due to the compression stress. In addition, the role of anisotrophy in the shock compression of directionally cut quartz crystal was analyzed.

49. Dynamics of Stratified Fluid

"Dynamics of Stratified Fluid," by A. M. Obukhov, corresponding member, Academy of Sciences USSR; Mosciw, Doklady Akademii Nauk SSSR, Vol 145, No 6, Aug 62, pp 1239-1242

The author obtains by sufficiently general assumptions an expression for the change of potential vortex(adiabatic invariant) in the presence of weak external action (heat influx, frictional force) on stratified fluid. The results may be used in problems of the dynamics of the ocean and the theory of atmospheric circulation.

50. Approximate Solutions for Flow of Incompressible Viscous Liquids in Porous Tubes

"An Approximation Theory for the Flow of an Incompressible Viscous Liquid in Tubes With Porous Walls," by S. A. Regirer, Northern Branch of the Institute of Refrigeration imeni V. A. Obruchev; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy: Matematika, No 5, 1962, pp 65-74

The article is concerned with the flow of liquids forced through tubes with porous walls at a low rate of speed. Approximate solutions are obtained by exapnding the desired functions into Fourier series of degree equal to the Re number. The general theory is illustrated by calculation of the flow between parallel walls for variable speeds of penetrability.

51. Fine Structure of Line in Rayleigh Scattering in Liquids With Diverse Viscosity

"Results of an Experimental Study of the Fine Structure of a Line in Rayleigh Light Scattering in Liquids With Diverse Viscosity," by I. L. Fabelinskiy; Moscow, Uspekhi Fizicheskikh Nauk, Vol 77, No 4, Aug 62, pp 649-662

The first part of the article summarizes the research in the field of light scattering by Einstein, Debay, Rayleigh, Brillouin, and others. Following this is a discussion of the results of investigations by Soviet scientists Landsberg, Shustin, Molchanov, Pesin, and Mandel'shtam into Rayleigh scattering in different liquids such as benzene, carbon bisulfide, toluene, acetone, chloroform, and water. The speeds of ultrasonic and hypersonic waves in each liquid and the relation of these speeds to the temperatures of the liquids are tabulated.

52. Shock Tube Velocities Equation

"Equation of Three Velocities for Shock Tube," by A. I. Lashkov; Moscow, Inzhenernyy Zhurnal, Vol 2, No 3, 1962, pp 161-162

A derivation of a equation connecting three basic velocities of gas flow in a shock tube is given. As a result of its application, the limiting values of flow parameters on a reflected shock wave are found easily.

53. Plactic Deformation of Metals Under Stress

"On Plastic Deformations of Metals in Biaxial Tension," by L. S. Andreyev; Mosciw, Inzhenernyy Zhurnal, Vol 2, No 3, 1962, pp 150-157

The author gives results of experiments in order to check certain relations between invariants of true stresses and deformations in the region of large plastic deformations in a complex stressed state.

54. Thermal Calculations for Thin Shells

"On Calculation of Temperature of Thin Orthotropic Shells of Revolution," by S. M. Durgar'yan; Mosciw, Inzehenernyy Zhurnal, Vol 2, Issue 3, 1962, pp 126-140

In connection with the achievements of technology, the problems of thermoelasticity for large gradients of the temperature field are acquiring ever greater significance.

In cases of substantial change of temperature, neglect of the changes in the physical proterties of materials due to heating becomes, in many cases, intolerable, and the necessity arises for determination of the stressed and deformed state of machine parts or design features by taking into account the dependence of the coefficients of elasticity and thermal expansion on temperature at a given point of the shell.

This work is devoted to the axisymmetric problem of thermoelasticity for thin orthotropic shells of revolution with variable coefficients of elasticity and thermal expansion.

The problem is solved in a linear formulation without taking into account creep of material, assuming the validity of generalized Hooke's law.

55. Stressed-State Calculations for Thick-Walled Cylinders

"Determination of the Stressed State for a Thick-Walled Cylinder," by Ya. S. Shain; Moscow, Inzhenernyy Zhurnal, Vol 2, No 3, 1962, pp 99-108

The author presents a solution to the problem on stresses in a short, elastic, thick-walled cylinder subjected to action of external nonaxially symmetric loads along its side surface. The solution is based on a method worked out by Prof M. M. Filonenko-Borodich with the use of his proposed "cosine-binomial" function.

The results of the obtained solution may be used in calculations for rolling mill rolls, piston pins of internal combustion engines, crankgear axles of press forging equipment, certain underground structures, etc. Because of the lack of proper methods, calculations for strength and rigidity of these items are at present either not made or they are calculated according to formulas based on the theory of elementary strength of materials, which, by virtue of the shape of these bodies, the relation between their geometric dimensions, and the nature of external loads, cannot be regarded as correct.

In this solution, all equations are reduced to working formulas sufficiently simple for computation.

56. Deformations of Cones

"Axisymmetric Deformation of Cones," by K. V. Solyanik-Krassa; Moscow, Inzhenernyy Zhurnal, Vol 2, Issue 3, 1962, pp 74-87

Values of displacements and stresses for different loadings of solid and hollow cones were given in the works of J. H. Michell and others. The compression of a cone along the axis of rotation, bending by couple and concentrated force applied at the vertex, torsion, polynomial loading along the side surface, and deformations under the action of its own weight and in uniform rotation around the axis have all been studied.

The purpose of this work is to extend the scope of known results. A new form of solution is obtained which corresponds to axially symmetric loading of the side surface of a cone by forces of radial and axial directions, represented in the form of expansion in Fourier series or as improper integrals. Two special cases of loading are examined.

A device for stress functions as given by K. V. Solyanik-Krassa in DAN SSSR, Vol 86, No 3, 1952, was used in the solution.

57. Stationary Problem of Magnetic Gas Dynamics

"Stationary Problem of Magnetic Gas Dynamics With Dependence on Two Coordinates," by V. S. Tkalich; Moscow, Inzhenernyy Zhurnal, Vol 2, No 3, 1962, pp 43-53

The author examines the stationary problem of magnetic gas dynamics (Vvedeniye v Kosmicheskuyu Gazodinamiku (Introduction to Space Gas Dynamics), by F. A. Baum, S. A. Kaplan, and K. P. Stanyukovich, Fizmatgiz, 1958) with one cyclic coordinate. In analytic mechanics, a coordinate on which the Hamiltonian (or, more rarely, the Lagrangian) does not depend is called

cyclic. In this article, the cyclic coordinate is one on which the basic physical values like density, entropy, velocity, and magnetic field do not depend. Successive use of properties of the stationary state and symmetry (presence of cyclic coordinate) makes it possible to advance substantially integration of equations of magnetic gas dynamics and also to expose several essential physical properties.

58. Gas Cooling of Porous Plate in High-Speed Flow

"Laminar Boundary Layer With Reaction Front on a Porous Plate," by V. M. Yemel'yanov; Moscow, Inzhenernyy Zhurnal, Vol 2, Issue 3, 1962, pp 21-26

During the flow of hot gas past the nozzle walls of reaction engines and gas turbine blades, as well as in the motion of flying apparatus at high velocities through dense layers of atmosphere, the system of cooling the surface by means of passing through it a coolant such as cold gas is very important.

The effectiveness of cooling depends of chemical reactions between the coolant and the oncoming flow (L. Krokko [Crocco ?], "Approximate Theory of Porous and Pellicular Cooling by Use of Reacting Liquids," Problemy Dvizheniya Golovnoy Chasti Raket Dal'nego Deystviya, [Problems of Long-Range Rocket Nose Cone Motion], (IL, Moscow, 1959). If the rate of the reaction is infinitely great, then the reaction takes place on some surface in the boundary layer (reaction front). The reaction is determined by the diffusion of the substance toward the front (heterogeneous reaction, taking place in the diffusion region). This approach in calculation of chemical processes was used by Cohen et al. Voprosy Raketnoy Tekhniki, No 4, 1959).

This work examines the auto-model problem of flow of hot or high-speed gas around a semi-infinite plate through which is injected, according to the law $v_w \approx x^{1/2}$, a gas coolant which reacts in the boundary layer with the oncoming flow.

59. Hypersonic Flow Past Slender Cone

"Viscous Hypersonic Flow Past a Slender Cone," by V. S. Nikolayev; Moscow, Inzhernernyy Zhurnal, Vol 2, No 3, 1962, pp 9-13

The author makes calculations on hypersonic perfect gas flow past a slender cone under a zero angle of attack taking into account the cross-section curvature of the surface and the interaction of the boundary layer with the shock wave. In calculations of the boundary problem, the integral relation of impulse and energy was used. In addition, the side view of the longitudinal component of velocity was assumed to be linear, and the side view of the temperature -- quadratic (but not similar in length).

The pressure on the outer limit of the boundary layer was determined by Newton's method, taking into account the thickness of displacement of the boundary layer. Surface temperature was assumed to be constant (absolutely diathermal body).

60. Periodic Solutions of Autonomous Systems

"Oscillations of Autonomous Systems With One Degree of Freedom" by Yu. M. Kopnin; Moscow, Inzhenery Zhurnal, Vol 2, No 3, 1962, pp 3-8

The author constructs periodic solutions by the small parameter method for autonomous systems with one degree of freedom, which are close to arbitrary nonlinear systems possessing a family of periodic solutions, for the general case, when the roots of the equations of basic amplitudes can be multiple.

For systems close to linear, this problem was examined in PMM, Vol 22, No 4, 1958 and Nekotoryye Zadachi Teorii Nelineynykh Kolebainy (Some Problems of the Theory of Nonlinear Oscillations), Gostekhizdat, 1956.

61. Periodic Solutions of Nonautonomous Qualilinear System

"Construction of Periodic Solutions of a nonautonomous Quasilinear System With One Degree of Freedom Close to Resonance in the Case of Double Roots of the Basic Amplitude Equations," by G. V. Plotnikova; Moscow Prikladnaya Matematika i Mekhanika, Vol 26, No 4, Jul/Aug 62, pp 749-755

In the works Nekotoryye Zadachi Teorii Nelineynkh Kolebaniy (some Problems in the Theory of Nonlinear Oscillations) by I. G. Malkin, Gostekhizdat, 1956, and PMM, Vol 23, Issue 4, 1959 the problem of construction of periodic solutions of nonautonomous quasilinear systems with one degree of freedom in the case of simple roots of the basic amplitude equations, as well as in the case of multiple roots with some additional condition, was analyzed. It is shown that the solution is presented in these cases

as series in integer powers of small parameter μ. This work considers the problem of construction of periodic solutions of such systems in case of double roots of the basim amplitude equations as series for both integer powers of μ and powers of $\mu^{1/2}$.

62. Elastic Equilibrium of Transversally Isotropic Medium and Thick Plate

"Elastic Equilibrium of a Transversally Isotropic Layer and a Thick Plate," by S. G. Lekhnitskiy; Moscow, Prikladnaya Matematika i Mekhanika, Vol 26, No 4, Jul/Aug 62, pp 687-696

The problem of elastic equilibrium of an infinite isotropic layer is presented in detail in the book Prostranstvennyye Zadachi Teorii Uprugosti (Spatial Problems of the Theory or Elasticity), Moscow, GITTL, 1955, by A. I. Lur'ye who used for its solution a method based on the use of special differential operators. Having the solution for an infinite layer, it is easy to obtain the solution for a limited thick plate if one avoids the exact satisfaction of side-surface conditions and replaces them with approximate, integral, or averaged conditions.

In this article, the author examines a problem on equilibrium of an elastic layer having a particular from of anisotropy, namely, transversally isotropic. General and special solutions are possible by a method similar to the A. I. Lur'ye method.

63. On the Theory of Bending of Elastic Plates

"Formulation of Approximate Theory of Bending of a Plate by the Method of Asymptotic Integration of the Equations of Elasticity Theory," by A. L. Gol'denveyzer; Moscow, Prikladnaya Matematika i Mekhanika, Vol 26, No 4, Jul/Aug 62, pp 668-686

The author investigates the possibility of refining the theory of bending of a plate based on the hypothesis of Kirchhoff. The problem of bending of a plate is formulated as a three-dimensional problem of elasticity theory, which is solved by an iteration method. It is assumed that one of the dimensions of the examined region is small compared to the other two. The unknown stressed condition of the plate is composed of a sum of slowly diminishing stressed conditions which are formed with the help of the basic iteration process and rapidly diminishing stressed conditions upon removal from the boundaries, which are formed with the help of auxiliary iteration processes. Such an approach is often used with asymptotic integration of differential equations (UMN, Vol 12, Issue 5, 1957, p 77) and conforms with the physical nature of the phenomenon. The basic iteration process makes it possible to find that stressed condition which the classical theory gives in the first approximation. The auxiliary iteration process allows one to consider those boundary stressed conditions

which were discovered during an attempt at making more precise the classical theory by replacing the Kirchhoff hypothesis with another supposition (Izv. AN SSSR, OTN, No 4, 1958, et al.).

64. Deformation of Solid Cylinders

"Axisymmetric Deformation of a Solid Circular Cylinder of Finite Length," by G. M. Valow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 26, No 4, Jul/Aug 62, pp 650-667

The author solves in this article the fundamental mixed problem and the second fundamental problem of elasticity theory on axisymmetric deformation of a solid circular cylinder of finite length. The mixed problem is solved in two versions: (1) to the bases of the cylinder are assigned arbitrary stresses, and to the side surface -- displacements; (2) to the bases of the cylinder are assigned arbitrary displacements, and to the side surface -- stresses. The special case of the first problem is the bending of a thick circular plate rigidly fixed along the side surface under a load applied to one of the bases.

The mixed problem for a cylinder was examined in the work of Filon (Phil. Trans. of the Royal Soc. London, 1902, Ser. A, 198), where the boundary conditions for tangential displacements on the bases of the cylinder were not satisfied. This problem was solved by an approximation method in the work Zadacha o Szhatii Tsilindra Mezhdu Zhestkimi Plitami bez Skol'zheniya (The Problem of Compression of a Cylinder Between Rigid Plates Without Slipping), Ministry of Higher Education SSSR, Moscow Forestry Engineering Institute, 1957.

65. Shock-Wave Structure

"Structure of Shock Waves," by A. G. Kulikovskiy; Moscow, Prikladnaya Matematika i Mekhanika, Vol 26, No 4, Jul/Aug 62, pp 631-641

Considered are systems of equations of the form

$$\frac{\partial}{\partial t}A'_i + \frac{\partial}{\partial x}B'_i - \frac{\partial}{\partial x}L_{ij}\frac{\partial u_j}{\partial x} \qquad A'_i = \frac{\partial A}{\partial u_i},\ B'_i = \frac{\partial B}{\partial u_i} \qquad (i,\ j=1,\ldots,n)$$

where A, B and L_{ij} are given functions of variables u_k, and also the matrices $\|A''_{ij}\|$ and $\|L_{ij}\|$ are positive definite, i.e., in case of any z_i not simultaneously equal to zero, the inequalities

$$A''_{ij}z_iz_j>0, \qquad L_{ij}z_iz_j>0$$

66. Stationary Quasio-one-dimensional Magnetogasdynamic Flow

"Stationary Quasi-one-dimensional Magnetogasdynamic Flow in the Case of Finite Conductivity," by R. I. Khrapko; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 32, No 9, Sep 62, pp 1063-1071

For some time, there has been much interest in the study of stationary one-dimensional and quasi-one-dimensional magnetogasdynamic flows in the case of finite of conductiovty, without taking into account the viscosity and the thermal conductivity. In this article, certain exact solutions lying within the general fundamental system of equations are stated and analyzed.

67. Electrical Conductivity Measurement in Gas Jets

"Measuring the Electrical Conductivity in Gas Jets," by K. V. Donskoy, Yu. A. Dunayev, and A. I. Prokov'yev, Physico-technical Institute imeni A. F Ioffe, Academy of Sciences USSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 32, No 9, Sep 62, pp 1095-1098

To solve any magnetic gas dynamics problem, it is necessary to know the electrical conductivity of the gas under investigation. However, the theoretical determination of this magnitude for real gas mixtures which are often not in thermodynamic equilibrium is a very difficult problem. At present, the experimental data on the magnitude of electrical conductivity for heated gases are entirely insufficient.

In this article, a description of the inductive method to measure the electrical conductivity in gas jets is given, as well as some measurements in the jet of a heated gas.

68. Electromagnetic Phenomena of Flow Around Bodies

"Investigation of Electromagnetic Phenomena at the Flow Around Bodies in a Conducting Liquid in a Magnetic Field," by L. I. Dorman and Yu. M. Mikhaylov, Laboratory for Magnetic Research, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3 (9), Sep 62, pp 752-762

The motion of a sphere in an imcompressible fluid of finite conductivity in an externam magnetic field is examined for small magnetic Reynolds numbers and small Stuart numbers. The distribution of the electric and magnetic fields is given under the assumption that the fluid velocity field is potential. The electric field distribution in the boundary layer of the sphere is derived for small Hartmen numbers. The electric and magnetic fields produced during the movement of the sphere in mercury are investigated experimentally for Reynolds hydrodynamic numbers lying between 5×10^4 and 5×10^5.

Optics

69. Properties of Transaxial Electrostatic Systems

"Main Electron Optical Properties of Transaxial Electrostatic Systems," by A. M. Strashkevich, Kiev Polytechnic Institute; Leningrad, Zhurnal Tekhnickeskiy Fiziki, Vol 32, No 9, Sep 62, pp 1142-1152

The overwhelming majority of electron optical investigations are on systems with axial symmetry. In addition, the system is always assumed to be coaxial, that is, to be a system in which the direction of the scattering of charged particles makes a sufficiently small angle with the axis of symmetry of the field. Until recently, only this case was applied in electron optical instruments using axial symmetric systems. The investigation here is on transaxial systems, that is, on axial symmetric fields which are governed by the action of charged particles which are scattered almost perpendicularly to the axis of symmetry of the field. This case is of practical interest due to the possibility of obtaining the so-called disk beam by means of the transaxial system.

70. Effect of an External Magnetic Field on Light Characteristics

"Investigation of the Effect of an External Magnetic Field on the Light Characteristics of a Pulsed Discharge in Helium," by S. I. Andreyev, M. P. Vanyukov, and A. T. Starovoytov, State Optical Institute; Moscow, Zhurnal Eskperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3 (9), Sep 62, pp 804-807

The effect of a longitudinal quasistationary magnetic field of up to 150,000 Oe on the brightness of the column of a pulsed discharge in helium is investigated. It is found that at pressure less than 100 mm mercury column, the brightness of a discharge in a magnetic field increases with an increase in the field strength. The plasma conductivity in this case also increases.

Plasma Physics

71. Plasma Acceleration by Magnetic Field

"On Plasma Acceleration by Magnetic Field," by S. I. Fadeyev; Moscow, Inzhenernyy Zhurnal, Vol 2, No 3, 1962, pp 68-73

The author proposes a method of calculating the characteristics of discharge systems used for creation of strong shock waves by electromagnetic acceleration, when the parameters of the external circuit are given: C, capacity; V_0, voltage on condenser casing before the start of discharge; L_0, inductance; R_0, resistence, where L_0 and R_0 are assumed constant.

The hydrodynamic processes in the discharge system are examined for the one-dimensional case. Two assumptions are essential: (1) the entire mass of the gas behind the shock wave is in the shock wave itself; (2) the magnetic field H of the discharge exerts on current-carrying gas particles of ideal conductivity, which are concentrated in the shock wave, a pressure $H^2/8\pi$.

The problem reduces to integration of a system of two ordinary differential equations of second order, the first of which describes the process in an oscillatory loop (exterior circuit plus discharge system) with variable variable inductance and resistance; the second gives the law of shock wave motion as a function of current intensity of the discharge.

72. Conical Source of Plasmoids.

"Conical Source of Plasmoids," by Yu. S. Azovskiy et al., Physicotechnical Institute, Academy of Sciences Uzbek SSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 32, No 9, Sep 62, pp 1050-1054

A comparative study is made of two conical plasma sources. Plasmoids which are scattered at a velocity of 3×10^7 cm/sec and which have a charged particle density greater than 10^{12} cm^{-3} are obtained.

73. Nonlinear Wave Structure in Plasma

"Structure of Nonlinear Waves in Plasma," by V. N. Tsytovich, Physics Institute imeni P. P. Lebedev, Academy of Sciences USSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 32, No 9, Sep 62, pp 1042-1050

Up to now, nonlinear waves in plasma have not been much investigated. The recent interest in the nonlinear oscillations of plasma grew undoubtedly in connection with the repeated considerations in the literature of the problem on the structure of noncolliding shock waves and of the problem on the acceleration of separate particles by nonlinear waves in plasma.

Waves which are propagated at relativistic velocity are of particular interest here. For weak linear waves, the propagation velocity may be relativistic if the dielectric permeability is close to one and, consequently, the displacements of the particles are slight. Generally speaking, this is not the case for nonlinear waves, and the displacements of the particles may be large.

74. Determination of Transfer Coefficients in Plasma by the Grad's Method," by M. V. Samokhin; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 32, No 9, Sep 62, pp 1055-1062

The use of Grad's method to solve the linearized kinetic equation for the electron distribution function in a plasma of a certain kind of stationary ions makes it possible to reduce the problem of determining the transfer coefficients to finding the roots of an infinite system of the linear equation which is satisfactorily approximated by a finite system. The limits of applicability of the linearized kinetic equation to calculate the current and thermal flow are estimated.

75. Shock Waves in a Rarefied Plasma

"Shock Waves in a Rarefied Plasma in a W ak Magnetic Field," by S. S. Moiseyev and R. Z. Sagdeyev; Moscow, Doklady Akademii Nauk SSSR, Vol 146, No 2, Sep 62, pp 329-332

At present, the problem of the so-called noncolliding shock waves in a plasma which are propagated crosswise to a strong magnetic field has been investigated in detail. The magnetic field parallel to the plane of the wave front retains many "hot" particles which prevent the spreading of

the transition region between the nonperturbed (cold) plasma (ahead of the front of the shock wave) and the "heated" plasma behind the wave. With large Mach numbers, the thickness of the front of such a wave is, by magnitude, close to the Larmor radius of the ions. The possibility of noncolliding shock waves in plasma without a magnetic field is considered in a number of papers. Here, as the mechanism restricting the spreading of the transition region, the so-called "beam" instability of two interpenetrating plasmas was determined. With such an approach, however, the thermal scattering inside each of the "beams" is not considered. A more rigorous examination, taking into account the thermal movement, does not give, however, instability up to Mach numbers, from one to approximately $(m_i/m_e)^{1/2}$ if the "temperatures," of the electrons compare with the "temperature of the ions" or are less; m_i is the ion mass; m_e is the electron mass. It is shown that even at small Mach numbers, instability of another type (so-called "nonisotropic") must lead to the formation of a noncolliding shock wave.

76. Quasilinear Approximation in the Kinetics of a Rarefield Plasma

"Quasilinear Approximation in the Kinetics of a Rarefield Plasma," by A. A. Vedenov and Ye. P. Velikhov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 963-967

A set of quasilinear equations is deduced from the equations with a self-consistent field of a rarified high-temperature plasma. The equations are intended for describing the processes taking place in a weakly turbulent plasma, that is, for the case when the spectral energy density of the plasma oscillations considerably exceeds the thermodynamical equilibrium value, but remains much smaller than the plasma particle kinetic energy density. The quasilinear equation set includes: (1) an equation for the averaged distribution function particles diffusing in phase space under the action of stray fields and (2) an equation for the rate of variation of the spectral energy density of these stray fields due to energy exchange with the particles.

77. Helical Instability of Toroidal Discharge

"Helical Instability of Toroidal Discharge in a Varying Magnetic Field," by A. P. Babichev, A. I. Karchevskiy, and Yu. A. Muromkin; Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 881-885

In experiments on the effect of a varying longitudinal field on a toroidal discharge, loss of macroscopic stability of the discharge was observed, that is, helical twisting of the current channel as a whole took place. The instability develops after a change of the direction of the external longitudinal magnetic field.

78. Lifetime of High Temperature Plasma

"Determining the Lifetime of High Temperature Plasma on the Basis of Duration of Neutron Emission," by Yu. V. Gott and V. G. Tel'kovskiy; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 831-834

The possibility of determining the lifetime of a high temperature deuterium plasma in an installation with magnetic mirrors on the basis of the neutron emission is investigated. It is shown that if organic scintillators are employed for recording the neutrons, the experimental results may be distorted by γ-quanta produced in the scintillator as a result of rediative caputre of the slowed down neutrons.

Solid State Physics

79. Gamma Quantum Radiation and Scattering by Nuclei in Solids

"Radiation and Scattering of Gamma Quanta by Nuclei in Solids in the Presence of Time-Dependent External Pertubations," by I. P. Dzyub and A. F. Lubchenko, Institute of Physics, Academy of Sciences Ukrainian SSR; Leningrad, Fizika Tverdogo Tela, Vol 4, No 8, Aug 62, 2081-2089.

The theory of radiation and scattering of gamma quanta by nuclei in solids in the presence of an external perturbation which is dependent on time is developed. The shape of the spectrum of radiation and scattering is calculated under the hypothesis that the external perturbation periodically depends on time. It is shown that the presence of such a perturbation leads to the appearance in the spectrum, in addition to the principal line, additional Mossbauer lines: in the scattering spectrum, the main line appears with observation at the Bragg angle; the angle at which the additional lines are observed depends on the wave vector of lattice oscillations due to external perturbation. This last makes it possible to determine on the basis of the spectrum of scattered gamma quanta the frequency spectrum of normal oscillations in a solid.

80. Kinetic Cyclotron Resonance in Semiconductors

"Kinetic Consideration of Cyclotron Resonance in Semiconductors," by G. M. Genkin, Gor'kiy State University imeni N. I. Lobachevskiy; Leningrad, Fizika Tverdogo Tela, Vol 8, No 4, Aug 62, pp 2116-2122

The quantum kinetic equation for the action on a system of an external electromagnetic field with resonant frequency is solved using the graphic technique by the methods of Green's temperature functions. Cyclotron resonance is examined in semiconductors. It is shown that the quantum analog of the collision interval depends on the electric field.

81. Spin Wave Spectrum

"On the Spin Wave Spectrum," by P'u Fu-ch'o and Meng Hsien-ch'in, Institute of Semiconductors, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 4, No 8, Aug 62, pp 2141-2150

The spin wave spectrum of a nonconducting ferromagnetic sphere, taking into account the exact expression for the demagnetization fields of spin waves with any quasimomentum x, is calculated. The result obtained differs from the familiar expression for the spectrum of spin waves $\omega(x)$ in that the magnetization M_0 is replaced by the value $M_0(1-\Phi(xR))$, where $\Phi(xR)$ may be expressed in terms of the integrals of the known functions. As $x \to 0$, the expression obtained for $\omega(x)$ approaches the known expression for homogeneous precession, but as $x \to \infty$, it approaches the regular formula for the spin wave spectrum.

82. Deformation Splitting of Exciton Series

"Deformation Splitting of Blue and Dark Blue Exciton Series in Cu_2O Crystal Spectrum," by Ye. F. Gross, A. A. Kaplyanskiy, and V. T. Agekyan, Physicotechnical Institute imeni A. F. Ioffe, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 4, No 8, Aug 62, pp 2169-2178

The splitting of blue and dark blue exciton series is investigated in the reflection spectrum of Cu_2O monocrystals subjected to uniaxial compression. The symmetry of appropriate energy zones of Cu_2O, particularly the high conductivity zone of Cu_2O, is determined at $k=0$ from an analysis of the deformation splitting of the series.

83. Selection Rules and Exciton Energy Spectrum

"Selection Rules and Exciton Energy Spectrum. Consideration of External Fields and Directional Deformation," by S. A. Moskalenko and A. I. Bobrysheva, Institute of Physics and Mathematics, Academy of Sciences Moldavian SSR: Leningrad, Fizika Tverdogo Tela, Vol 4, No 8, Aug 62, pp 1994-2004

Selection rules for exciton absorption, beginning with the multi-electron examination of the problem, are given. The method is applicable to crystals of various symmetry subjected to external constant fields and directional deformation. The lattice oscillations, lags, and the Coulomb long-range actions are not considered.

The selection rules for crystals of ten types of symmetry are determined. The theory is compared to the experiment on Cu_2O crystal.

84. Electron Electrostatic Emission from Tungsten

"Investigation of Electron Electrostatic Emission From Tungsten in Wide Interval of Current Density," by I. I. Gofman, Tashkent State University imeni V. I. Lenin; Leningrad, Fizika Tverdogo Tela, Vol 4, No 8, Aug 62, pp 2005-2014

The measurement of electron electrostatic emission currents in a wide current interval (from 10^{-19} to 10^{-1} amps) is given. The distribution of the emission current according to the crystallographic direction is also investigated.

It is possible to compare the results with existing emission theories.

85. Neutron Scattering in Doped Ferromagnetics

"Theory of Inelastic Magnetic Scattering of Slow Neutrons in Doped Ferromagnetics" by V. N. Kashcheyev, Institute of Physics, Academy of Sciences Latvian SSR; Leningrad, Fizika Tverdogo Tela, Vol 4, No 8, Aug 62, pp 2037-2046

A theory is given for the energy distribution of single magnon magnetic scattering of slow monochromatic neutrons in ferrodielectrics containing a small concentration of dia- and paramag etic impurities.

86. Energy Distribution of Inelastically Scattered Electrons

"Energy Distribution of Inelastically Scattered Electrons in Solids," by I. M. Bronshteyn and V. S. Kovalenko, Leningrad State Pedagogical Institute imeni A. I. Gertsen; Leningrad, Fizika Tverdogo Tela, Vol 4, No 8, Aug 62, pp 2047-2049

It is shown that the shape of the energy distribution curve of inelastically scattered electrons does not depend on the atomic number.

87. Electon and Quasi-Particle Lattice Effect on Noise

"Effect of Electrons and Quasi-Particle Lattices on the Absorption of Noise of Solids," by L. A. Svergunenko, Dnepropetrovsk Medical Institute; Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, No 4, 1962, pp 46-53

The problem of the absorption of noise in solids due to the interaction of a sound wave with an electro-particle lattice is solved on the basis of the relaxation method, which makes it possible to obtain a general expression for the noise absorption coefficient suitable to calculate the combined effect of any number of the relaxation parameters. The constants which enter into this expression are determined from the expression of free energy and from the form of the kinetic equation. The direct necessity of searching for the solution of the kinetic equation is eliminated, which on the whole simplifies the problem.

88. Temperature Dependence on Dielectric Permeability

"Investigation of Temperature Dependence on Dielectric Permeability for Dielectric Substances in the Centimeter Range," by Yu. P. Radin and N. V. Tarasova, Saratov State University imeni N. G. Chernyshevskiy; Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, No 4, 1962, pp 87-90

Results are given of the investigation of the temperature dependence on dielectric permeability at the wave length $\lambda = 3.2$ cm for aliphatic alcohol, bromobenzene, d-caphor, and crystals (NaCl and KBr). The main problems in using this method of investigation are examined.

89. Effect of Intensity of Light on Surface Recombination Rate

"Effect of Intensity of Light on the Surface Recombination Speed, by M. Azizov, Andizhan State University; Tashkent, Izvestiya Akademii Nauk UzSSR, Seriya Fiziko-Matematicheskikh Nauk, No 4, 1962, pp 67-71

In all the papers on the rate of surface recombination, it is considered stable, not connected with the intensity of the incident light. In reality, depending on the intensity of the light, incident to the surface of the photoelement, not only the space concentration is changed, but also the distribution of the electrons on the surface levels, which, in turn, causes a change in the surface potential.

In an experiment, it was observed that the rate of surface recombination depends on the intensity of light which, if it is close to the surface, there is a barrier which at first decreases and then becomes stable. In the case of no barrier, the rate of the surface recombination at first increases and then also becomes stable. This article explains the effect mentioned above.

90. Calculation of the Volt-Ampere Characteristics for a p - i - n Symmetric Diode

"Calculation of the Volt-Ampere Characteristic for a p-i-n Symmetric Diode in a Forward Direction," by R. Mamatkulov, Tashkent State University imeni V. I. Lenin; Tashkent, Izvestiya Akademii Nauk UzSSR, Seriya Fiziko-Matematicheskikh Nauk, No 4, 1962, pp 92-99

The calculation of the volt-ampere characteristic for a symmetric p - i - n diode for three cases is given depending on the voltage drop over the thickness of p, i, and n regions, provided that $p_n = p_{no}$ and $n_p = n_{po}$ at the contact of the n and p semiconductor with the metal. The formulas obtained contain the expressions mentioned in the works of Pikus, Herlet and Spenke, and Schockley.

91. Rectangular Ferromagnetic Hysteresis Loop

"Theory of the Rectangular Ferromagnetic Hysteresis Loop," by N. S. Akulov and P. P. Galenko, Physico Technical Institute, Academy of

Sciences Belorussian SSR; Minsk, Doklady Akademii Nauk BSSR, Vol 6, No 9, Sep 62, pp 551-555

The basic idea of the work on rectangular hysteresis loop consists in examining the physical factors which provide for a transition from a hysteresis loop of the Rayleigh to a rectangular loop. Works were conducted earlier along these lines in which the method making it possible to describe mathematically the entire set of curves providing for this transition was given.

With a purely rectangular loop, the inner fields H_1 are small. With a gradual transition to a Rayleigh Loop, inner fields of the "Preyzakhov type" play the all important role.

A more detailed inv estigation of the role of the field H_1 for individual domains, as well as the statistics of their coercive forces H_c is given in this article.

92. Theory of the Surface Effect in Ferromagnetics

"Theory of the Surface Effect in Ferromagnetics with a Nonsinusoidal Field," by A. Z. Veksler and N. V. Pen'khov, All-Union Scientific-Research Institute of Petrology imeni D. I. Mendeleyev, Sverdlovsk Affiliate; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 32, No 9, Sep 62, pp 1104-1114

The process of magnetizing a plate and a circular cylinder by a longitudial, periodic, nonsinusoidal field in investigated. The relations which are derived will make it possible to determine the magnetic field strength inside the ferromagnetics, the magnitude of the total current, and the eddy current losses for a stationary process. The results obtained are applied to a case of pulsed magnetization. It is shown that the results already known which were obtained for separate forms of the pulses are special cases of the relations which are derived in this article.

93. Exact Measurement of Dielectric Parameters of Ferroelectric Substances

"Exact Measurement of Dielectric Parameters of Ferroelectric Substances at Super-High Frequencies," by Yu. M. Poplavko, Kiev Polytechnic Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, vol 43, No 3 (9), Sep 62, pp 800-803

A comparatively precise wave method is described for measuring the high values of dielectric permeability (up to several thousands) on centimeter waves. The method should be applied for investigating the dispersion of the dielectric permeability of ferroelectric substances at super-high frequencies.

94. Linear Antiferromagnetic Chain Theory

"Theory of Linear Antiferromagnetic Chain," by L. N. Bulayevskiy, Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3 (9), Sep 62, pp 968-973

The thermodynamic properties of a linear chain of spins with exchange antiferromagnetic interaction is investigated in the Hartree-Fock approximation. The system does not possess a phase transition of the second kind. For an infinite number of spins, there is no gap between the ground state and the first excited state. Unlike the Ising model, the magnetic susceptibility does not vanish at absolute zero temperature.

95. Natural Ferromagnetic Resonance in Nickel-Iron Ferrite Single Crystal

"Natural Ferromagnetic Resonance in Nickel-Iron Ferrite Single Crystal," by A. A. Askochenskiy and T. M. Perekalina, Institute of Crystallography, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 3(9), Sep 62, pp 841-846

Natural ferromagnetic resonance in a nickel-iron ferrite single crystal is observed experimentally in a temperature range of from room temperature down to -196°C. The experimental temperature dependence of the resonance frequency is compared with that calculated theoretically for the following two cases: when the high frequency magnetic field is parallel to the domain boundaries and when it is perpendicular to them.

96. Anisotropy of Mossbauer Effect in B-Sn Single Crystal

"Anisotropy of Mossbauer Effect in B-Sn Single Crystal," by N. Ye. Alekseyevskiy et al., Institute of Nuclear Physics, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 8(9), Sep 62, pp 790-794

The probability for resonance absorption f' of 23.8 Kev quanta in single crystal plates of white metallic tin cut out along various crystallographic planes in determined. A large anisotropy of the effect was observed which did not change upon transition from a temperature of 283 to 77°K. The following ratio of the quantities f' in various plates was observed: f'100; f'101; $f'001_{polycrystal} = 1 : 0.95 : 0.71 : 0.80$. Differences in the positions of the absorption peaks and an asymmetry of the absorption lines have been found which can be explained by quadrupole splitting of Sn^{119} nucleus level in B-Sn crystal.

Statistical Physics

97. Equation of Boltzmann in Kinetic Theory of Gases

"The Equation of Boltzmann in the Kinetic Theory of Gases," by A. Ya. Povzner; Moscow, Matematicheskiy Sbornik; Novaya Seriya, Vol 58, No 1, Sep 62, pp 65-86

The paper is devoted to theorems of existence and uniqueness for the Boltzmann equation in an entire space. The most important results, obtained earlier, are probably due to T. Carleman (Problemes Mathématiques dans la Theorie Cinetique des Gaz, Uppsala, 1957), who proved a theorem of existence and uniqueness for the Boltzmann equation for the case in which the dispersion is spatially homogeneous (depending only on the velocity) and the molecules are considered as flexible spheres.

In this paper, the author considers a somewhat modified Boltzmann equation, differing from the classical one in that a possible "spreading" of the collisions is assumed instead of the molecules' colliding at a point, as commonly supposed.

Submitted for publication on 16 February 1961.

98. Mathematical Physics in Quantum Physics

"Application of Direct Methods of Mathematical Physics in Quantum Physics," by A. N. Kushnirenko, Kiev State University imeni T. G. Shevchenko; Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, No 4, 1962, pp 16-20

In the quantum theory of solids, in quantum mesodynamics, and in other branches of quantum physics it is necessary to solve the nonstationary Schroedinger equation in the presence of a strong interaction between particles.

It is fully understood that in these cases the application of the usual methods of perturbation theory is not justified. Therefore, repeated attempts were made to go outside the limits of perturbation theory with the aim of constructing so-called theories of "intermediate" and "strong" connections. But all of these theories have a whole series of deficiencies; namely, in some of them it is difficult to eliminate the divergences; in others, it is difficult to make relativistic generalizations.

These methods which are based on the application of the method of moments, the Bubnov-Galerkin method, and the method of least squares are proposed to solve the nonstationary Schroedinger equation. In quantum field theory, these methods have relativistically invariant forms and allow the elimination of divergences by means of the well-known method

of normalization of mass and charge. Within the limit of a weak connection in these methods, formulas are obtained for the perturbation theory.

99. Potentials of Quantum Mechanics

"Potentials of Quantum Mechanics," by I. S. Arzhanykh Institute of Mathematics imeni V. I. Romanovskiy, Academy of Sciences Uzbek SSR; Tashkent, Izvestiya Akademii Nauk UzSSR, Seriya Fiziko-Matematicheskikh Nauk, No 4, 1962, pp 5-11

A function is determined by the Schroedinger equation. The problem arises to substitute one equation with one unknown function by an equivalent system with many unknown functions similar to the case in optics where one equation of D'Alembert is replaced by the equivalent system of Maxwell equation. An analogous problem was solved by Dirac in the theory of the relativistic electron. The solution proposed in this article for the problem given differs essentially from the solution of Direck in that the former method is equal for the relatavistic and the nonrelatavistic cases: it is based on the variational principle of quantum mechanics stated by I. S. Arzhanykh (DAN SSSR,Vol 126, No 1). This method is completely universal, that is, it can not only be used in relatavistic and nonrelatavistic cases, but it encounter no main obsticles in the transition from one particle to a system of particles, which cannot be said in particular, of the Dirack method.

Thermodynamics

100. Heat Transfer to Boiling Liquid

"Determination of Coefficient of Heat-Transfer for Boiling Liquid at a Continuous Change of Heat Flow," by V. V. Gusev, A. I. Pridantsev, and A. N. Solov'yev; Moscow, Zhurnal Prikladnoy Mekhaniki i Tekhnicheskoy Fiziki, No 4, Jul Aug 62 pp 111-114

The author makes an attempt to show the possibility of determination of the coefficient of heat transfer in the boiling of a large volume under continuous linear increase (or decrease) of heat flow. Here, the time of conducting the experiment is reduced substantially, which makes possible investigation in strongly corrosive liquids and high temperatures. The latter allows the use of material with a high thermal conductivity and thus decreases the correction at a depth which can be determined more accurately.

II. MATHEMATICS

101. Properties of Algebraically Dependent Quantities

"Some Properties of Algebraically Dependent Quantities," by V. A. Oleynikov, chair of the theory of numbers; Moscow, Vestnik Moskovskogo Universiteta; Seriya I: Matematika, Mekhanika, No 5, Sep-Oct 62, pp 11-17

The paper states some general theorems on the number of linearly independent products of the powers of prescribed quantities which are algebraically dependent over a given field.

102. Convergence of Method of Straight Lines for Boundary Value Problems

"Convergence of the Method of Straight Lines for Some Boundary Value Problems," by V. A. Morozov, chair of computer mathematics; Moscow, Vestnik Moskovskogo Universiteta; Seriya I: Matematika, Mekhanika, No 5, Sep-Oct 62, pp 25-33

In this paper the author considers the differential-difference method (the method of straigh lines) of approximate solution of some boundary value problems for parabolic and hyperbolic equations.. The convergence of approximate solutions to exact ones is proved and an estimate is made of the errors involved.

103. Stability of Solutions of Systems of Differential Equations

"The Stability of Solutions of Systems of Differential Equations for Certain Conditions," by V. A. Samsonov, chair of theoretical mechanics; Moscow, Vestnik Moskovskogo Universiteta; Seriya I: Matematika, Mekhanika, No 5, Sep-Oct 62, pp 74-78

The article considers properties of characteristic numbers in the solution of systems of linear differential equations and methods for solving a problem in stability for different situations.

104. Asymptotic Solutions of Differential-Difference Equations

"Asymptotic Solutions of Differential-Difference Equations for the Case of Slight Differences of the Argument," by A. B. Vasil'yeva; Moscow, Zhurnal Vychislitel'noy Matematiki i Matematicheskoy Fiziki, Vol 2, No 5, Sep-Oct 62, pp 768-786

The paper is concerned with the problems relating to the differential equation $x(t) = f[t,x(t), x(t- t), x(t- t)]$ for a slight positive variation of the agrument t which is not dependent on the quantity t. The initial conditions are given as $x = o(t)$, 0 t t. The underlying question is whether the solution of the given equation which satisfies the initial conditions for t 0 tends toward some solution of the equation which is obtained when t is actually set equal to zero, and if it does, what additional conditions must be imposed on such a solution.

In Part 1 the cases are studied for which $x(t- t)$ is absent from the right side of the equation; i.e., the equation will be one with a delay in the argument. In Part 2 the special case is considered in which the right side of the equation does not contain x; i.e., the equation becomes simply a difference equation. In these two special cases there is an asymptotic expansion for the small parameter t. In Part 3 the given equation is studied for the general case.

105. Simplified Difference Method

"A Simplified Difference Method of Solution of a Multivariate Parabolic Equation in an Arbitrary Region," by A. A. Samarskiy; Moscow, Zhurnal Vychislitel'noy Matematiki i Matematicheskoy Fiziki, Vol 2, No 5, Sep-Oct 62, pp 787-811

The article concerns a local univariate method of solving linear and quasilinear equations of a parabolic type with any number p of spacial variables compatible with an arbitrary region G. The equations considered are of the type

$$u_t = Lu = \sum_{=1}^{p} L\,u,\quad L\,u = \quad x\,[k\ (x,t)\ u_x\ ] -\ r\ (x,t)\ u_x$$

$x = (x_1,\ldots,x_p)$, with spatial variables $x_1,\ldots, x\ ,\ldots, x_p$.

$x_i = (i_1h_1,\ldots,i \quad h \quad , \ldots, i_ph_p)$, $t_j = j \quad ; i \quad = 0, \_1, \_2,\ldots;$ $j = 0,1,\ldots$ is a space-time difference net with steps h and , $y^j = y(x_i,t_j)$ is a net function, and is the difference approximation of the operator L (L).

Expressions are obtained for the error in the approximation and also for the convergence and accuracy of the system.

106. Iteration Methods in Symmetrization of Matrices

"Some Iteration Methods in Symmetrization of Matrices," by V. N. Kublanovskaya; Moscow, Zhurnal Vychislitel'noy Matematiki i Matematicheskoy Fiziki, Vol 2, No 5, Sep-Oct 62, pp 760-767

The article is concerned with iteration methods of transforming an arbitrary matrix A into a matrix B_k, as close as desired, for sufficiently large k, to a symmetrical matrix, by multiplying it by an orthogonal matrix T_k on its right. The orthogonal matrix T_k is formed in like manner by the product of the primary matrices of rotation.

The article is in three parts. Part 1 is devoted to the algorithms and their convergence. In Part 2 the algorithms are used for extracting the square root from a positively defined matrix and for solving linear systems -- in particular, systems with a rectangular matrix. In Part 3 is indicated the extremal nature of a positively defined matrix AA'.

107. Mixed Problem of Nonlinear Partial Difference Equation With Small Parameter

"An Approximation Method for the Solution of a Mixed Problem of a Nonlinear Hyperbolic-Type Partial Differential Equation Containing a Small Parameter," by A. G. Ilyukhin; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol 14, No 3, 1962, pp 250-259

A method is given for reducing a mixed problem of a hyperbolic-type partial differential equation to an infinite system of ordinary differential equations. The averaging method of N. M. Krylov and N. N. Bogolyubov is applied to the solution of the resulting system of differential equations. The proposed method is of interest in connection with certain problems in the theory of dynamic stability.

108. Asymptotic Solution of Mixed Problem of Integral-Differential Equations With Small Parameter

"The Asymptotic Form of the Solution of a Mixed Problem for a Class of Integral-Differential Equations Containing a Small Parameter," by A. A. Stonitskiy; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol 14, No 3, 1962, pp 299-307

S. F. Feshchenko in two separate papers (Dop. AN URSR, No 2, 1954, p 82; and Dop. AN URSR, No 3, 1955, p 211) has studied asymptotic solutions of systems of differential equations with slowly varying coefficients. In this paper the author, assuming certain limitations, finds an asymptotic solution for the following integral-differential equation which is compatible with the results of Feshchenko:

$$L[u(t,x,E)] \qquad \int_a^b K(\ ,x,5,E)u(t,\ ,E)d \quad = \quad f$$

(,x,E)e $^{(t,E)}$, satisfying initial and boundary conditions u (0,x,E) = 0 (x,E), u't(),x,E) = (x,E0, u(t, ,E) = 0, u(t,b,E) = 0.

E is a real, small parameter; = Et; 0 N; a x b

(N, a, and b are arbitrary numbers); d0/dt = k( ), where k( ) is a real, positive function defined in the interval [0,N] and having a sufficient number of derivatives.

109. Variation Theory of Nonlinear Equations

"A Variation Theory of Nonlinear Equations" (presented by Academician V. D. Kupradze 15 Jul 61), by D. P. Zeragiya, Tbilisi State University; Tbilisi, Soobshcheniya Akademii Nauk Gruzinskoy SSR, Vol 29, No 2, Aug 62, pp 135-142

The article concerns the equation Au - F(u) = f, where A is a linear operator defined on a dense set M of Banach space E; F is a nonlinear potential operator defined in the whole space E; Au, F(u), f E*; and E* is a space conjugate to E.

For given conditions the questions of the existence and uniqueness of the solution to the above equation lead to a problem of minimizing the functional (u) = (Au, u) 2o (u) - 2(u,f), where grad o(u) = F(u). This problem is studied in Banach space. The method of Riesz is applied to the construction of minimizing sequences, and the method of Galerkin is used to construct an approximate solution.

110. Indeterminate A-Integrals and (A) Fourier Series

"Indeterminate A-Integrals and (A) Fourier Series (oresented by Academician N. P. Vekua 5 Aug 61), by O. D. Tsereteli, Georgian SSR Academy of Sciences, Tbilisi Mathematical Institute imeni A. M. Razmadze; Tbilisi, Soobshcheniya Akademii Nauk Gruzinskoy SSR, Vol 29, No 2, Aug 62, pp 129-134

A measurable function f(x), x [a, b] is called A-integrable in the interval [a, b] if

u x:x [a, b], f(x) n = $O(\frac{1}{n})$

and there exists a finite limit of sequences $\int_a^b [f(x)]\,dx$, n = 1, 2, ...,

where [f(x)] = f(x) for f(x) n
0 for f(x) n

The "pathological" properties of A-integrals are shown in series form, based on a theorem for sequences of continuous functions.

111. Extremal Properties of Periodic Functions

"Extremal Properties of Periodic Functions" (presented by Academician Yu. A. Mitropol'skiy, Ukrainian SSR Academy of Sciences), by N. P. Korneychuk, Dnepropetrovsk State University; Kiev, Doklady Akademii Nauk Ukrainskoy SSR, No 8, 1962, pp 993-998

The paper deals with a class of periodic functions $W^{(r)}H_w$ in which the modulus of continuity of the rth derivative does not exceed the given modulus of continuity W(t) and discusses the sub-class $W_0^{(r)}H_w$ of functions of class $W^{(r)}H_w$ with a mean value over the period equal to zero.

Two theorems are given for maximum upper bounds of functions for periods of and 2 , under conditions of upward convexity.

112. Single-Sheeted Quasi-Conformal Mapping of Multiconnected Regions

"Theorems on Single-Sheeted Quasi-Conformal Mapping of Multiconnected Regions" (presented by Academician Yu. A. Mitropol'skiy, Ukrainian SSR Academy of Sciences), by I. P. Mityuk, Poltava Engineering-Construction Institute; Kiev, Doklady Akademii Nauk Ukrainskoy SSR, No 8, 1962, pp 987-989

A method is given for extending various theorems on single-sheeted conformal mapping of multiconnected regions having at least one non-degenerate boundary component to the case of quasi-conformal mapping of such regions.

113. Functions of One Variable

"Properties of a Function of One Variable," by F. I. Shmidov; Moscow, Matematicheskiy Sbornik; Novaya Seriya, Vol 58, No 1, Sep 62, pp 29-46

The paper studies the properties of a finite function of a real variable $y = f(x)$. These properties are characterized by the position of tangents to the curve of the function $y = f(x)$, defined on a bounded set **E**. The nature of a function which depends on the position of generalized tangents to the curve of the function $f(x)$ is also studied.

Submitted for publication on, 3 February 1961.

114. Stability of Solutions of Differential Operator Equations During Disturbances

"Stability of Solutions of Differential Operator Equations During Constantly Acting Disturbances," by R. Gabasov, Ural Polytechnical Institute imeni S. M. Kirov; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy: Matematika, No 5, 1962, pp 29-38

The stability of solutions of differential operator equations in Banach space is studied. The fundamental equation under consideration is $dx/dt = f(x, t)$, where x is an element in Banach space X, $f(x, t)$ is the operator acting in X, and $f(x, t) \in X$. It is assumed also that the operator $f(x, t)$ is continuous with respect to t and satisfies the Lipschitz condition $\| f(x, t) - f(y, t) \| \leq L \| x - y \|$, $x, y \in X$ with respect to x.

115. Fourier Integral Transform and Deformation of Unbounded Flexible Medium With Internal Forces

"Application of the Method of a Fourier Integral Transform to the Problem of Deformation of an Unbounded Flexible Medium With Internal Forces," by V. G. Gromov, Shakhtinskiy Pedagogical Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy: Matematika, No 5, 1962, pp 39-42

The method of a multivariate Fourier integral transform is applied to a classical 3-dimensional problem in the mathematical theory of elasticity.

The article was submitted for publication on 13 October 1959.

116. Resonance in Oscillating Systems With Retarded Arguments

"Resonance Effects in Quasilinear Oscillating Systems with Retarded Arguments," by V. P. Rubanik, Chernovitsy State University; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy: Matematika, No 5, 1962, pp 75-86

The asymptotic method of N. N. Bogolyubov is used in the study of nonautonomous quasilinear oscillating systems with any number of degrees of freedom and retarded arguments. An asymptotic construction in general form is given for a two-parameter family of single-frequency solutions of the given system. The asymptotic solution obtained is then applied to the study of the effects of a retarded argument on different resonance phenomena in a quasilinear oscillating system.

The article was submitted for publication on 12 September 1959.

117. Two-Sided Bivariate Laplace Transforms

"Properties of a Two-Sided Bivariate Laplace Transform," by V. M. Chernov, Tul'skiy Mechanical Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy: Matematika, No 5, 1962, pp 115-127

A function of two real variables $f(x, y)$, either real or complex, is defined for all finite values of x and y. Several theorems are given relating to properties of two-sided bivariate Laplace transforms of this funcion, including the necessary conditions that it be this type of Laplace transform.

The article was submitted for publication on 10 September 1959.

118. Indicators of Functions, Subharmonic in Multidimensional Space

"An Indicator of a Function Which Is Subharmonic in Multidimensional Space," by V. S. Azarin; Moscow, Matematicheskiy Sbornik; Novaya Seriya, Vol 58, No 1, Sep 62, pp 87-94

The article investigates finite order, normal type functions which are subharmonic in an entire space. A function which is subharmonic in an entire space is considered to have a "finite order ρ" if

$$\overline{\lim_{R \to \infty}} \frac{\ln^{+} M_u(R)}{\ln R} = \rho < \infty$$

and to be a "normal type σ for order ρ " if

$$\overline{\lim} \frac{M_u(R)}{R^\rho} = \sigma < \infty ,$$

where $M_u(R)$ is max $[u(Q), Q]$ in the sphere K_R of radius R with its center at the center of coordinates O.

The function $h(\overline{x}) = \overline{\lim_{R \to \infty}} u(\overline{Rx})$, where $\overline{x}$ is a unit vector and $u(\overline{Rx})$ is the value of $u(Q)$ at the end of the vector $\overline{Rx}$, originating at the point O, is defined as the "indicator of the function $u(Q)$ of order ρ which is subharmonic in the entire space." In the article the properties of such an indicator, particularly the trigonometric convexity of the indicator of an integral function, are analyzed.

119. Topology of Planar Algebraic Curves

"Some Problems in the Topology of Planar Algebraic Curves," by D. A. Gudkov, Gor'kiy Physicotechnical Research Institute of Gor'kiy State University imeni N. I. Lobachevskiy; Moscow, Matematicheskiy Sbornik; Novaya Seriya, Vol 58, No 1, Sep 62, pp 95-127

This article is devoted to the study of the topology of real algebraic curves on real projective planes. Two main subjects are covered: (1) a theorem on the independence of branchings of simple double points and points of return (real and imaginary) for algebraic curves satisfying certain conditions, and (2) theorems on the variation of simple double points of algebraic curves.

120. Compact and Discrete Ring Groups

"Compact and Discrete Ring Groups," by G. I. Kats; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol 14, No 3, 1962, pp 260-269

Ring Groups were discussed by the author in a previous paper ("Generalization of the Group Principle of Duality," DAN, Vol 138, No 2, 1961, pp 275-278) as a generalization of locally compact groups. In this paper an analogy of Pontryagin's duality theorem for compact and discrete groups is established for ring groups.

121. Locally Extremal and Extremally Layered Groups

"Locally Extremal and Extremally Layered Groups," by Ya D. Polovitskiy; Moscow, Matematicheskiy Sbornik; Novaya Seriya, Vol 58, No 2, Oct 62, pp 685-694

In a previous paper by the author ("Extremally Layered Groups," DAN SSSR, Vol 134, No 3, 1960, pp 533-535) it was shown that for sufficiently general limitations the class of groups studied, with the condition of primary minimality, coincides with a class of extremally layered groups, i.e., groups in which each set of elements of one and the same order generates an extremal subgroup.

In this paper are established properties of extremally layered groups and locally extremal groups associated with them. (A locally extremal group is considered to be a group every element of which is contained in some one of its extremal normal divisors.)

122. Orthogonal Series for Complete Systems

"Orthogonal Series for a Complete System," by A. M. Olevskiy; Moscow, Matematicheskiy Sbornik; Novaya Seriya, Vol 58, No 2, Oct 62, pp 707-748

The article is devoted to the problem of coefficients of convergent orthogonal series for complete systems. The general statement of the problem is as follows: Given the series $\sum_{n=1}^{\infty} c_n \varphi_n(x)$, where $\varphi_n(x)$ is a complete orthonormalized system of functions in $L^2[0,1]$ converging nearly everywhere on a set of positive degree, in the metric L^2, with respect to the degree; find the condition on the coefficients of convergent orthogonal series which is necessary and sufficient in the class of complete systems.

In the course of the article the author discusses an example of a complete orthonormalized system which tends toward zero, coefficients of convergent series for a complete system, Fourier coefficients for a complete system and convergence with respect to degree, series with convex and monotonic coefficients, and the permutation of complete systems.

123. Conjugate Nets of Projective Spaces

"Axial Forms of Conjugate Nets of an N-Dimensional Projective Space and Certain Problems Connected With Them," by V. V. Gol'dberg; Moscow, Matematicheskiy Sbornik; Novaya Seriya, Vol 58, No 2, Oct 62, pp 749-784

The paper is divided into two parts. In Chapter 1 the author generalizes the concept of an axial plane for a conjugate net of any even-dimensioned space P_{2n} and classifies the nets into those for which the axial planes contain one or two focal lines. Nets $L^{2\pi}_{\pi 1 \pi}$ and sequences $L^{2\pi}_{\pi 1 \pi}$, serving as a generalization of nets L and sequences L in space P_4, are also studied.

Chapter 2 concerns nets $L^{2\pi+1}_{\pi 1 \pi}$ and sequences $L^{2\pi+1}_{\pi 1 \pi}$, which appear as a generalization of Vil'chinskiy harmonic nets, and Laplace sequences of space P_3 which are based on them.

Kartan's method of external forms [S. P. Finikoff, Teoriya Kongruentsiy (Theory of Congruences) Gostekhizdat, Moscow-Leningrad, 1948] is used in this paper, and the basic results appear, without proof, in another paper by the author (DAN SSSR, Vol 134, No 4, 1960, pp 757-761).

124. Autonomous Nonlinear Differential Systems in Neighborhood of Family of Cylinders

"Behavior of Particularly Disturbed Autonomous Nonlinear Differential Systems in the Neighborhood of a Family of Cylinders," by K. V. Zadiraka; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol 14, No 3, 1962, pp 235-249

The author considers the system of differential equations

$$\frac{dx}{dt} = f(x,z), \quad \epsilon \frac{dz}{dt} = F(x,z)$$

and the corresponding degenerate system $\frac{d\bar{x}}{dt} = f(\bar{x}, \phi(\bar{x}))$, $\bar{z} = \phi(\bar{x})$, where $z = \phi(x)$ is an isolated solution of the system $F(x,z) = 0$.

It is proven that if the degenerate system has a family of solutions $\bar{x} = \bar{x}^0(\theta,c)$, $\bar{z} = \bar{z}^0(\theta,c)$ which are periodic in $\theta = \omega(c)t + \phi_0$ with a period of 2π, then the given family has a stable family of periodic solutions $x = x^0(\theta,c,\epsilon)$, $z = z^0(\theta,c,\epsilon)$ with the same period; and furthermore, $x^0 - \bar{x}^0 \to 0$, $z^0 - \bar{z}^0 \to 0$ together with ϵ.

125. Spectral Representation for Bethe-Salpeter Amplitude

"A Spectral Representation for the Bethe-Salpeter Amplitude," by A. F. Plish; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol 14, No 3, 1962, pp 337-340

This article is a direct continuation of a previous one by the author ("An Integral Representation of the Behte-Salpeter Amplitude," Dopovidi AN URSR, No 3, 1962). Its purpose is to show that a Fourier transform of the Bethe-Salpeter amplitude can be definitely expressed by the absorptive part of a third-order vertex function in perturbation theory. It is also shown that there exists for it a spectral representation according as one of the first two invariants is negative and a third invariant is on the mass shell.

126. Steady-State Solutions for Oscillating Systems With One Degree of Freedom

"The Problem of Obtaining Steady-State Solutions for Certain Oscillating Systems with One Degree of Freedom," by E. F. Fayzibayev; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol 14, No 3, 1962, pp 340-348

The study of a number of mechanical and electrical operations of an oscillatory nature, encountered in various fields of physics and mechanics, leads to the consideration of a differential equation for natural oscillations

of the type

$$\frac{d^2x}{dt^2} + k\frac{dx}{dt} + (\alpha + \gamma_1 x^2)\, x = \epsilon(\beta + \gamma_2 x^2)\frac{dx}{dt} + R \sin m\omega t$$

In the case of mechanical vibrations x is a coordinate determining the position of the oscillating system; k>0 is the coefficient of friction; $\alpha, \beta, \gamma_1, \gamma_2$ are known constant quantities; ω, R are positive constants; m is an integer; t is time; ϵ is a small parameter; and R sin $m\omega t$ is an external sinusoidal disturbance.

In this paper it is shown that in a system of natural oscillations characterized by the equation above, together with other oscillations produced by the frequency of an external disturbance, oscillations with combined frequencies are possible.

127. Limit Theorems in Boundary Value Problems for Sums of Independent Terms

"New Limit Theorems in Boundary Value Problems for Sums of Independent Terms," by A. A. Borovkov; Moscow, Sibirskiy Matematicheskiy Zhurnal, Vol 3, No 5, Sep/Oct 62, pp 645-694

In this paper the author investigates a group of problems concerning the trajectory of a random path on a one-sided boundary. Following this are several limit theorems on common distribution of maxima and minima of sequential and final sums, including therems on common distribution of maxima and minima of sequential and final sums, including theorems on asymptotic expansions and large deviations and theorems on distribution of certain special functions of trajectories.

In his discussion the author introduces a new method employing the concept of "factorization of functions," first formulated by V. S. Korolyuk ("A New Method in Problems of Paths on a Semiaxis," Teoriya Veroyatn. i yeye Primen., Vol 5, No 2, 1960, pp 263-264).

128. Closure of Locally Nilpotent Groups

"Closure of Locally Nilpotent Groups," by M. I. Kargapolov; Moscow, Sibirskiy Matematicheskiy Zhurnal, Vol 3, No 5, Sep/Oct 62, pp 695-700

By means of the general theory of groups the following generalizations of the theorems of Mal'tsev (Izv. Ak. Nauk SSSR, Ser. Matem., Vol 13, No 3, 1949, pp 201-212) and Conrad (Illinois J. Math., 5, 1961, pp 212-224)

are proven: An arbitrary nilpotent (locally nilpotent) group G with a torsion-free commutator group has a unique nilpotent (locally nilpotent) closure, correct to the isomorphism, in which the commutator group is also torsion-free; and the periodic part serves as a closure of the periodic part of G.

Two properties of closure of locally nilpotent groups are needed in the proofs:

(1) If a locally nilpotent torsion-free group G* serves as a closure of its own subgroup G, then every element of G* is contained in some positive degree in G.

(2) If a nilpotent torsion-free group G* is the closure of its own subgroup G, then the closure in G* of the i-th hypercenter of G coincides with the i-th hypercenter of G*.

129. Numerical Solution of Partial Differential Equations

"A Method for the Numerical Solution of the Cauchy Problem for Divergent Systems," by V. B. Balakin; Moscow, Zhurnal Vychislitel'-noy Matematiki i Matematicheskoy Fiziki, Vol 2, No 5, Sep/Oct 62, pp 925-930

The article is devoted to the numerical solution of the Cauchy problem for divergent hyperbolic systems of first-order partial differential equations of the type

$$\frac{\partial u}{\partial t} + \frac{\partial \phi(u,x,t)}{\partial x} = \psi(u,x,t),$$

where u, ϕ, ψ are vectors of n dimensions. Attention is focused, in particular on homogeneous systems of the form $\frac{\partial u}{\partial t} + \frac{\partial \phi(u)}{\partial x} = 0$. General solutions, i.e., piecewise continuous functions $u(x,t)$, are sought which satisfy the initial conditions $u(x,0) = u_0(x)$ and the integral relation $\oint_C u\,dx - \phi(u)\,dt = 0$, where C is an arbitrary piecewise smooth boundary in the plane (x,t).

130. New Approaches in Numerical Methods

"Some New Approaches in Numerical Methods and Processing of Experimental Data," by L. V. Kantorovich; Moscow, Sibirskiy Matematicheskiy Zhurnal, Vol 3, No 5, Sep/Oct 62, pp 701-709

The author stresses the need for obtaining more accurate results in approximation methods of calculation. This need has arisen with the increased volume of analysis required in applied mathematics in the fields of economics,

physics, and science in general. As an example of the accuracy possible, he cites the results obtained by using a method of linear programing for the evaluation of a fifth degree polynomial. The answer is accurate to within 0.0004 as compared to 0.0009 by Horner's method.

A use of linear operators in approximation formulas is outlined. The author also suggests linear programing methods for problems in applied mathematics in such subjects as gravitation and magnetism.

131. Spatial Mapping

"A Theory of Spatial Mapping," by M. A. Lavrent'yev; Moscow, Sibirskiy Matematicheskiy Zhurnal, Vol 3, No 5, Sep/Oct 62, pp 710-714

A consequence of the theory of mapping of spatial regions is the well-known theorem of Liouville that the class of conformal mappings in three-dimensional space coincides with a class of linear transformations. Liouville proved this theorem on the assumption that the functions $u = u(x,y,z)$, $v = v(x,y,z)$, $w = w(x,y,z)$ defining the mapping possess three continuous derivatives with respect to all three variables.

In this article the author limits the mappings under consideration to a system of 4 equations of the 5 equations defining the conformality. A theorem is proven for five conditions of smoothness which the mappings of the above functions must satisfy.

132. Boundary Value Problems for Elliptical Systems

"Some Boundary Value Problems for Elliptical Type Systems," by M. A. Lavrent'yev; Moscow, Sibirskiy Matematicheskiy Zhurnal, Vol 3, No 5, Sep/Oct 62, pp 715-728

The author cites a number of problems (new and old) on the action of a liquid with a free surface which can be solved by variational methods. The first part of the article is devoted to several planar problems and problems with axial symmetry. The second part deals with some particular results concerning flows in space.

133. Formulas of Mechanical Cubature on Surface of Sphere

"Formulas of Mechanical Cubature on the Surface of a Sphere," by S. L. Sobolev; Moscow, Sibirskiy Matematicheskiy Zhurnal, Vol 3, No 5, Sep/Oct 62, pp 769-796

A quadrature or cubature formula $\int_L f\,dx \approx \sum_{k=1}^{N} C_k f(x^{(k)})$ is characterized by a functional $(l,f) \equiv \int_L f\,dx - \sum_{k=1}^{n} C_k f(x^{(k)})$, which the author calls the "functional of the errors." The problem consists of investigating the errors of cubature formulas for functions on a sphere. A group G of rotation of the sphere is considered which transforms a system of points $x^{(k)}$ ($k = 1,2,\ldots,N$) into itself.

Several theorems are proved for spherical harmonics and for functions which are invariant with respect to the group G of rotation.

134. Convergence of Fourier Series for Orthonormalized Multiplicative Systems

"Convergence of Fourier Series for a Class of Orthonormalized Multiplicative Syspems," by G. M. Dzhafarli; Baku, Izvestiya Akademii Nauk Azerbaydzhanskoy SSR; Seriya Fiziko-Matematicheskikh i Tekhneskikh Nauk, No 4, 1962, pp 17-36

The article concerns several theorems on the coverage of Fourier series for an orthonormalized multiplicative system $\{\Psi_\pi(x)\}$ closed relative to the operation of extracting the root. The definitions of this system of functions $\{\Psi_\pi(x)\}$ and the system of functions $\{\Phi_\pi(x)\}$ connected with it are given by the author in an earlier issue of this journal (No 6, 1961).

An analogy of covergence tests, including those of Hardy and Littlewood for trigonometric systems of functions, is obtained; and some theorems on the convergence nearly everywhere of a Fourier series for a trigonometric system of functions are presented.

135. Functions of Several Variables Approximated by Rational Fractions

Properties of Functions of Several Variables Adequately Approximated by Rational Fractions," by Ye. P. Dolzhenko; Moscow, Izvestiya Akademii Nauk SSSR: Seriya Matematicheskaya, Vol 26, No 5, Sep Oct 62, pp 641-652

It is whown in the paper that functions of one or more real (or complex) variables, adequately approximated by rational fractions, necessarily have nearly everywhere a total differential of sufficiently high order. Furthermore, such functions cannot have at any point derivatives higher than the first order.

136. Stochastic Equations and Degenerate Elliptic Equations

"Stochastic Equations of Ito and Degenerate Elliptic Equations," by M. I. Freydlin; Moscow, Izvestiya Akademii Nauk SSSR: Seriya Matematicheskaya, Vol 26, No 5, Sep Oct 62, pp 653-676

In the paper the general solution of the Dirichlet problem is found for an elliptic, possibly degenerate, linear second-order differential equation. Conditions are found which guarantee the uniqueness and continuity of this solution. The general solution is obtained and its nature investigated with the aid of the theory of Markov random processes.

The proofs are based on the stochastic integral equations of K. Ito (Nagoya Math. Jorn., 3, 1951, pp 55-65; and Stochastic Processes, by J. L. Doob, IL, 1956) and theorems on Markov processes by Ye. B. Dynkin (Theory of Probability and Its Applications, Vol 1, No 1, 1956, pp 38-59; and Basic Theory of Markov Processes, Fizmatgiz, 1959).

137. Classes of Fields of Complex Multiplication

"The Number of Classes of Fields of Complex Multiplication," by A. P. Novikov; Moscow, Izvestiya Akademii Nauk SSSR: Seriya Matematicheskaya, Vol 26, No 5, Sep Oct 62, pp 677-686

The paper gives the arithmetic representation of the number of classes of divisors of certain fields, abelian over quadratic-imaginary fields, resulting from the general analytic formulas of Dedekin.

138. Generalization of Laplace Transform

"Generalization of a Laplace Transform," by L. G. Zastavenko; Moscow, Izvestiya Akademii Nauk SSSR: Seriya Matematicheskaya, Vol 26, No 5, Sep Oct 62, pp 687-720

The author studies the inversion of the integral transform $F(p) = \int_0^\infty \Psi(pt)\, f(t)dt$ for a class of kernels $\Psi(x)$ "near" e^{-x}.

129. Integral Points on Single-Sheet Hyperpoloids and Ergodic Theorems

"Asymptotic Distribution of Integral Points on a Single-Sheet Hyperboloid and Ergodic Theorems," by B. F. Skubenko; Moscow, Izvestiya Akademii Nauk SSSR: Seriya Matematicheskaya, Vol 26, No 5, Sep Oct 62 pp 721-752

The paper is concerned with analogies of ergodic theorems for matrices with integral elements. With the aid of these analogies, the author considers the question of distribution of integral points on the surface of a hyperboloid of one sheet.

140. Linear and Quasilinear Equations

"A Boundary Value Problem for Linear and Quasilinear Parabolic Equations, Part II," by O. A. Ladyzhenskaya and N. N. Ural'tseva; Moscow, Izvestiya Akademii Nauk SSSR: Seriya Matematicheskaya, Vol 26, No 5, Sep Oct 62, pp 753-780

The article establishes the solvability "in the large" of the first boundary valuelproblem for quasilinear parabolic equations, with a divergent principal part. It is a continuation of an article by the authors appearing in an earlier issue of the same journal ("A Boundary Value Problem for Linear and Quasilinear Parabolic Equations, Part I," Vol 26, 1962, pp 5-52).

141. System of Powers on Semiaxis

"The Problem of Completeness of a System of Powers on the Semiaxis," by A. F. Leont'yev; Moscow, Izvestiya Akademii Nauk SSSR: Seriya Matematicheskaya, Vol 26, No 5, Sep Oct 62, pp 781-792

In the article it is shown that if the sequence $\{e^{-t}P_\pi(t)\}$, where $P_\pi(t)$ are finite linear combinations of degree t^{λ_ν} ($\lambda_\nu > 0, \lambda_{\nu+1} - \lambda_\nu > c > 0$), converges on the semiaxis $(0, \infty)$ in L_a, and if the system $\{e^{-t}t^{\lambda_\nu}\}$ is not complete in $L_a(0, \infty)$, then the sequence $\{P_\pi(t)\}$ converges in the region $0 \leq |t| < \infty$, $-\infty < \arg t < \infty$. This result is extended, to a certain degree, to the sequences $\{e^{-p(t)}P_\pi(y)\}$.

III. CONFERENCES

142. Recent Soviet Conferences in Physics and Mathematics

The conferences listed below were reported or announced in recent issues of Soviet periodicals. Included in the listing are the dates and location of the conference, sponsoring organizations, and wource. Unless otherwise indicated, it is assumed that there was no non-Soviet participation in the conferences.

a. First All-Union Conference on Analog Means and Methods of Solving Boundary Value Problems; 22-? October 1962, Moscow. (Moskovakaya Pravada, 23 Oct 62, p 1)

b. Second All-Union Conference on the Theory of the Structure of Functions; 8-? October 1962, Baku; sponsored by the Institute of Mathematics and Mechanics of the Academy of Sciences Azerbaydzhan SSR and the Mechanics-Mathematics Department of the Azerbaydzhan State University. (Bakinskiy Rabochiy, 9 Oct 62, p 3)

c. Third Conference on Theoretical and Applied Magnetohydrodynamics; Huly 1962, Riga; sponsored by the Institute of Physics of the Academy of Sciences Latvian SSR. (Izvestiya Akademii Nauk Latviyskoy SSR, No 9(182), 1962, p 139)

d. 14th Conference on Spetroscopy; 5-12 July 1961, Gor'kiy. (Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, No 10, Oct 62, entire issue)

e. First Siberian Conference on Spectroscopy; February 1962, Kemerovo; sponsored by the Commission on Spectroscopy of the Siberian Department of the Academy of Sciences USSR and the Chair of Physics of the Kemerovo Mining Institute. (Zavodskaya Laboratoriya, No 10, Oct 62, p 1,276)

f. Conference of Specialists of the Republics of Central Asia and Kazakhstan on Spectroscopy; 11-? September 1962, Tashkent; sponsored by the Commission on Spectroscopy of the Academy of Sciences USSR, the State Committee of the Council of Ministers Uzbek SSR for Coordination of Scientific Research Work, and the Council of Scientific-Technical Societies of the Uzbek Republic. (Pravda Vostoka, 13 Sep 62, p 3)

g. Annual Federov Session Devoted to the 50th Year Since the Discovery of x-Ray Diffraction; 21-? May 1962. (Vestnik Akademii Nauk SSSR, No 9, Sep 62, p 132)

h. Conference on the Theory of Electron Shells of Atoms and Molecules; 7-11 June 1962, Vil'nyus; sponsored by the Institute of Physics and Mathematics of the Academy of Sciences Lithuanian SSR, the Scientific Council on the Theory of Chemical Structure, Kinetics, Reactivity, and Catalysis of the Academy of Sciences USSR, the Commission on Spectroscopy of the Academy of Sceinces USSR, and the Physics-Mathematics Faculty of Vil'nyus University; representatives from Hungary, Czechoslovakia, and Poland. (Vestnik Akademii Nauk SSSR, No 9, Sep 62 p 135)

i. Tenth Meteorite Conference; 29 May-1 June 1962, Leningrad; sponsored by the Committee on Meteorites of the Academy of Sciences USSR. (Vestnik Akademii Nauk SSSR, No 9, Sep 62, p 140)

j. Seminar on Stellar Cosmogony; 7-13 July 1962, Tartu, Estonia; sponsored by the Astronomical Council of the Academy of Sciences USSR. (Sovetskaya Estonia, 14 Jul 62, p 3)

k. Scientific Session Devoted to the Study of the Internal Structure of the Earth According to Seismic Data; 10-15 May 1962, Leningrad; sponsored by the Council on Seismology and the Institute of Physics of the Earth imeni O. Yu. Shmidt. (Vestnik Akademii Nauk SSSR, No 9, Sep 62, p 134)

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7 September 2004

Ms. Roberta Schoen
Deputy Director for Operations
Defense Technical Information Center
7725 John J. Kingman Road
Suite 0944
Ft. Belvoir, VA 22060

Dear Ms. Schoen:

In February of this year, DTIC provided the CIA Declassification Center with a referral list of CIA documents held in the DTIC library. This referral was a follow on to the list of National Intelligence Surveys provided earlier in the year.

We have completed a declassification review of the "Non-NIS" referral list and include the results of that review as Enclosure 1. Of the 220 documents identified in our declassification database, only three are classified. These three are in the Release in Part category and may be released to the public once specified portions of the documents are removed. Sanitization instructions for these documents are included with Enclosure 1.

In addition to the documents addressed in Enclosure 1, 14 other documents were unable to be identified. DTIC then provided the CDC with hard copies of these documents in April 2004 for declassification review. The results of this review are provided as Enclosure 2.

We at CIA greatly appreciate your cooperation in this matter. Should you have any questions concerning this letter and for coordination of any further developments, please contact Donald Black of this office at (703) 613-1415.

Sincerely,

Sergio N. Alcivar
Chief, CIA Declassification Center,
Declassification Review and Referral
Branch

Enclosures:

1. Declassification Review of CIA Documents at DTIC (with sanitization instructions for 3 documents)
2. Declassification Status of CIA Documents (hard copy) Referred by DTIC (with review processing sheets for each document)

Processing of OGA-Held CIA Documents

The following CIA documents located at DTIC were reviewed by CIA and declassification guidance has been provided.

OGA Doc ID	Job Num	Box	Fldr	Doc	Doc ID	Document Title	Pub Date	Pages	Decision	Proc Date
AD0333357	78-03117A	187	1	24	4083	Scientific Information Report Organization And Administration Of Soviet Science (6)	12/4/1962	94	Approved For Release	3/29/2004
AD0333955	78-03117A	190	1	20	4197	Scientific Information Report Organization And Administration Of Soviet Science (7)	1/15/1963	100	Approved For Release	3/29/2004
AD0334986	78-03117A	194	1	1	4341	Scientific Information Report Organization And Administration Of Soviet Science (8)	3/5/1963	129	Approved For Release	3/29/2004
AD0335307	78-03117A	196	1	2	4421	Scientific Information Report Organization And Administration Of Soviet Science (9)	3/19/1963	85	Approved For Release	3/29/2004
AD0336305	78-03117A	199	1	14	4550	Scientific Information Report Organization And Administration Of Soviet Science (10)	4/24/1963	99	Approved For Release	3/29/2004
AD0337360	78-03117A	203	1	2	4702	Scientific Information Report Organization And Administration Of Soviet Science (11)	6/13/1963	65	Approved For Release	3/29/2004
AD0338686	78-03117A	205	1	41	4816	Scientific Information Report Organization And Administration Of Soviet Science (12)	7/18/1963	67	Approved For Release	3/29/2004
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AD0343989	78-03117A	213	1	12	5111	Scientific Information Report Organization And Administration Of Soviet Science (15)	10/18/1963	58	Approved For Release	3/29/2004
AD0345283	78-03117A	215	1	21	5180	Scientific Information Report Organization And Administration Of Soviet Science (16)	11/18/1963	61	Approved For Release	3/29/2004
AD0344526	78-03117A	217	1	34	5255	Scientific Information Report Organization And Administration Of Soviet Science (17)	12/24/1963	32	Approved For Release	3/29/2004
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AD0334380	78-03117A	192	1	4	4260	Scientific Information Report Physics And Mathematics (25)	1/31/1963	53	Approved For Release	3/29/2004
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